AN EXAMINATION OF DENSITY AND VISCOSITY DEPENDENT INFILTRATION OF IMMISCIBLE NONAQUEOUS PHASE LIQUIDS USING THE NUMERICAL MODEL "SWANFLOW"

By

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NOMENCLATURE

c_r	aquifer compressibility
g	gravitational constant
k	intrinsic permeability
k_{ra}	relative permeability of air (vapor)
k_{rn}	relative permeability of NAPL (nonwetting fluid)
k_{rna}	relative permeability of NAPL in an air-NAPL system as a function S_a
k^*_{rnw}	relative permeability of NAPL at the residual saturation of water in a water-NAPL system
k_{rw}	relative permeability of water (wetting fluid)
k_{rnw}	relative permeability of the NAPL system as a function of S_w
p	interstitial fluid pressure
p°	reference pressure
p_a	interstitial air (vapor) pressure
p_n	interstitial NAPL (nonwetting fluid) pressure
p_w	interstitial water (wetting fluid) pressure
p_{can}	capillary pressure between air (vapor) and NAPL (nonwetting fluid)
p_{caw}	capillary pressure between air (vapor) and water (wetting fluid)
p_{cnw}	capillary pressure between the NAPL (nonwetting fluid) and water (wetting fluid)
q_a	air (vapor) mass accumulation (source/sink) term

q_n	NAPL (nonwetting fluid) mass accumulation (source/sink) term
q_w	water (wetting fluid) mass accumulation (source/sink) term
t	time
A	cross-sectional area perpendicular to the direction of flow
D	depth
DNAPL	dense nonaqueous phase liquid
K	hydraulic conductivity
K_{oc}	partitioning coefficient based on organic fraction of the aquifer material
K_{ow}	octanol-water partition coefficient
L	length increment in the flow direction
LNAPL	light nonaqueous phase liquid
M_n	mass per unit volume of NAPL
M_w	mass per unit volume of water
NAPL	nonaqueous phase liquid
S_a	interstitial air (vapor) saturation
S_n	interstitial NAPL (nonwetting fluid) saturation
S_{nwr}	irreducible or residual NAPL (nonwetting fluid) saturation
S_w	interstitial water (wetting fluid) saturation
S_{wi}	residual or irreducible water (nonwetting fluid) saturation
T_n	transmissibility of NAPL
T_{ng}	transmissibility of NAPL under gravitational influence
T_w	transmissibility of water
T_{wg}	transmissibility of water under gravitational influence

V_b	grid block volume
ϕ	porosity of the medium
ϕ°	porosity of the medium at the reference pressure, p°
μ_a	dynamic viscosity of air (vapor)
μ_n	dynamic viscosity of NAPL (nonwetting fluid)
μ_w	dynamic viscosity of water (wetting fluid)
ρ_a	fluid density of the vapor (air) phase
ρ_n	fluid density of the nonwetting phase (NAPL)
ρ_w	fluid density of water
Δ	difference operator for the finite-difference approximation
∇	differential operator

INTRODUCTION

Many hazardous waste sites, including leaking underground storage tanks, involve immiscible nonaqueous phase organic liquids (NAPL) [e.g., *Burmaster and Harris*, 1982; *Maugh*, 1979; *U.S. Environmental Protection Agency*, 1980, 1982, 1983; *Villaume*, 1985]. Release of these organic liquid contaminants usually occurs at or near the ground surface, and once released, they are free to migrate downward, under the influence of gravity, through the vadose zone toward the water table. Owing to capillary forces, much of the nonaqueous phase will remain trapped in the unsaturated zone; however, if the spill volume is large enough it eventually reaches the water table. If the nonaqueous phase organic liquid is less dense than water (LNAPL), it will spread laterally upon reaching the top of the water table, and will usually migrate down-gradient from the spill site, as the right side of Figure 1 demonstrates. If the organic liquid is more dense than water (DNAPL), it will continue to migrate through the saturated zone to the base of the aquifer, illustrated by the left side of Figure 1. Once reaching the base, the DNAPL may be transported down-gradient by groundwater flow or may migrate down-dip toward topographic aquifer lows. Additionally, in the vicinity of the water table, soluble components may dissolve in the water phase forming a plume of contaminated water extending outward from the main zone of contamination. A gaseous envelope of chemical vapor may also develop and migrate beyond the main body of contamination

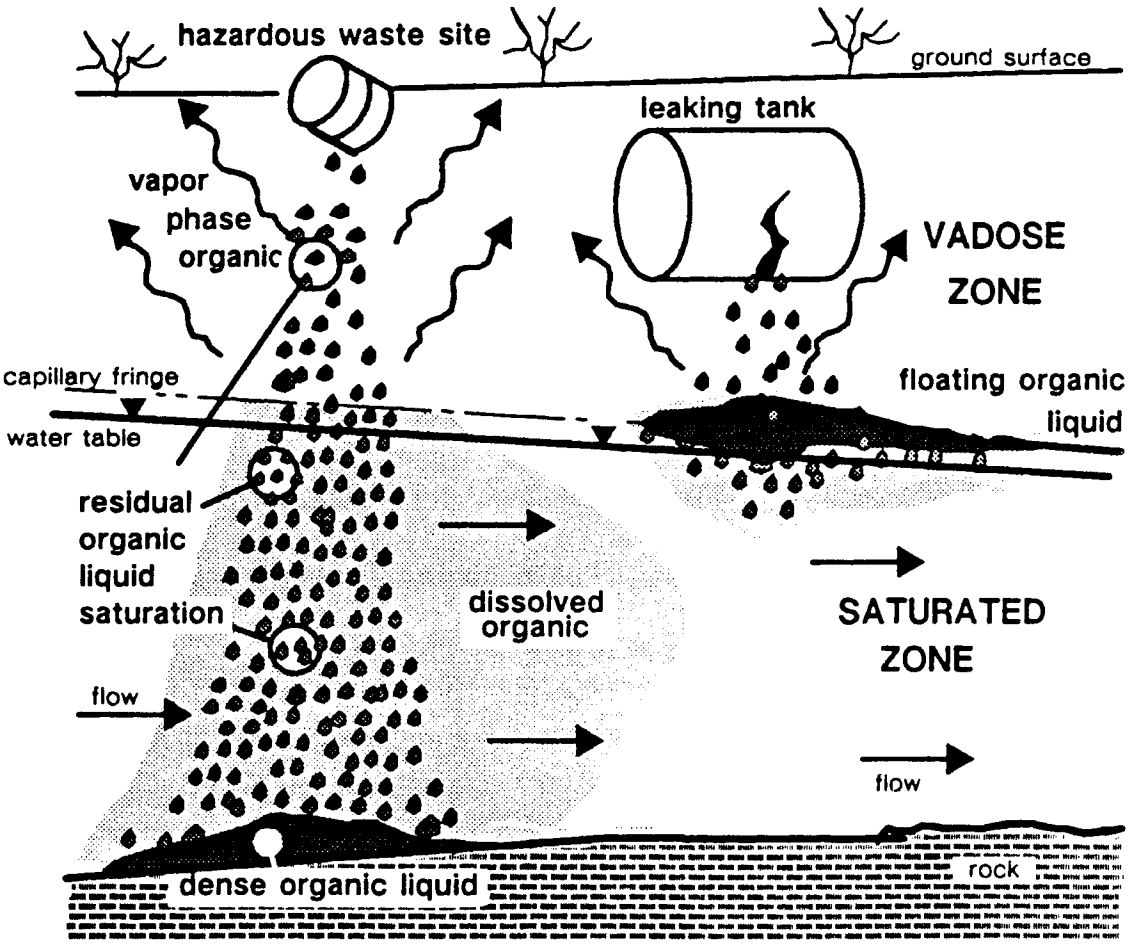

Figure 1. Migration pattern for an organic liquid more dense than water (left) and less dense than water (right) [*Wilson et al.*, 1990].

as the result of volatilization of light components. Such behavior by immiscible contaminants, in addition to dispersion and diffusion phenomena, adsorption onto aquifer solids, and chemical and biological degradation, pose complex challenges to the groundwater-contaminant flow modeler.

The purpose of this study is to evaluate the infiltration pathways of immiscible nonaqueous phase liquids as functions of fluid density and viscosity. Often, groundwater modelers attempt to simulate the movement of a nonaqueous liquid accidentally introduced to subsurface by assuming the NAPL will behave much like the water in the groundwater system. However, the different density and viscosity of the NAPL will result in a dissimilar infiltration pathway. These dissimilarities could impact the design and implementation of a system intended to monitor and recover free product, and should be considered in the evaluation of a contaminated site. Although differences in the infiltration pathway of a NAPL introduced to the subsurface may be generally known for some contaminants, there is little published data which quantify this variation as a function of NAPL fluid properties, i.e., its density and viscosity.

Scope of Related Research

Much of the current knowledge of the physics of multiphase fluid flow [e.g., *Corey et al.*, 1956; *Land*, 1968; *Leverett and Lewis*, 1941; *Snell*, 1962; *Stone*, 1973] and the relevant numerical solution methods have been developed in the petroleum industry, and are widely published in the petroleum reservoir engineering literature [e.g., *Coats*, 1982; *Peaceman*, 1977; *Young and Stephenson*, 1983]. The simultaneous movement of multiple fluid phases (i.e., crude oil, water, and natural gas) through a single porous

media, as it relates to hydrocarbon emplacement and production is critically important to the reservoir engineer. This concept has long been commonplace within the petroleum industry; however, it was not until 1967 that the movement of a NAPL in a groundwater system was recognized as a multiphase flow problem [*van Dam*, 1967]. *Green et al.* [1970] further expanded the multiphase concept of NAPL transport by questioning the importance of a hydrodynamically passive air phase, an assumption commonly accepted by the hydrologists of the period. Instead, they presented an analysis based upon dynamic air and water phases.

Based on work by *van Dam* [1967], several numerical models were developed to describe mathematically the immiscible flow of a lighter than water NAPL [*Hocmuth and Sunada*, 1985; *Holzer*, 1976]. These early models assumed piston-like flow, i.e., negligible capillarity. Inherent in this assumption is the requirement that the NAPL and water phases have fixed saturations, which is not realistic in field situations where phase saturations can vary considerably [*Pinder and Abriola*, 1986].

During the last decade, several finite-difference and finite-element numerical simulators for NAPL transport in multiphase subsurface systems have been reported in the groundwater literature. Many of the early models were developed to incorporate the concept of capillarity into the immiscible NAPL transport scheme [*Faust*, 1985; *Faust et al.*, 1989; *Kaluarachchi and Parker*, 1989; *Kuppusamy et al.*, 1987; *Osborne and Sykes*, 1986]. However, they do not consider interphase mass transfer of the NAPL components, and either do not include a gas phase or assume an immobile gas phase at uniform atmospheric pressure. Therefore, these simulators do not include the transport of solubilized and vaporized constituents in the water and air phases, respectively. What

follows is a brief discussion of the evolution of these numerical models which have recently been developed.

The model introduced by *Faust* [1985], Simultaneous Water, Air, and NAPL Phase Flow (SWANFLOW), and subsequently updated by *Faust et al.* [1989], analyzed the simultaneous flow of water and NAPL in a three-phase fluid system. The flow model presented uses a finite-difference method in two- and three-dimensional domains, and is based on the mass conservation of each fluid under the assumption of a static air phase at atmospheric pressure. The coupled, nonlinear, partial differential equations are a simplification of the conventional three-phase flow equations used in petroleum reservoir simulation [*Peaceman*, 1977], and can be solved for both saturated and unsaturated conditions. Constitutive relationships employed by the model include relative permeability-saturation, pressure-saturation, and porosity-fluid pressure expressions. In addition, the flow of the nonaqueous phase is in response to viscous and gravity (density dependent) forces.

A finite-element solution for liquid flow in a three-phase porous medium system comprising two space dimensions was presented *Kuppusamy et al.* [1987]. The model involves the simultaneous solution of two coupled, partial differential equations for flow of the water and NAPL phases. It is assumed the air phase is static and remains at constant atmospheric pressure. The model incorporates constitutive relationships for fluid conductivities and saturations as functions of fluid pressures. These relationships were experimentally calibrated by *Parker et al.* [1987], and are included in the finite-element code. No interphase mass transfer is considered.

A simulator by *Kaluarachchi and Parker* [1989] was developed to predict the

simultaneous flow of water and oil in a three-phase system through the unsaturated zone. The two-dimensional, finite-element model, MOFAT-2D, utilizes Galerkin's weighted residual approach and an upstream weighting technique to solve the two coupled, nonlinear, partial differential equations. Brooks and Corey [1966], and van Genuchten [1980] soil properties are also considered. Constitutive relationships are used to describe three-phase relative permeabilities and saturations as functions of fluid pressures. Assumptions include negligible pressure gradients in the air phase (i.e., air pressure is atmospheric), an incompressible porous media, constant fluid properties, and no mass transfer between phases.

The finite-element model, Waterloo Simulator for Two-Phase Immiscible Flow (WSTIF), introduced by *Osborne and Sykes* [1986], is a two-dimensional, two-phase simulator based on Darcy's law and conservation of mass for each liquid, and is intended to predict the migration of an immiscible organic solvent in groundwater. The numerical model is based on a generalized method of weighted residuals in conjunction with the finite-element method to solve the two, coupled, second-order, nonlinear immiscible transport equations. A non-hysteretic capillary pressure-water saturation expression, and a relative permeability-water saturation constitutive relationship are incorporated into the model as well. An incompressible porous media and incompressible fluids are assumed. The transport of the air phase and interphase mass transfer are not considered.

A few of the reported simulators consider interphase mass transfer of one or more NAPL components to the gas and water phases, but assume that the NAPL itself is immobile in the unsaturated zone [*Baehr and Corapcioglu*, 1987; *Corapcioglu and Baehr*, 1987; *Sleep and Sykes*, 1989]. The focus of these simulators is to evaluate the impact of

a NAPL at residual saturation (i.e., immobile conditions), in the unsaturated zone, and its transport as solubilized and vaporized components in the water and air phases, respectively. Such conditions may arise as a spilled contaminant migrates vertically downward through the unsaturated zone, or may be that portion of a spill which remains trapped in a soil after routine remedial efforts to recover the product have ceased.

A one-dimensional, finite-difference model to describe multiphase transport in the unsaturated zone was introduced by *Baehr and Corapcioglu* [1987] and *Corapcioglu and Baehr* [1987]. The simulator considers the fate of an immobile, reactive, multiconstituent, immiscible contaminant, which is allowed to partition between the air, water, sorbed, and immiscible phases. An equilibrium approximation is applied to partition the constituent mass between the four available phases in regions where the contaminant plume exists. Outside the limits of the plume, the equilibrium approximation takes on a simpler form to partition the constituent mass between the air, water, and sorbed phases only. Thermodynamic principles are employed to quantify the interphase partitioning. In addition, molecular transformations of the contaminant, both biotic and abiotic, are incorporated as sink terms into the conservation of mass equation. One nonlinear, partial differential equation is required for each constituent of the immiscible contaminant for the one-dimensional approximation. The one-dimensional formulation allows for conservative estimates of constituent mass released to the atmosphere or aquifer, and of constituent mass remaining in the unsaturated zone.

The simulator developed by *Sleep and Sykes* [1989] is intended to predict the fate of immobilized volatile organic compounds in variably saturated media. The partial differential equations are obtained by combining Darcy's law with the mass continuity

equation, and are solved for a two-dimensional, vertical cross section using Galerkin's method of weighted residuals. The equations are linked by capillary pressures existing at the interfaces between phases. Variably saturated water flow, density-dependent gas flow, and water and gas phase transport are considered by this simulator.

Models presented by *Abriola and Pinder* [1985a, b] and *Forsyth* [1988] allow for interphase mass transfer and flow of the NAPL and water phases, but the gas phase is assumed to be stagnant. *Abriola and Pinder* [1985a, b] developed a series of governing equations for a two-component (nonvolatile and volatile) contaminating phase. Using Darcy's law, the conservation of mass principles, and the volume averaging theory, it was possible to describe the simultaneous transport of a contaminant in three physical forms, including transport as a nonaqueous phase, as a soluble component of a water phase, and as a mobile fraction of a gas phase. Incorporated within the flow equations are the effects of matrix and fluid compressibility, gravity, phase composition, interphase mass exchange, capillarity, diffusion, and dispersion. These resulting equations form a system of three nonlinear partial differential equations for transport of the water phase, and the two organic phases. The five unknowns include nonaqueous-water and water-gas capillary pressures, and the mass fraction of the volatile organic species in the nonaqueous, water, and gas phases. The work of *Forsyth* [1988] involves the basic modeling strategy of *Faust* [1985] and *Faust et al.* [1989]. The simulator includes the interphase mass transfer concepts developed by *Abriola and Pinder* [1985a, b], except the organic phase is composed of a single species.

Recently, researchers including *Falta et al.* [1992a, b], *Sleep and Sykes* [1993a, b], and *Adenekan et al.* [1993] have made significant contributions toward simulation of a

nonaqueous phase in groundwater systems. The model developed by *Falta et al.* [1992a, b], STMVOC, was the first simulator in the groundwater literature to consider interphase mass transfer and the transport of the contaminant in all three fluid components, including gas phase advection, for nonisothermal conditions. Interphase mass transfer of the components between any of the phases is calculated by assuming local chemical equilibrium between the phases. Adsorption of the chemical contaminant to the soil is also included. This code was specifically developed for simulating steam injection for the removal of nonaqueous fluids from shallow subsurface formations.

The three-dimensional simulator developed by *Sleep and Sykes* [1993a, b] considers the fate of a three-phase fluid system in isothermal subsurface conditions. This model includes the flow of the water, gas, and nonaqueous phases, partitioning of an arbitrary number of organic and inorganic species between these phases, and the transport of species in each of these phases.

The most comprehensive simulator to date has recently been introduced by *Adenekan et al.* [1993]. Their model, Multiphase Multicomponent Nonisothermal Organic Transport Simulator (M^2NOTS), includes the interphase partitioning described by *Falta et al.* [1992a, b] and *Sleep and Sykes* [1993]. In addition, flow of all three NAPL phases in response to viscous, gravity (dependent on NAPL density), and capillary forces in three-dimensional and arbitrary geometries are included. The nonaqueous phase may consist of any number of user specified chemical components, and each component is allowed to partition into all other phases.

Multiple Phase Fluid Systems

The movement of nonaqueous phase liquids that are immiscible with water through the subsurface may be tracked in any of four phases [*Abriola and Pinder*, 1985b]. The contaminant may be tracked: (1) as a distinct nonaqueous phase, (2) as a solute, (3) as a vapor, and (4) as a sorbate on the aquifer solids. All four contaminant phases, as illustrated in Figure 2, are free to exist in the unsaturated zone; however, owing to the absence of air, the vapor phase is excluded in the analysis of the saturated zone. The contaminating liquid is free to partition itself between one or all of the available phases in order to achieve phase equilibrium. The partitioning characteristics of each contaminant (or each constituent of a heterogeneous contaminant such as gasoline) can be determined utilizing Henry's law constant in conjunction with vapor pressure, an experimentally determined aqueous solubility (octanol-water partition coefficient, K_{ow}), and the partitioning coefficient based on organic fraction of the aquifer material (K_{oc}). For more detailed discussions on partitioning and sorption processes, the reader is referred to *Fetter* [1993].

In addition to partitioning phenomena, there are three basic concepts which govern the flow of immiscible fluids in the subsurface. These include saturation ratio, capillary pressure, and relative permeability.

Saturation Ratio

The saturation ratio is the fraction or percent of the total pore space filled with a particular liquid. The liquid may be NAPL, water, or air, and the interstitial saturations are expressed as S_n, S_w, and S_a, respectively. The total of all the saturation ratios for all

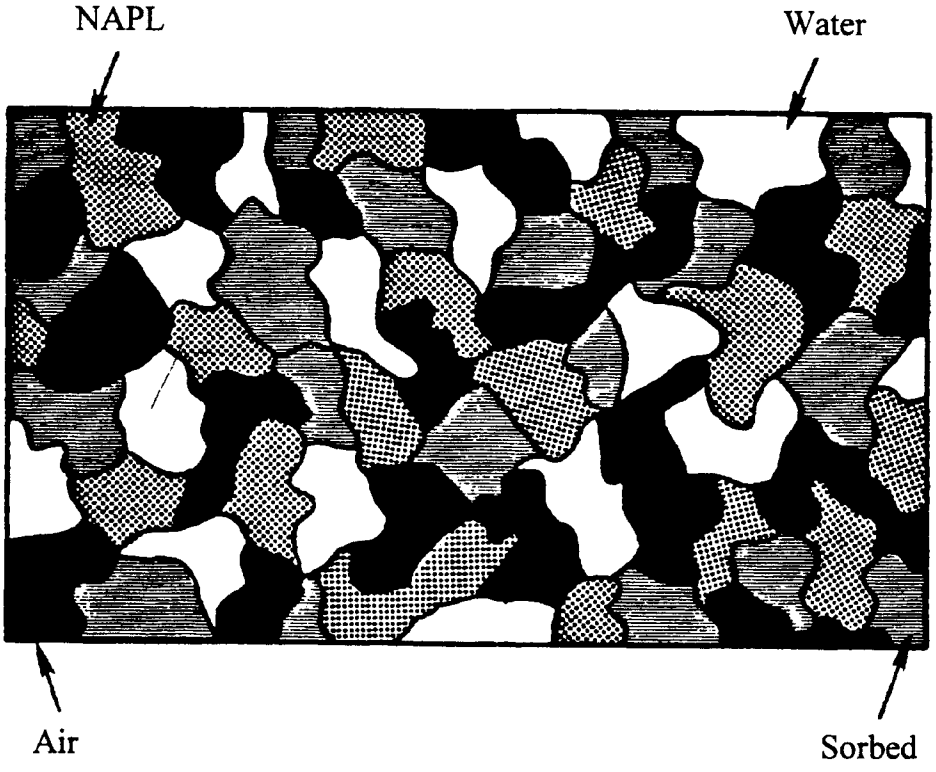

Figure 2. Schematic cross section illustrating a porous media containing four phases, i.e., NAPL, water, air, and sorbed contaminant on framework grains [modified from *Abriola and Pinder*, 1985a].

fluids present must total to one [*Fetter*, 1993]. That is,

$$S_n + S_w + S_a = 1 \tag{1}$$

Capillary Pressure

If the pore pressures of two immiscible fluids are measured near an interface, different pressures will be noted. That difference is the capillary pressure [*Fetter*, 1993]. The capillary pressures of interest to contaminant flow modelers are those which occur at the air-NAPL interface in the unsaturated zone, and the NAPL-water interface in the saturated zone [e.g., *Faust*, 1985; *Faust et al.*, 1989; *Guswa*, 1985; *Osborne and Sykes*, 1986]. The expressions used to denote the capillary pressures described above are

$$p_{can} = p_a - p_n \tag{2}$$

$$p_{cnw} = p_n - p_w \tag{3}$$

where w, n, and a represent the water, nonaqueous, and air phases, respectively, p is interstitial fluid pressure, and p_c is the capillary pressure. It is not necessary to define the third capillary pressure, as it is a simple combination of the other two [*Peaceman*, 1977]

$$p_{caw} = p_a - p_w = p_{can} + p_{cnw} \tag{4}$$

where p_{caw} is the capillary pressure between air and the wetting-phase fluid, i.e., the water.

The capillary pressure, relative to the saturation of the two immiscible fluids, can be determined experimentally for a given porous medium. The sample is initially water wet, i.e., the saturation of the wetting fluid is 100 percent. The wetting fluid is gradually

displaced from the sample by forcing a nonwetting fluid into the pore space. Because of surface tension and the curvature of the interfaces between the fluids within the small pores, the pressure in the nonwetting fluid is higher than the pressure in the wetting fluid [*Peaceman*, 1977]. Therefore, as the wetting fluid is "drained" from the sample and the saturation decreases, the capillary pressure will also decrease. Capillary pressure head can then be plotted against the wetting fluid saturation to produce a drainage curve as seen in Figure 3. The saturation at which the wetting fluid can no longer flow under decreasing capillary pressure is referred to as the residual or irreducible wetting saturation (S_{wi}). The process is then reversed, displacing the nonwetting fluid with the wetting fluid, increasing the wetting saturation and the capillary pressure. The resulting plot is called an imbibition or wetting curve. When the imbibition curve reaches zero capillary pressure, some of the nonwetting fluid will remain in the porous media. The remaining nonwetting fluid is known as the irreducible or residual nonwetting fluid saturation (S_{nwr}).

The different pathways observed between the drainage and imbibition curves is referred to as hysteresis. Hysteresis is a function of saturation history, i.e., which fluid initially occupied the pore space. It can also be shown experimentally that the capillary pressure for drainage cycle is greater than the capillary pressure required for imbibition [*Corey*, 1986].

Little experimental data concerning three-phase capillary pressures for nonaqueous phase liquids appears in the groundwater literature. The available data are primarily concerned with determining relative permeability data for specific organic contaminants. Some current research includes work by *Dane et al.* [1992], *Ferrand et al.* [1990], *Lenhard* [1992], and *Soll et al.* [1993].

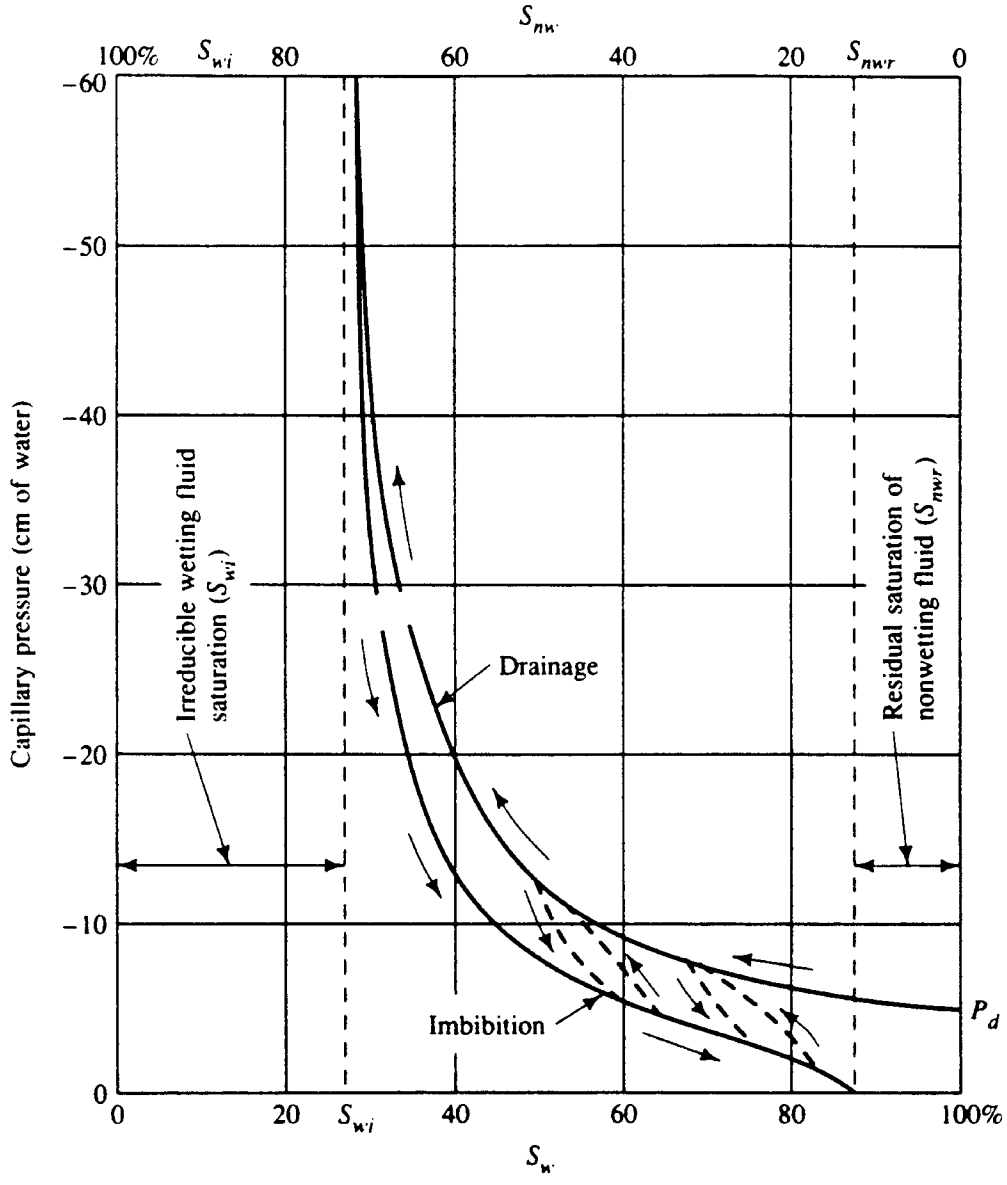

Figure 3. Capillary pressure-wetting fluid saturation for two-phase flow [*Fetter*, 1993].

Relative Permeability

As two immiscible fluids flow through a porous media, part of the available pore space will be filled with one fluid and the remainder will be filled with the other. Because the two fluids must compete for pore space through which to flow, the cross-sectional area of the pore available to each fluid now becomes a fraction of the total pore space. The relative permeability is the ratio of the intrinsic permeability for a fluid at a given saturation to the total intrinsic permeability of the rock [*Fetter*, 1993].

Figure 4 shows two-phase relative permeability curves for a wetting and nonwetting fluid. No flow of the wetting fluid occurs within the irreducible saturation "zone," and the S_{wi} must be exceeded to initiate flow. The same is true for the residual nonwetting fluid, that is, no flow of the nonwetting phase can occur until the S_{nwr} is exceeded.

Three-phase relative permeabilities for an air-water-NAPL system are more complex. By obtaining the relative permeabilities for two of the three fluids, the third can be estimated using a procedure devised by *Stone* [1973]. First, the relative permeability of water, k_{rw}, as a function of S_w for a water-NAPL system is determined. Second, the relative permeability of air, k_{ra}, as a function of S_a is obtained for an air-NAPL system. Finally, the relative permeability of the nonaqueous liquid, k_{rn}, in the three-phase system is calculated using equation (5) [*Faust*, 1985]

$$k_{rn} = k^*_{rnw}\left[\left(\frac{k_{rnw}}{k^*_{rnw}} + k_{rw}\right)\left(\frac{k_{rna}}{k^*_{rnw}} + k_{ra}\right) - (k_{rw} + k_{ra})\right] \qquad (5)$$

where k^*_{rnw} is the relative permeability of NAPL at the residual saturation of water in a

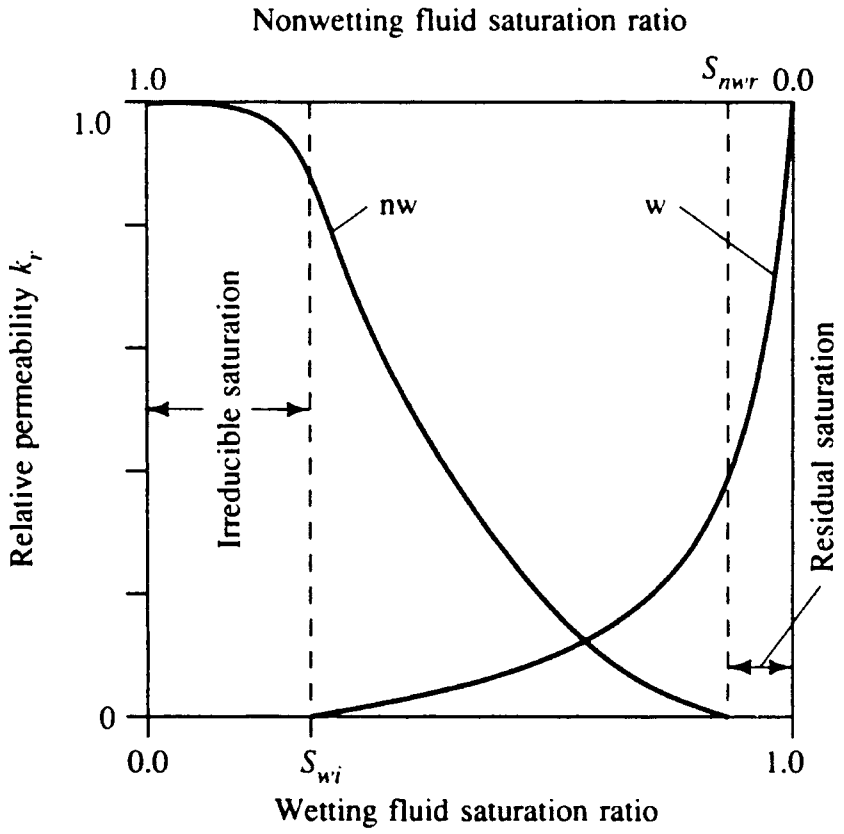

Figure 4. Typical relative permeability curves for a two-phase system [*Fetter*, 1993].

water-NAPL system, k_{rnw} is the relative permeability of the NAPL for a water-NAPL system as a function of S_w, and k_{rna} is the relative permeability of NAPL in an air-NAPL system as a function S_a. Figure 5 is a ternary plot of the relative permeability for a NAPL in an air-water-NAPL system, i.e., the unsaturated zone, where water is the wetting fluid.

Experimental data and empirical relationships concerning three-phase relative permeabilities have long been employed in the recovery of crude oil [e.g., *Corey et al.*, 1956; *Land*, 1968; *Snell*, 1962; *Stone*, 1973]; however, comparatively little information is available on these data for organic liquid contaminants [e.g., *Demond and Roberts*, 1993].

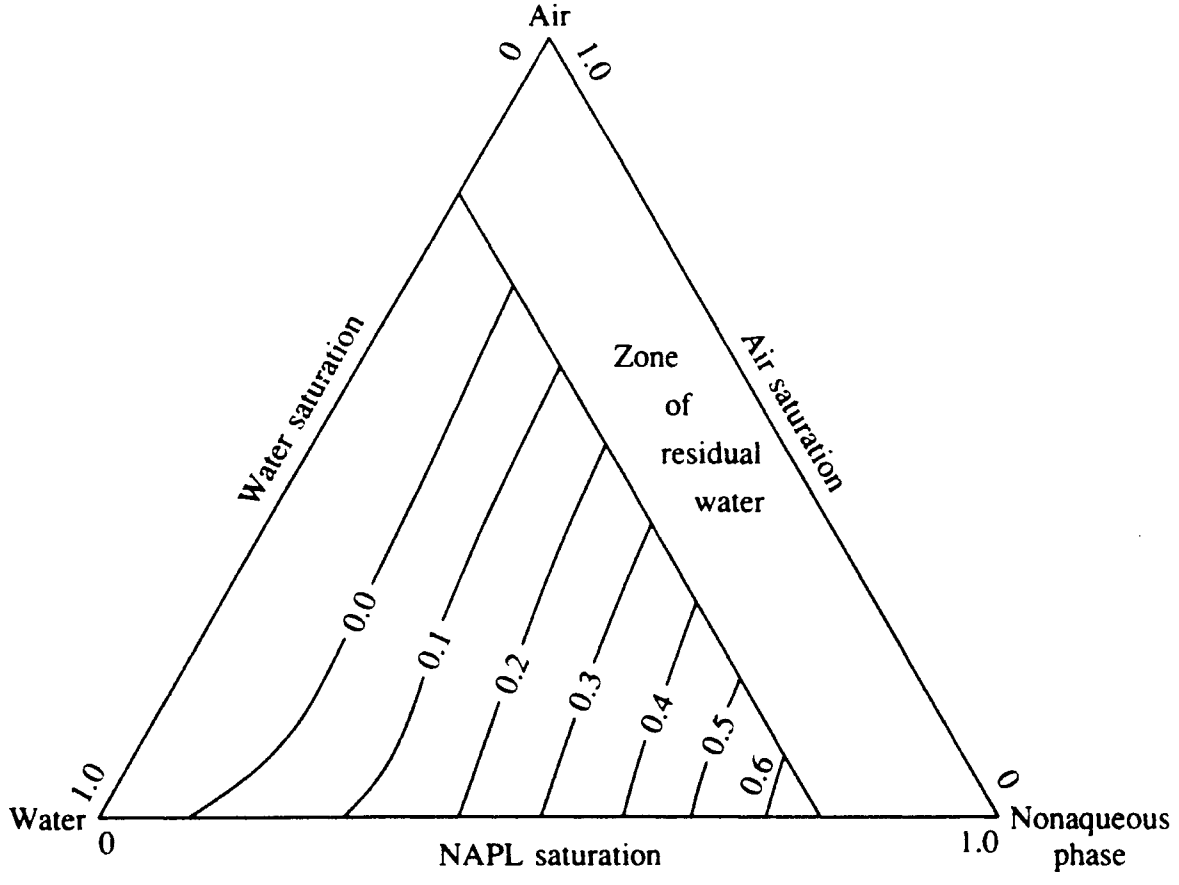

Figure 5. Ternary diagram showing the relative permeability of NAPL in an air-water-NAPL system as a function of saturation [*Fetter*, 1993].

EXPERIMENTAL METHODOLOGY

Research Objectives and Methods Overview

The purpose of this study is to evaluate the infiltration pathways of immiscible nonaqueous phase liquids as functions of fluid density and viscosity. Often, groundwater modelers attempt to simulate the movement of a NAPL accidentally introduced to the subsurface by assuming the NAPL will behave much like the water in the groundwater system. However, the different density and viscosity of the NAPL will result in a dissimilar infiltration pathway. These dissimilarities could impact the design and implementation of a system intended to monitor and recover free product.

This study utilizes numerically simulated cross-sectional flow profiles of nine representative liquids with various densities and viscosities. Table 1 summarizes the liquids and their respective physical constants used in the comparison simulations. For the simulations, all input parameters are kept constant with the exception of NAPL density and viscosity. Simulations were run from the inception of the leak to a time of 10 years. Outputs were produced for one, three, five, and 10 years for each NAPL. Simulated results are plotted and contoured to provide direct visual comparison of the infiltration pathways. Pathway evaluation also includes an examination of vertical and horizontal NAPL migration. The examination of vertical migration is accomplished by comparing breakthrough times at two horizontally-oriented hydrogeologic markers, i.e.,

the groundwater table and the lower draining aquifer. Horizontal migration is evaluated by graphically determining the distance the immiscible plume travels from the source.

TABLE 1. NAPL Density and Viscosity Data*

NAPL	SWANFLOW Units		Standard Groundwater Units	
	Density (kg/m^3)	Dynamic Viscosity (kg/m·s)	Specific Gravity (gm/cm^3)	Dynamic Viscosity (centipoise)
Gasoline	730.0	4.500E-4	0.7300	0.450
Kerosene	810.0	2.050E-3	0.8100	2.050
p-Cymene	857.3	3.402E-3	0.8573	3.402
10W-30 Motor Oil	869.0	1.300E-1	0.8690	130.0
Water	1000.0	1.000E-3	1.0000	1.000
Phenol	1053.3	4.076E-3	1.0533	4.076
o-Nitrotoluene	1162.9	2.370E-3	1.1629	2.370
Trichloroethene	1467.9	5.660E-4	1.4679	0.566
Tetrachloromethane	1584.2	9.690E-4	1.5842	0.969

*Source: *Mercer et al.* [1990]

The Numerical Model

The finite-difference model, Simultaneous Water, Air, and Nonaqueous Phase Flow (SWANFLOW), simulates the flow of an immiscible nonaqueous phase fluid under both saturated and unsaturated near-surface conditions [*Faust and Rumbaugh*, 1985]. Mathematical models developed for multiphase simulation are highly nonlinear which result in analytical solutions which are difficult to achieve. Solution techniques for the SWANFLOW model consist of a finite-difference approximation of the differential

equations, the Newton-Raphson method to treat the nonlinearities and to provide faster solution convergence, and the slice successive overrelaxation (SSOR) method for matrix solution [*Faust and Rumbaugh*, 1985].

Governing Equations for Multiphase Flow

The mathematical description of mulitphase flow in porous media is the conservation equation of mass and momentum for each fluid phase present. The equations utilized by the SWANFLOW code are based on a simplification of the conventional three-phase flow equations commonly used in petroleum reservoir simulation intended to simulate three-phase immiscible flow [*Faust et al.*, 1989]. The three equations are

$$\nabla \left[\frac{k \rho_w k_{rw}}{\mu_w} (\nabla p_w - \rho_w g \nabla D) \right] + q_w = \frac{\partial (\phi \rho_w S_w)}{\partial t} \tag{6}$$

$$\nabla \left[\frac{k \rho_n k_{rn}}{\mu_n} (\nabla p_n - \rho_n g \nabla D) \right] + q_n = \frac{\partial (\phi \rho_n S_n)}{\partial t} \tag{7}$$

$$\nabla \left[\frac{k \rho_a k_{ra}}{\mu_a} (\nabla p_a - \rho_a g \nabla D) \right] + q_a = \frac{\partial (\phi \rho_a S_a)}{\partial t} \tag{8}$$

where the subscripts w, n, and a denote the water, nonaqueous phase, and air constituents, respectively; k is the intrinsic permeability tensor (L^2); ρ is the fluid density (M/L^3); k_r is the fluid relative permeability (*dimensionless*); μ is the fluid dynamic viscosity (M/LT); p is the fluid pressure (M/LT^2); g is the gravitational constant (L/T^2); D is the depth (L); q is the mass source/sink rate (M/T); ϕ is the porosity of the medium (*dimensionless*); S is

the volumetric saturation (*dimensionless*); ∇ is the differential operator; and t is time (T). The above equations include 16 dependent variables in the general case [*Peaceman*, 1977].

Constitutive Relationships

Five constitutive relationships encompassing an additional 13 independent relationships are necessary to obtain a solution to the flow equations described above. The five most general relationships include:

(1) The volumetric saturations of all three phases total to one--one relationship (see equation 1)

(2) Densities and viscosities are functions of phase pressures--six relationships. For the shallow systems in which most contaminated groundwater is encountered, it is appropriate to assume densities and viscosities are pressure independent [*Faust and Rumbaugh*, 1985].

(3) The relative permeabilities are functions of saturations--three relationships.

(4) The capillary pressures are functions of saturations--two relationships (see equations 2 and 3).

(5) porosity is a function of pressure for both the unsaturated and saturated zones--one relationship (see equation 19).

Final Multiphase Flow Equations

Equations (6), (7) and (8) are further simplified by assuming the pressure gradients in the air phase are negligible and are at atmospheric conditions. This eliminates the need for equation (8) and allows for the reformulation of (6) and (7) in terms of NAPL

pressure (p_n) and water saturation (S_w) using the relationships defined in equations (1), (2), and (3). The final governing partial differential flow equations can now be expressed as

$$\nabla\left[\frac{k\rho_w k_{rw}}{\mu_w}(\nabla p_n - \rho_w g \nabla D)\right] - \nabla\left[\frac{k\rho_w k_{rw}}{\mu_w}\nabla p_{cnw}\right] + q_w = \frac{\partial(\phi\rho_w S_w)}{\partial t} \quad (9)$$

$$\nabla\left[\frac{k\rho_n k_{rn}}{\mu_n}(\nabla p_n - \rho_n g \nabla D)\right] + q_n = \frac{\partial(\phi\rho_n(1 - S_w - S_a)}{\partial t} \quad (10)$$

where p_{cnw} is the capillary pressure between NAPL and water (see equation 3).

Finite-Difference Formulation

The three-dimensional model is based on a finite-difference scheme utilizing a block centered grid that allows for variable spacing and approximation of irregular geometries. The Cartesian grid does not need to be aligned horizontally, permitting the simulation of sloping aquifers. The implicit finite-difference approximations of equations (9) and (10) are given by

$$\Delta\left(T_w^{t+\Delta t}\Delta p^{t+\Delta t}\right) - \Delta\left(T_{wg}^{t+\Delta t}\Delta D\right) - \Delta\left(T_w^{t+\Delta t}\Delta p_{cnw}^{t+\Delta t}\right) + q_w^{t+\Delta t} = \frac{V_b}{\Delta t}\left(M_w^{t+\Delta t} - M_w\right) \quad (11)$$

$$\Delta\left(T_n^{t+\Delta t}\Delta p^{t+\Delta t}\right) - \Delta\left(T_{ng}^{t+\Delta t}\Delta D\right) + q_n^{t+\Delta t} = \frac{V_b}{\Delta t}\left(M_n^{t+\Delta t} - M_n^{t}\right) \quad (12)$$

where q_n and q_w are the accumulation terms for NAPL and water (M/T), respectively, and V_b is the grid block volume (L^3). The transmissibility terms are defined as

$$T_w = \left(\frac{kA}{L}\right)\frac{\rho_w k_{rw}}{\mu_w} \tag{13}$$

$$T_{wg} = \left(\frac{kA}{L}\right)\frac{\rho_w^2 g\, k_{rw}}{\mu_w} \tag{14}$$

$$T_n = \left(\frac{kA}{L}\right)\frac{\rho_n k_{rn}}{\mu_n} \tag{15}$$

$$T_{ng} = \left(\frac{kA}{L}\right)\frac{\rho_n^2 g\, k_{rn}}{\mu_n} \tag{16}$$

where T_w is the transmissibility of water, T_{wg} is the transmissibility of water under the influence of gravity required for the unsaturated zone, T_n is the transmissibility of NAPL, T_{ng} is the transmissibility of NAPL incorporating the gravitational constant, A is the cross-sectional area perpendicular to the direction of flow, and L is the length increment in the flow direction. The mass terms are defined as

$$M_w = \rho_w \phi\, S_w \tag{17}$$

$$M_n = \rho_n \phi\, (1 - S_w - S_a) \tag{18}$$

where M_w and M_n are the mass per unit volume of water and NAPL, respectively (M/L^3).

Assumptions and Limitations

The major assumptions incorporated into the SWANFLOW code include the following.

1. The pressure in the air phase is constant and equal to atmospheric pressure.

2. Water and NAPL viscosity are pressure independent.

3. Water and NAPL density are pressure independent.

4. The relative permeability of water is a function of water saturation.

5. The relative permeability of NAPL is a function of air and water saturation.

6. Capillary pressure is a function of water saturation.

7. Air saturation is a function of NAPL pressure.

8. Porosity is a linear function of pressure.

9. Flow is in a porous medium.

10. Darcy's equation for multiphase flow is valid.

11. Intrinsic permeability is a function of space.

12. There is no interphase mass transfer, e.g., NAPL cannot dissolve in water.

Limitations which must be considered before applying the SWANFLOW code to a specific site are as follows.

1. Transport of the air phase cannot be modeled.

2. Transport of dissolved NAPL is not considered.

3. The model cannot treat highly pressurized systems, such as petroleum reservoirs, where the viscosity and density of the three phases are a function of pressure. Confined conditions can be simulated.

4. Fractured systems cannot be modeled unless the size of the model's grid blocks is much larger than the scale of the individual fractures.

Many of the recently developed numerical models, e.g., *Falta et al.* [1992a, b], *Sleep and Sykes* [1993a, b], *Adenekan et al.*, [1993], consider many of these limitations which are imposed on the SWANFLOW code. These numerical codes are written to

include such components as dissolved phase transport, vapor phase transport, and interphase mass transfer, in addition to flow modeling of the immiscible nonaqueous phase. However, as the complexity of the model increases, the data sets required to operate them becomes increasingly more comprehensive. In some instances, the necessary input data may not be readily available, and may require experimental derivation. Although SWANFLOW may appear simplistic in comparison, it is actually a complex, sophisticated model which affords the user valuable, useful information from input data which are readily available. This is provided the user understands and considers the assumptions and limitations listed above.

SWANFLOW Input Parameters

The SWANFLOW code can accommodate any consistent set of units within the input files. However, this often results in abandoning the more "standard" groundwater units commonly used in industry. For the reader's convenience, conversions between the standard units and the units used in the input data files are provided.

Hydrogeologic Setting

The hydrogeologic setting for the simulations involves an undetected surface leak of a nonaqueous phase liquid onto a stratigraphic unit considered to be an aquitard [*Huyakorn et al.*, 1983]. Thickness of this aquitard remains constant across the study area and extends to a depth of 4.75 meters below the ground surface. The water table occurs at a depth of 1.5 meters, resulting in both saturated and unsaturated conditions within the aquitard. The influence of the capillary fringe on fluid migration is not included in the

SWANFLOW code, and a sharp boundary between the unsaturated and saturated zones is assumed to exist. Immediately below is the aquifer which provides a local source of drinking water. Since the aquifer drains the overlying aquitard, any NAPL leakage into the aquifer will likely impact the quality of the drinking water. Only the upper most 0.25 meters of the aquifer is included in the simulation (Figure 6). Groundwater flow velocity is negligible and not considered in the simulation.

The porosity of the media is related to interstitial fluid pressure and aquifer compressibility by means of the following expression

$$\phi = \phi^{\circ}\left[1 + c_r\left(p - p^{\circ}\right)\right] \tag{19}$$

where ϕ° is the porosity at the reference pressure, p°, and c_r is the aquifer compressibility. The reference porosity is 0.3 at the reference pressure 0.0 N/m^2 which occurs at the groundwater table. Aquifer compressibility is 1.0E-15 m^2/N. Intrinsic permeability (k) is equivalent for the x-, z-, and y-directions at 10^{-12} m^2, and remains constant throughout the aquifer and the aquitard.

Table 2 and Figure 6 summarize the hydrogeologic parameters used in the simulations.

Initial Conditions

The natural recharge rate, NAPL source rate, initial water saturations, and initial interstitial NAPL pressures are assumed as initial conditions before contaminant leakage occurred.

The natural recharge rate, resulting from rainfall within the study area, is 3.94 in/yr (3.17E-6 $kg/s/m^2$) [*Huyakorn et al.*, 1983].

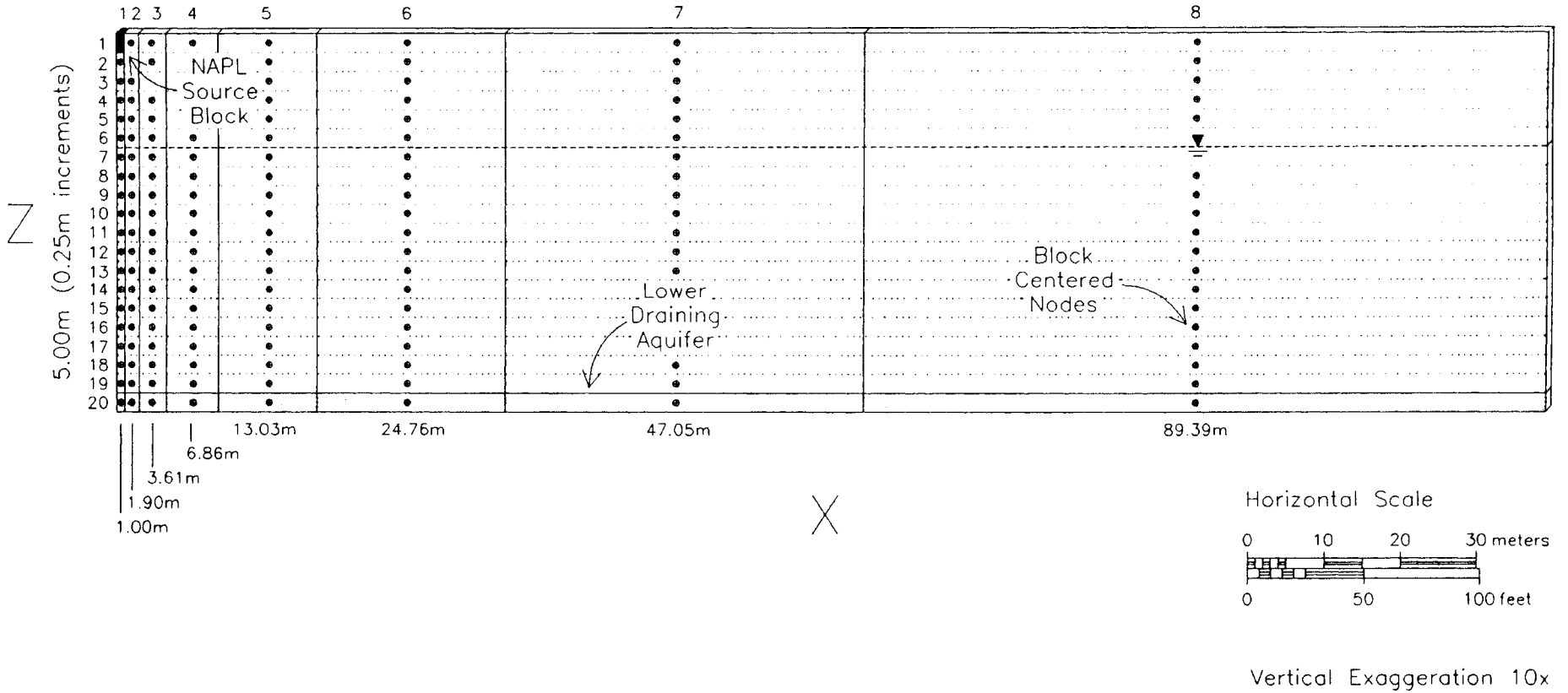

Figure 6. Finite-difference grid showing locations of the NAPL source block, the lower, draining aquifer, and the block-centered grid nodes.

TABLE 2. Hydrogeologic Parameters

Property	SWANFLOW Model Units
Total Aquitard Thickness	4.75 m
Represented Aquifer Thickness	0.25 m
Depth to Groundwater	1.50 m
Reference Porosity ($\phi°$)	0.30
Reference Pressure ($p°$)	0.00 N/m^2
Intrinsic Permeability (k)	1.00E-12 m^2
Hydraulic Conductivity (K)	0.84 m/d
Media Compressibility (c_r)	1.00E-15 m^2/N

The nonaqueous phase liquid is introduced to the system as a continuous source at grid block (x=1, z=1) (Figure 6) at a rate of 300 gal/yr (3.60E-8 m^3/s). The SWANFLOW code requires entry of the NAPL source term into the input file as spill mass per unit time (kg/s), which is a function of spill volume and NAPL density.

The initial volumetric water saturations are based on a yearly averaged soil moisture profile of the contamination site which was originally described by *Huyakorn et al.* [1983]. The saturation profile is assumed to be a steady-state condition, which is dependent on the natural recharge in the area of the spill site. The volume of water entering the system through natural recharge is equivalent the volume lost through the base of the finite-difference grid. Within the unsaturated zone, water saturations uniformly increased with depth at a rate of 7.5% per meter and range in value from approximately 84% at the surface to a maximum of 100% at the water table. Below the water table, within the saturated zone, initial volumetric water saturations are constant at

100% (Table 3).

Initial interstitial NAPL pressures are equivalent to the hydrostatic pressure head, which is a function of the distance above or below the water table, the gravitational constant, and the density of water. Within the unsaturated zone, pressure heads are negative, i.e., suction head, and become more negative with increasing distance from the water table. Suction head is the results from the down-flow of the natural recharge water through the unsaturated zone. Likewise, pressure heads are positive in the saturated zone and increase with increasing depth into the saturated zone depth. Pressure at the water table is zero and is uniform in each horizontal layer. The initial conditions are assumed to have been in effect at the time the simulation began, that is, before the spill occurred.

Relative Permeability and Capillary Pressure

The relative permeability and capillary pressure data utilized in the simulations were derived by *Guswa* [1985], and are representative of the relative permeabilities observed in a two-phase water-nonaqueous phase system, and a two-phase nonaqueous phase-air system for a fine sand matrix. Three-phase relative permeabilities are determined by SWANFLOW using the data in Table 4 and equation (5).

Numerical Model Discretization Data

The two-dimensional finite-difference grid extends 187.60 meters from the source in the positive x-direction and 5.00 meters vertically-downward in the z-direction, discretizing the cross section into 160 blocks. The x-coordinate is divided into eight unequal "columns" which increase in size by a factor of 1.9 in the positive x-direction. Although not represented in the finite-difference grid, SWANFLOW assumes the grid is

TABLE 3. Initial Conditions

Property	SWANFLOW Units	Standard Groundwater Units
Natural Recharge	3.17E-6 kg/s/m^2	3.94 in/yr
NAPL Source Rate*	3.60E-8 m^3/s	300 gal/yr

Depth (m)	Water Saturation (decimal %)	NAPL Pressure (N/m^2)
0.125	0.850	-14,700
0.375	0.875	-12,250
0.625	0.900	-9,800
0.875	0.925	-7,350
1.125	0.950	-4,900
1.375	0.975	-2,450
1.625	1.000	0
1.875	1.000	2,450
2.125	1.000	4,900
2.375	1.000	7,350
2.625	1.000	9,800
2.875	1.000	12,250
3.125	1.000	14,700
3.375	1.000	17,150
3.625	1.000	19,600
3.875	1.000	22,000
4.125	1.000	24,500
4.375	1.000	26,950
4.625	1.000	29,400
4.875	1.000	31,850

*The units of NAPL source rate required by SWANFLOW are actually kg/s.

TABLE 4. Capillary Pressure and Relative Permeability Data*

Capillary Pressure (N/m^2)	Water Saturation (decimal %)	Two-Phase Relative Permeabilities	
		Water	NAPL
103425.0	-0.10	0.00	1.00
103425.0	0.00	0.00	1.00
103425.0	0.10	0.00	0.82
103425.0	0.20	0.00	0.68
27580.0	0.30	0.04	0.55
10343.0	0.40	0.10	0.43
7585.0	0.50	0.18	0.31
7447.0	0.60	0.30	0.20
7309.0	0.70	0.44	0.12
7171.0	0.80	0.60	0.05
7033.0	0.90	0.80	0.00
6895.0	1.00	1.00	0.00
6895.0	1.10	1.00	0.00

Capillary Pressure (N/m^2)	Air Saturation (decimal %)	Two-Phase Relative Permeabilities	
		NAPL	Air
-98000.0	1.00	-0.32	1.00
0.0	0.00	0.68	0.00

*Source: *Guswa* [1985]

symmetrical; therefore, negative x values can be implied and presumed equivalent to the simulated values generated for the positive x segment. The z-coordinate is equally divided into 20 "layers" each 0.25 meters in length (Figure 6). The simulation is considered quasi three-dimensional given a y-direction that is defined by one "slice" having a width of one meter. Although the third dimension, i.e., the y-direction, is not fully represented by the finite-difference grid, SWANFLOW calculates fluid movement as though the third dimension were included. Fluids are free to enter and exit the grid. NAPL and water mass balances are calculated at each time step to check for proper fluid distributions.

Time steps within SWANFLOW are regulated by the maximum allowable saturation change which can occur during each time step. Maximum saturation change values range from 7.5-10% (0.075-0.010), and depend on the NAPL being simulated (Appendix A).

DISCUSSION OF SIMULATION RESULTS

As previously stated, the goal of this study is to examine the influence of gravitational forces, i.e., the density difference between water and the nonaqueous phase, as well as the impact of viscous forces, on the infiltration of an immiscible nonaqueous phase liquid into an aquitard/aquifer system.

The nine liquids used in the following simulations (Table 1) were selected not only for their common occurrence at contaminated sites, but also for the wide range of density and viscosity values they possess. The liquids can be divided into three categories: (1) less-dense-than-water nonaqueous phase liquids (LNAPL), (2) more-dense-than-water nonaqueous phase liquids (DNAPL), and (3) water. The water was treated in the same manner as an infiltrating NAPL, i.e. an immiscible fluid, and was included for comparison purposes and as a benchmark.

As indicated, the SWANFLOW code does not consider dissolution or volatilization and provides a conservative estimate of the extent of NAPL migration. For a highly volatile NAPL such as gasoline, any contaminant which migrates to a position at or near the ground surface will likely vaporize and enter the atmosphere. The volatilization of gasoline will effectively reduce saturation levels. However, the numerical model does not consider for losses resulting from NAPL volatilization. Also, contaminants which are relatively soluble, such as phenol, would experience a loss of mass as the NAPL dissolves

into the surrounding groundwater. Again, these are not considered by this model.

Based on the data presented herein, it is suggested that the infiltration of NAPL, especially LNAPL, through the unsaturated zone is strongly influenced by the interstitial pressure, i.e., suction head, of the nonaqueous liquid. If the density of the NAPL is sufficiently low, flow of NAPL from high to low pressure will predominate, and the vertically-driven gravitational flow will be significantly hindered. Moderately dense NAPL will exhibit infiltration pathways containing both pressure and gravity components. In contrast, the flow of DNAPL is gravity dominated, and shows no apparent influence of NAPL pressure gradients.

For the purpose of this study, only NAPL saturations are presented; values are provided in decimal percent unless otherwise indicated. SWANFLOW output also generates water saturation and air saturation data for each time step; however, these data are not treated quantitatively, and only receive qualitative attention. Discussion of the simulation results follows.

Gasoline

Gasoline represents the least dense of the less-dense-than-water nonaqueous phase liquids which were evaluated in this study. At the start of the simulation, only water and air were present in the system. See Table 3 for initial conditions for the simulations. At time t=0, gasoline began to infiltrate from a slow, continuous, surficial leak at a rate of 300 gallons per year, indicated in Figure 6 by the shaded grid block (1,1) in the upper left corner of the finite-difference grid. The reader is reminded the quasi three-dimensional nature of the simulations requires that y always equal 1; therefore, the finite-difference

grid block locations are defined by the x and z values only. The gasoline source and natural recharge term remain constant throughout the 10 year duration of the simulation. Simulated output is generated at one, three, five, and 10 years (Appendix B).

Figure 7 displays the numerical model solutions for one and three years. At time t=1 year, gasoline saturation contours range from 0-40%. The greatest saturation of LNAPL present in the domain is 42.5%, and occurs at grid block (1,1) (Appendix B). Water and air have been displaced by the infiltrating gasoline, indicated by a decrease in their respective saturations. Although water is being added to the system as natural recharge, the same amount of water is also exiting through the base of the finite-difference grid, creating the steady-state conditions previously described. Thus, the three phases, gasoline, water, and air, coexist in the available void space. It can be shown experimentally that any pore within the area of spill influence may contain a single phase or any possible combination of the three phases, i.e., NAPL, water, and air [*Wilson et al.*, 1990]. At one year, the contaminant plume has reached the depth of one meter below the ground surface, and extends 30 meters laterally from the source. At time t=3 years, the gasoline plume has expanded, but remains wholly within the unsaturated zone. Therefore, the available porosity may contain any or all three phases, i.e., gasoline, water, air, within the area of spill influence. The LNAPL extends approximately 60 meters laterally from its origin with a maximum depth of 1.3 meters below the ground surface. Saturation contour levels range from 0-40% (Figure 7) with the maximum LNAPL saturation of 46.4%, located at block (1,1) (Appendix B).

Figure 8 provides the numerical solutions for five and 10 years. At time t=5 years, the gasoline plume continues to expand both horizontally and vertically; however,

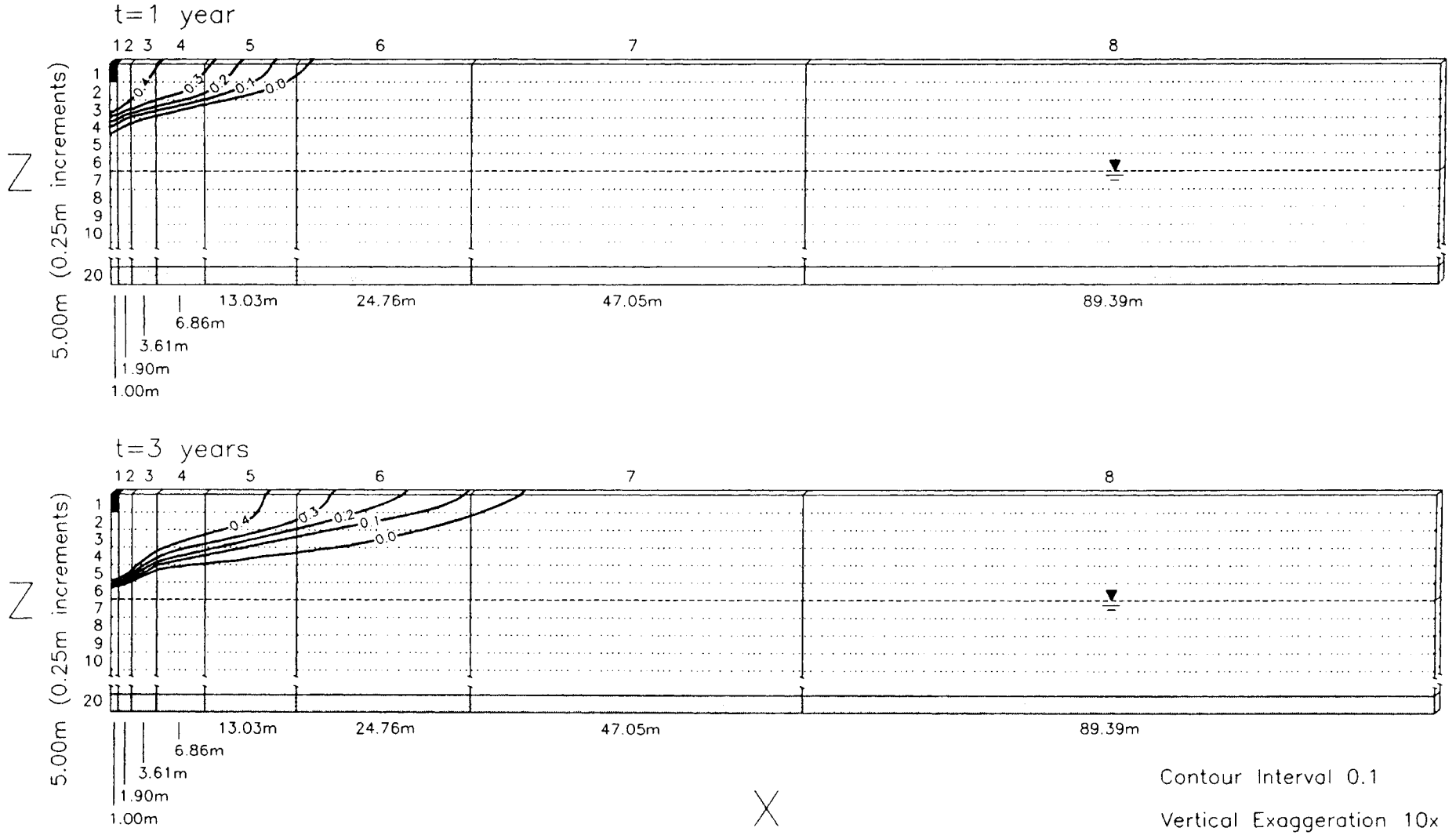

Figure 7. Infiltration of gasoline at one and three years.

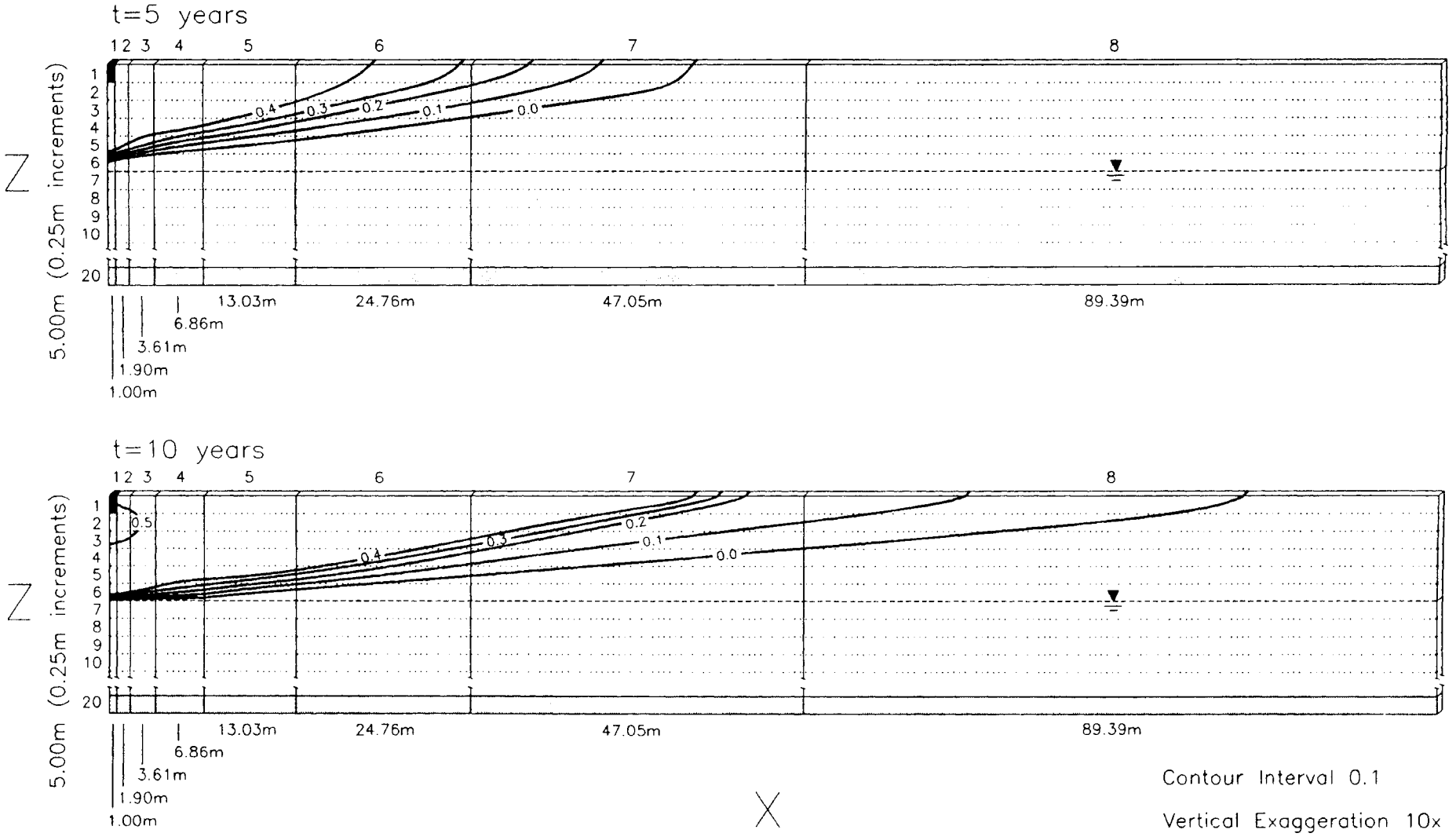

Figure 8. Infiltration of gasoline at five and 10 years.

has yet to break through the water table. The contaminant plume has reached 90 meters laterally from the source, and attained a depth of 1.4 meters below the ground surface. Gasoline saturation contours range from 0-40% with the greatest saturation in the domain at grid block (1,1) having the value 48.1% (Appendix B). As in the previous time steps, water and air within the zone of spill influence has been displaced by the infiltrating gasoline, indicated by the decrease in their respective saturations.

At time t=10 years, the gasoline plume shows still further enlargement in the x- and z-directions, extending approximately 175 meters laterally from the source, and has expanded vertically-down to intersect the water table at 1.5 meters; however, no NAPL has entered the saturated zone. Saturation contours range from 0-50% (Figure 8) with the maximum LNAPL saturation of 50.6%, located at block (1,2) (Appendix B).

The infiltration pathway of gasoline produced by the SWANFLOW simulation indicates lateral plume migration to be predominant. Horizontal migration of the gasoline plume has extended 175 meters from the source, while only penetrating to a depth of approximately 1.5 meters after 10 years of simulation. The horizontal movement of the LNAPL is likely the result of capillary pressure effects. The influence of capillary pressure on migration is greater for the less-dense-than-water nonaqueous phase liquids as gravity effects, which result in vertically-downward movement, proportionally decrease as NAPL density decreases. A decrease in the gravitational control on NAPL movement allows other forces, such as capillary pressure, a greater degree of influence on NAPL movement through the subsurface. All of the LNAPL, which has been introduced into the subsurface, remains wholly within the unsaturated zone, although breakthrough into the saturated zone does occur almost immediately after completion of the 10 year

simulation (see subsequent discussion on Vertical and Horizontal NAPL Infiltration Rates). The area of spill influence consists of a variable mixture of gasoline, water, and air. The maximum LNAPL saturation is 50.6%, suggesting the contaminant "lens," commonly referred to in groundwater literature, contains all three phases, and is not represented by 100% NAPL. This application shows that the lens concept may not apply for all possible types of contaminants and hydrogeologic settings. Although field observations often indicate a homogeneous NAPL lens, these observations are typically provided through monitoring wells. However, within the well the capillary forces which influence NAPL movement do not exist. Capillary pressure is a property of the macroscopic geometry of the void spaces in the porous media [*Fetter*, 1993]. The removal of the pore spaces, i.e., introduction of a well bore, eliminates capillary pressure forces within the affected area. This suggests the well bore is not an accurate representation of the surrounding media, and can be used to explains the differences in lens composition between field observations and the simulated results produced by SWANFLOW.

Kerosene

Kerosene, like gasoline, is one of the lighter less-dense-than-water nonaqueous phase liquids considered in this study. Initial conditions are identical to those used in the simulation of gasoline and consist of only water and air within the unsaturated zone, and water only within the saturated zone (Table 3). Simulated output is generated at one, three, five, and 10 year intervals.

Figure 9 provides the numerical solutions at one and three years. At time t=1

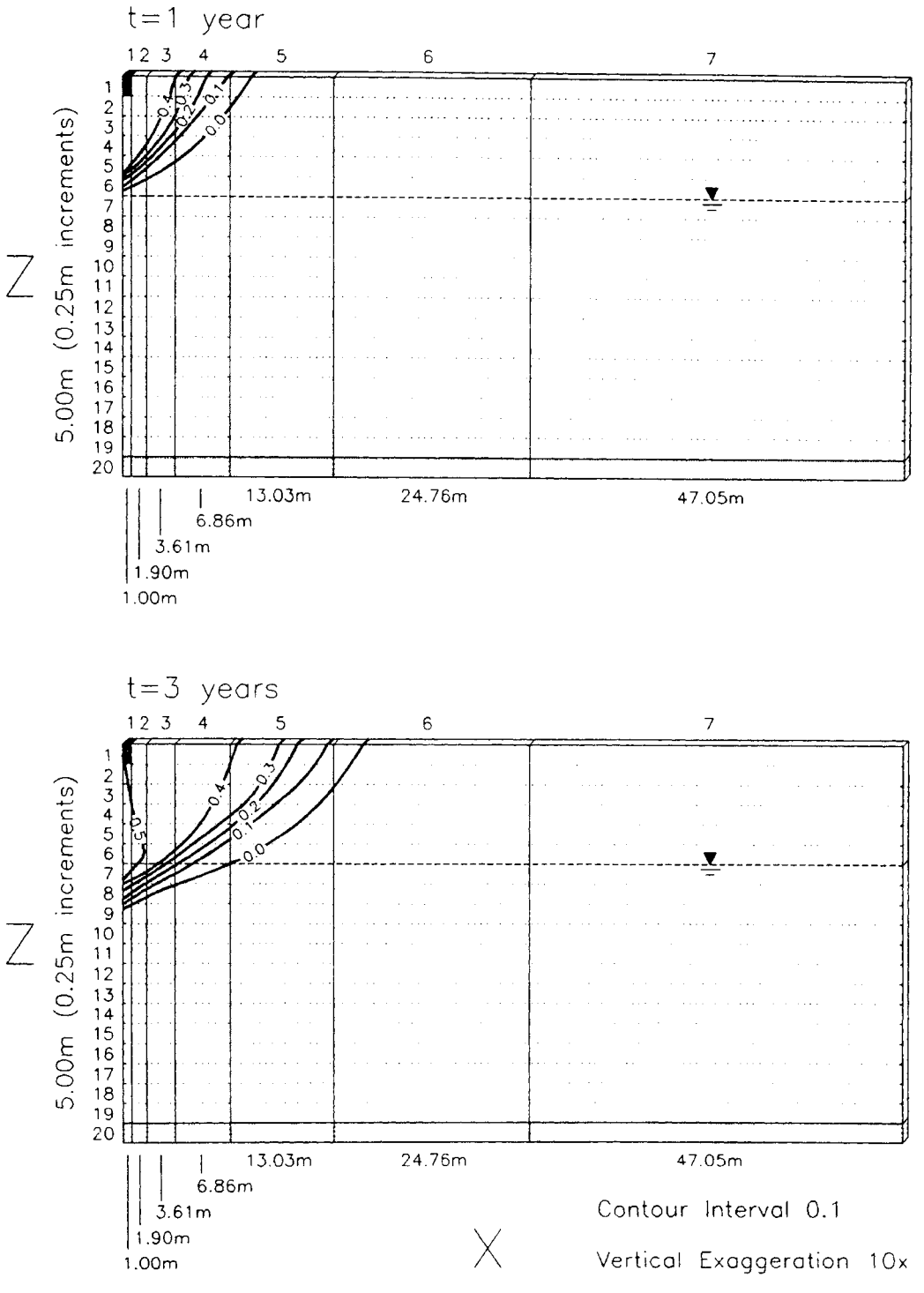

Figure 9. Infiltration of kerosene at one and three years.

year, the contoured kerosene saturation values range from 0-40%. The greatest saturation of LNAPL present in the domain is 49.8%, and occurs at grid block (1,5) (Appendix B). Water and air have been displaced by the infiltrating kerosene, evidenced by a decrease in their respective saturations, and indicate kerosene, water, and air, coexist in the available void space within the area of spill influence. Any pore within the area of spill influence may contain a single phase or any possible combination of the three [*Wilson et al.*, 1990]. At one year, the contaminant plume has reached a maximum depth of 1.4 meters. Lateral plume migration extends approximately 17 meters from the source.

At time t=3 years, the kerosene plume has expanded downward completely through the unsaturated zone and is now partly contained within the saturated zone. Movement into the saturated zone is likely results from the physical depression of the groundwater table due to the overlying mass of the kerosene plume. As before, porosity within the unsaturated zone may contain any or all three phases while the interstices of the saturated zone within the area of spill influence contain water and LNAPL only. The LNAPL extends approximately 32 meters laterally from its origin with a maximum depth of 2.1 meters below the ground surface. Saturation contour levels range from 0-50% (Figure 9) with the maximum LNAPL saturation of 50.6%, located at block (1,6) (Appendix B).

Figure 10 provides the numerical solutions at five and 10 years. At time t=5 years, the kerosene plume continues to expand both horizontally and vertically, enlarging the area of the contaminant influence progressively deeper into the saturated zone. The contaminant plume now extends 45 meters laterally from the source, and has reached a depth of 2.3 meters below the ground surface. Kerosene saturation contours range from

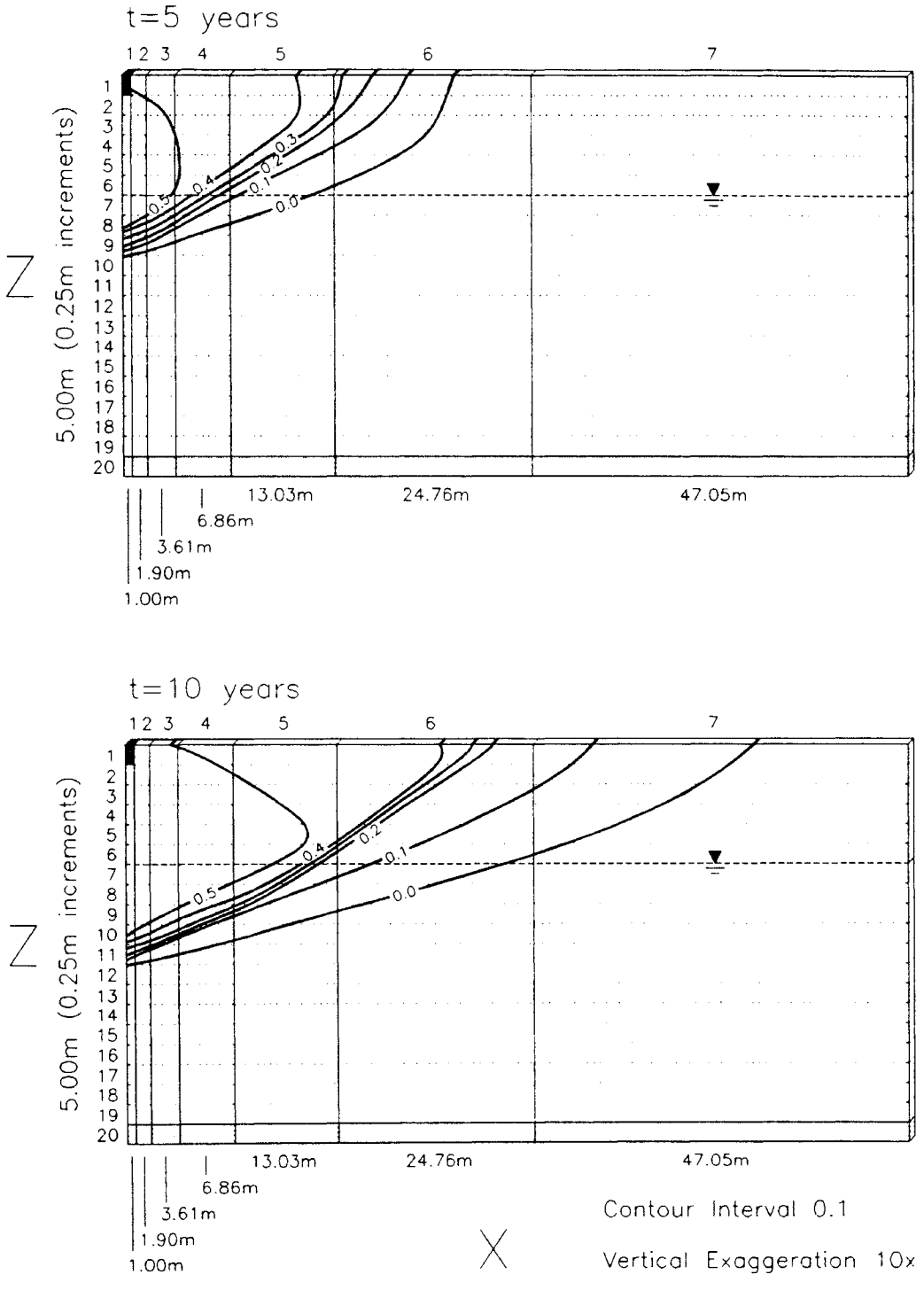

Figure 10. Infiltration of kerosene at five and 10 years.

0-50% (Figure 10) with the greatest saturation in the domain at grid block (1,6), having the value 53.2% (Appendix B).

At time t=10 years, the kerosene plume shows still further enlargement in the x- and z-directions, extending approximately 86 meters laterally from the source, and has expanded vertically-downward to 2.8 meters below the ground surface. Saturation contours range from 0-50% (Figure 10) with the maximum LNAPL saturation of 57.0%, located at block (1,6) (Appendix B).

The area of contaminant influence produced by the infiltration of kerosene and generated by SWANFLOW indicates lateral plume migration to be predominant. Horizontal migration of the contaminant plume has a maximum extent of 86 meters from the source, while penetrating only 2.8 meters into the aquitard after 10 years of simulation. The majority of the area of spill influence remains within the unsaturated zone with comparatively less occurring within the saturated zone. Composition of the plume is likely a variable mixture of kerosene, water, and air. The maximum simulated LNAPL saturation is 57.0%, indicating the contaminant "lens" contains all three phases present within the unsaturated zone, and two phases in the saturated zone, air being the absent phase. The contaminant lens does show pooling at and above the water table as would be expected for a less-dense-than-water nonaqueous phase liquid.

p-Cymene

The LNAPL *p*-cymene [1-methyl-4-(1-methylethyl)-benzene] is slightly more dense than gasoline and kerosene, but still considerably less dense than water. Again, initial conditions are as previously described and consist of water and air. The air phase

found in the unsaturated zone only (Table 3).

Figure 11 displays numerical solutions for one and three years after the initial introduction of *p*-cymene into the aquitard. At time *t*=1 year, the contoured *p*-cymene saturation values range from 0-40%. The greatest saturation of LNAPL present in the domain is 48.5%, and occurs at grid block (1,6) (Appendix B). A decrease in water and air saturations indicates displacement by the infiltrating *p*-cymene; *p*-cymene, water, and air, coexist in the available void space within the area of spill influence. At one year, the contaminant plume has reached a maximum depth of 1.9 meters below the ground surface. Lateral plume migration extends approximately 12 meters from the source.

At time *t*=3 years, the *p*-cymene plume extends approximately 27 meters laterally from its origin and has attained a maximum depth of 2.6 meters below the ground surface. Saturation contour levels range from 0-50% (Figure 11) with the maximum LNAPL saturation of 52.7%, located at block (1,6) (Appendix B).

Figure 12 provides the numerical solutions for the output times of five and 10 years. At time *t*=5 years, the *p*-cymene plume continues to expand both horizontally and vertically, enlarging the area of the contaminant influence still deeper into the saturated zone. The contaminant plume extends 43 meters laterally from the source, and has attained a depth of 2.9 meters below the ground surface. The *p*-cymene saturation contours range from 0-50% (Figure 12) with the greatest saturation in the domain at grid block (1,6), having the value 55.2% (Appendix B).

At time *t*=10 years, the *p*-cymene plume shows still further enlargement in the *x*- and *z*-directions, extending approximately 62 meters laterally from the source, and has expanded vertically-downward to 3.5 meters below the ground surface. The maximum

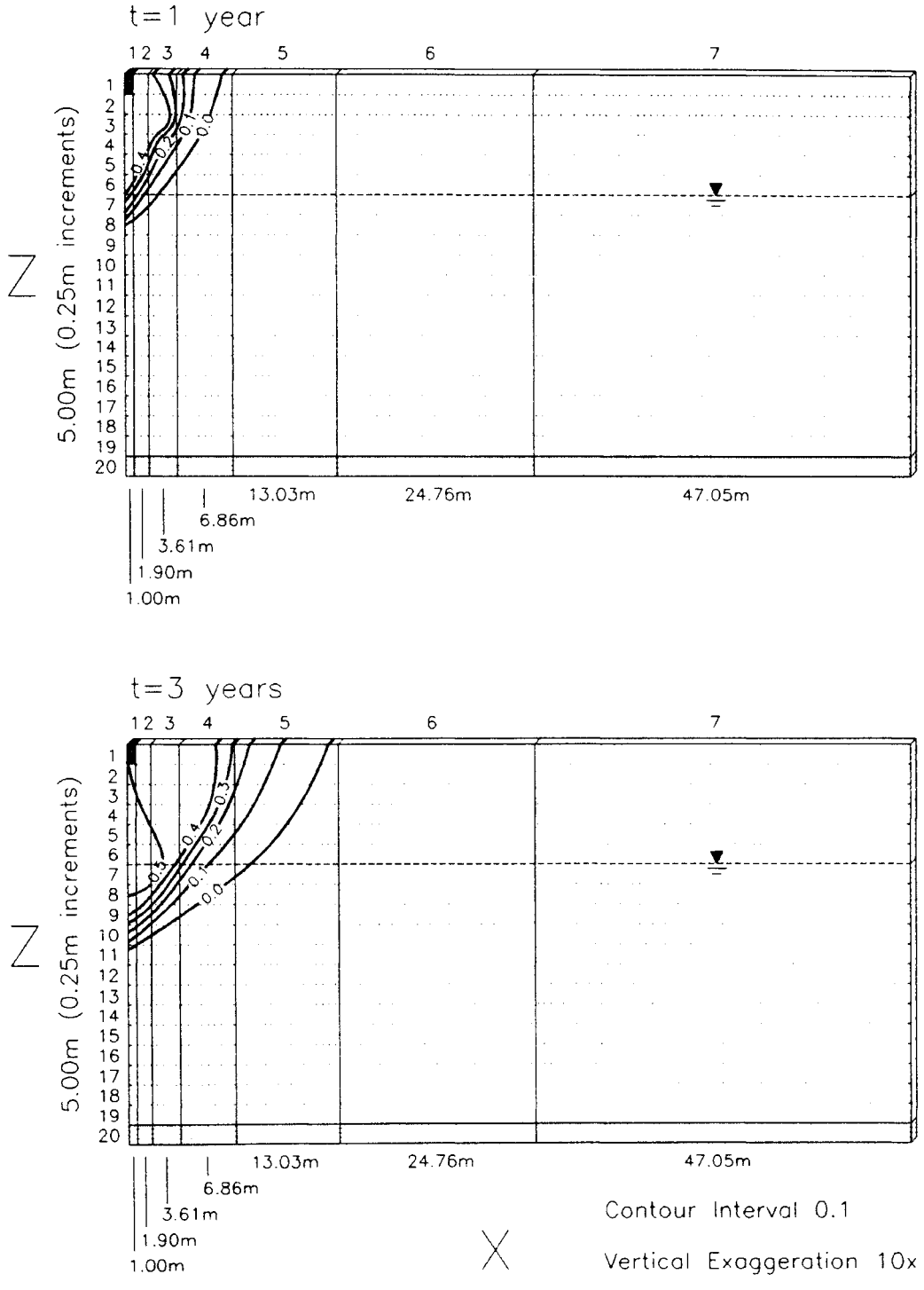

Figure 11. Infiltration of *p*-cymene at one and three years.

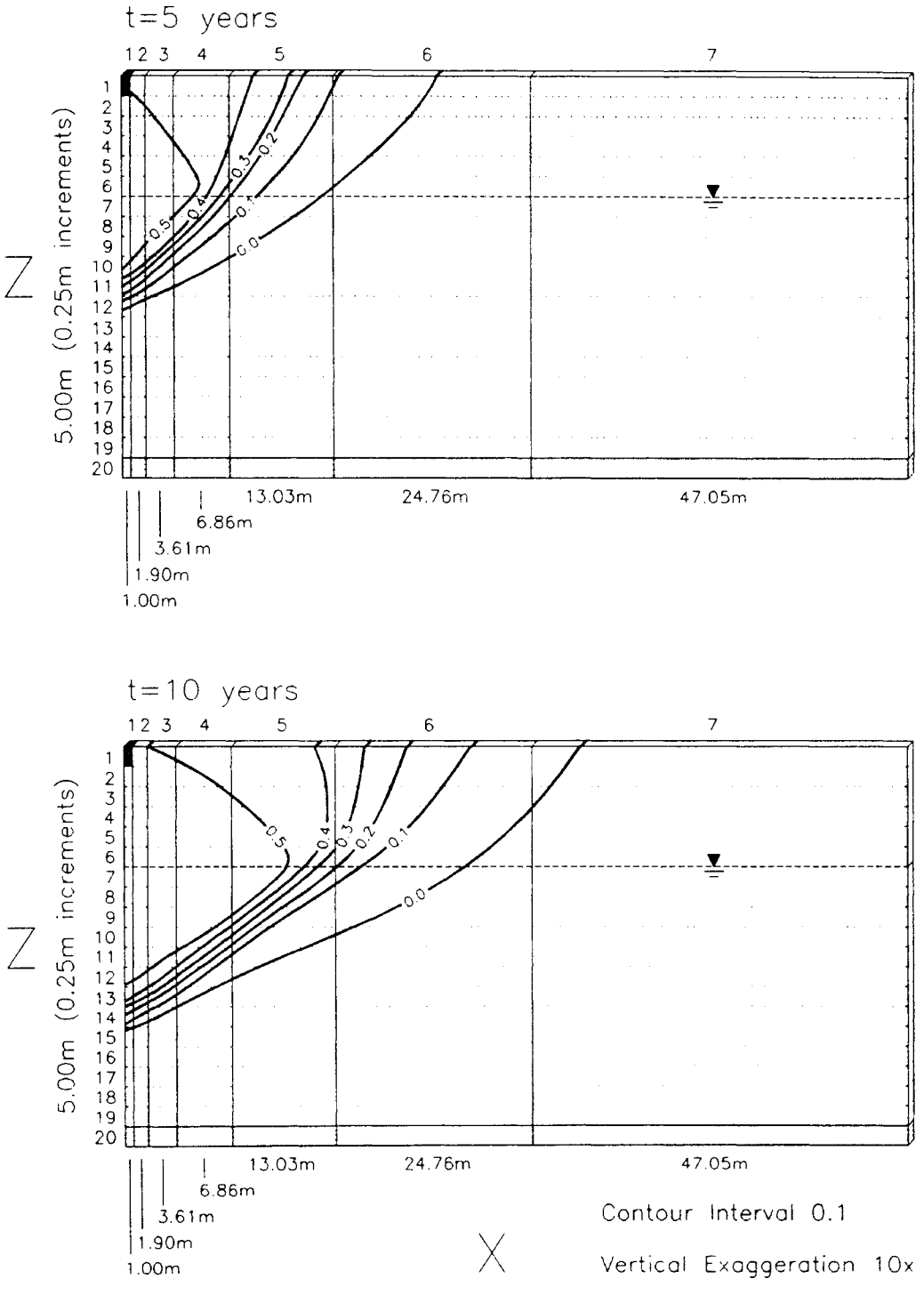

Figure 12. Infiltration of *p*-cymene at five and 10 years.

plume thickness is 3.5 meters directly below the source block. Saturation contours range from 0-50% (Figure 12) with the maximum LNAPL saturation of 58.7%, located at block (1,2) (Appendix B).

The area of contaminant influence produced by the infiltration of *p*-cymene and generated by SWANFLOW indicates lateral plume migration to be predominant. Horizontal migration of the contaminant plume has attained a maximum distance of 62 meters from the source, while penetrating only 3.5 meters into the subsurface at 10 years. The *p*-cymene infiltration event is similar to kerosene, likely due to their nearly equivalent density and viscosity values (see Table 1).

10W-30 Motor Oil

The inclusion of 10W-30 motor oil in this study is to examine the infiltration pathway of a NAPL with a high dynamic viscosity. In the case of motor oil, viscosity is approximately two orders of magnitude greater than *p*-cymene with a nearly equivalent density (Table 1). As with the previous simulations, no NAPL was present in the system at the start of the simulation. Water and air saturations are defined by the initial conditions given in Table 3.

Figure 13 provides the numerical model solutions at one and three years. At time t=1 year, saturation contour levels are given for 0, 20, 40, and 60%. The greatest oil saturation present in the domain is 66.2%, and occurs at grid block (1,1) (Appendix B). Water and air have been displaced by the infiltrating oil in the unsaturated and saturated zones, indicated by a decrease in their respective saturations. At one year, the oil plume has migrated completely through the unsaturated zone and penetrates 1.6 meters into the

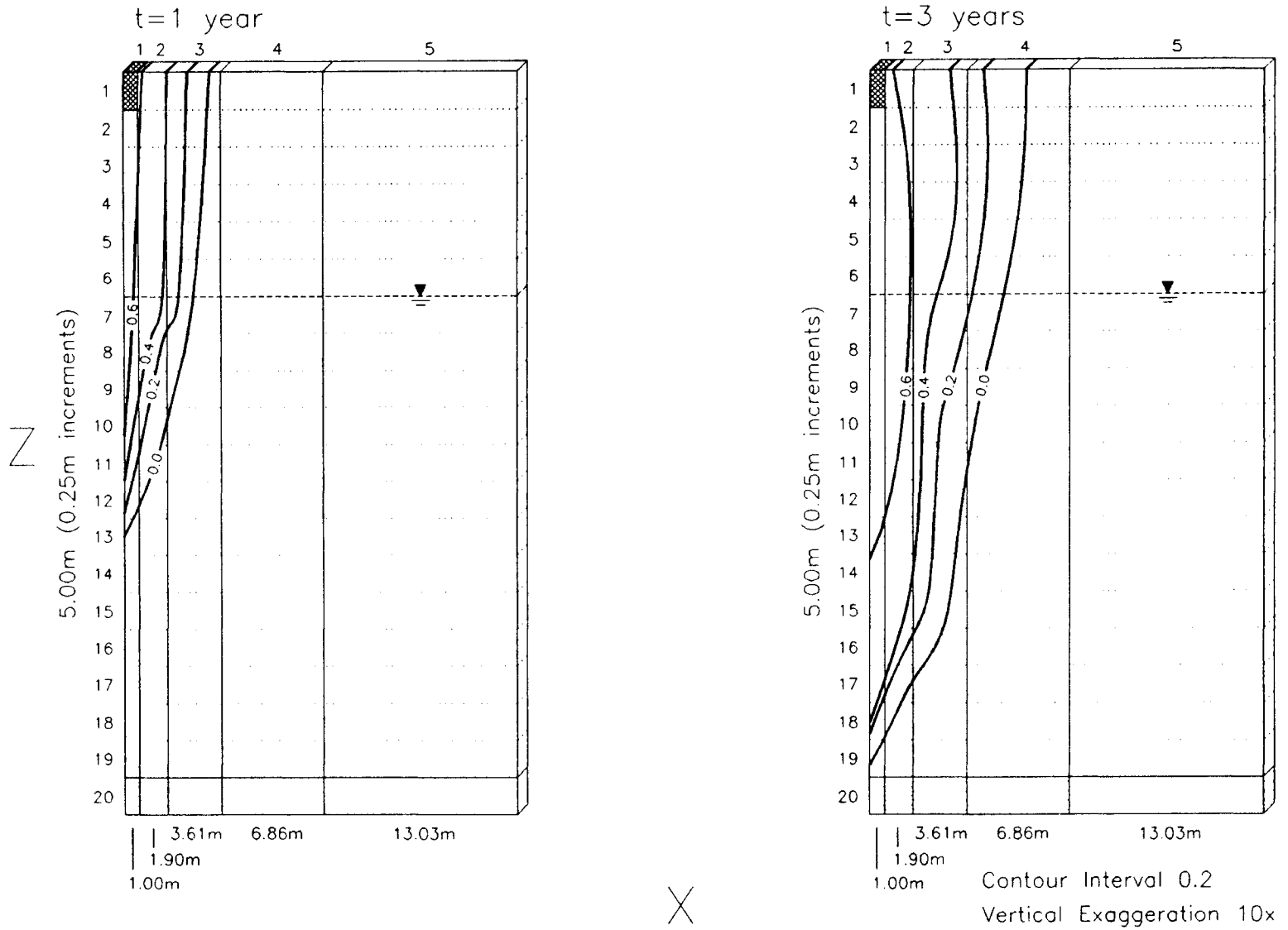

Figure 13. Infiltration of 10W-30 motor oil at one and three years.

saturated zone. The area of spill influence extends 5.6 meters laterally from the source.

At time t=3 years, the oil plume has expanded both vertically and horizontally. The plume extends approximately 9.9 meters laterally from its origin with a maximum depth of 4.6 meters below the ground surface. Saturation contour levels range from 0-60% (Figure 13) with maximum oil saturation at grid block (1,1) increasing from 66.2% to 68.9% (Appendix B).

Figure 14 supplies the numerical solutions for five and 10 years. At time t=5 years, the oil plume has expanded horizontally and vertically, and the area of influence produced by oil infiltration has enlarged to include the lower draining aquifer. The introduction of motor oil to the lower aquifer actually occurs at 3.4 years. The contaminant plume is detectable 11.0 meters laterally from the source. The maximum depth exceeds the area of the finite-difference grid and is greater than 5.0 meters in depth. The highest oil saturation reported by the SWANFLOW code occurs at grid block (1,1) and has a value of 70.0%. The highest saturation reported at the aquitard-aquifer interface is 50.6% at block (1,19) (Figure 14, Appendix B).

At time t=10 years, the oil plume shows still further enlargement in the x-direction and has attained a lateral distance of 20.6 meters from the source. Maximum oil saturation is 70.1% reported at block (1,1). Maximum NAPL saturation reported at the aquitard-aquifer interface is 51.1% at block (1,19), a slight increase over the value reported for the same grid location at five years, suggesting further expansion of the area of spill influence into the lower draining aquifer.

The area of contaminant influence produced by the infiltration of 10W-30 motor oil generated by the SWANFLOW code has decreased horizontally and increased

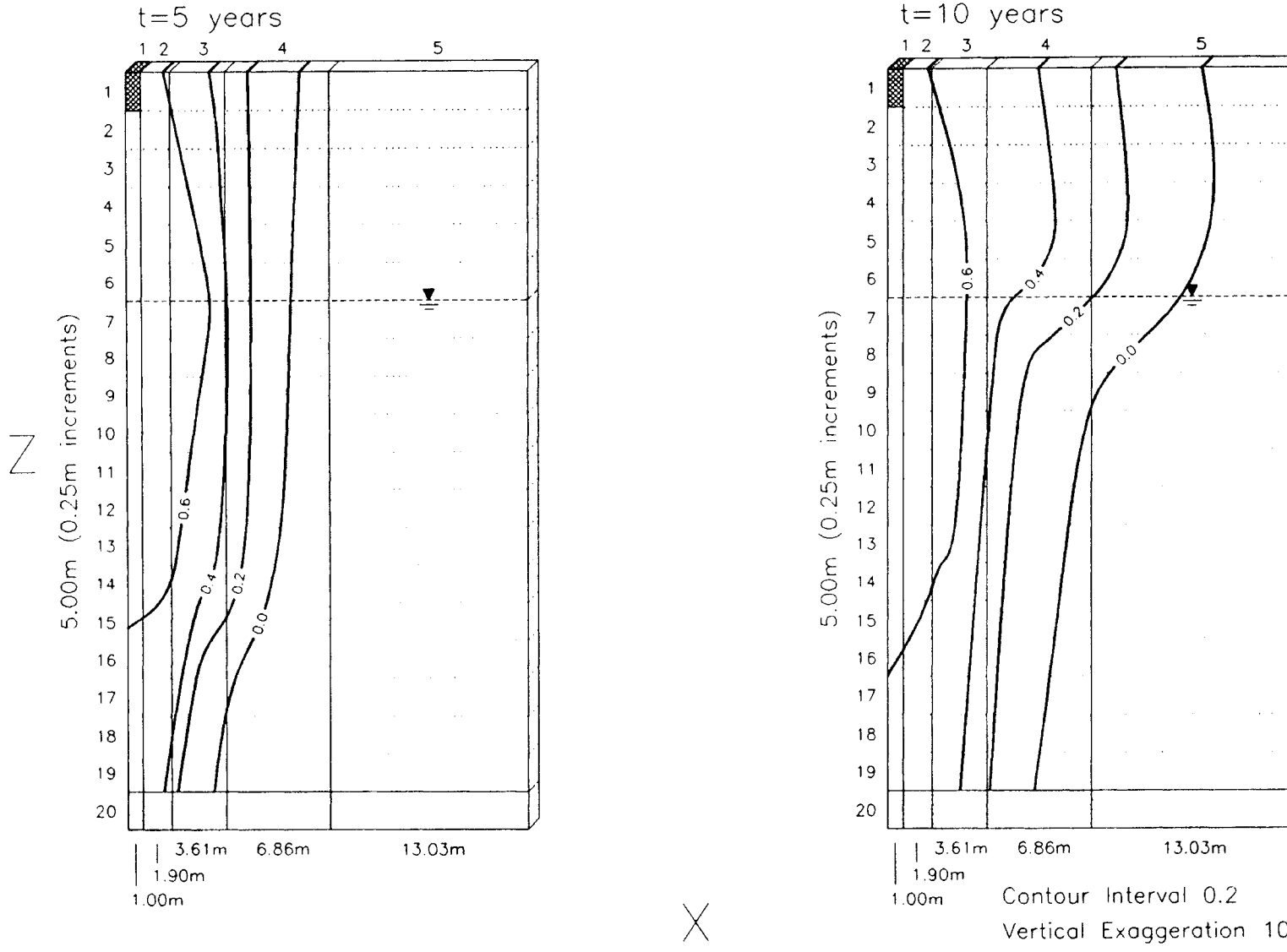

Figure 14. Infiltration of 10W-30 motor oil at five and 10 years.

vertically when compared with the pathway previously described for *p*-cymene. Also, the maximum saturation determined for the motor oil simulation is considerably higher than the saturation of the *p*-cymene, 70.1% versus 58.7%, respectively. As the densities of the two less-dense-than-water nonaqueous phase liquids are approximately equivalent, the differences observed in their infiltration pathways, i.e., area of spill influence and maximum saturation, are likely due to the higher viscosity of the motor oil versus *p*-cymene.

Water

An infiltration event consisting of water entering the finite-difference grid at a point source was performed to serve as a benchmark by which to compare NAPL infiltration. It is assumed the "spilled" water is immiscible in the groundwater and behaves independently of the water introduced through natural recharge. All the initial conditions previously described are retained for the simulation.

Figure 15 displays numerical solutions for one and three years after the initial introduction of water at the surface. At time t=1 year, the contoured water saturation values range from 0-30%. The greatest water saturation present in the domain is 33.6%, and occurs at grid block (1,1) (Appendix B). A decrease in the initial water and air saturations indicates displacement by the infiltrating water, which has entered the finite-difference grid since the beginning of the simulation. At one year, the plume has reached a maximum depth of 5 meters below the ground surface. Maximum saturation of the infiltrating water at the aquitard-aquifer interface is 10.2% at block (1,19). Horizontal plume migration extends a maximum of 6.5 meters from the source.

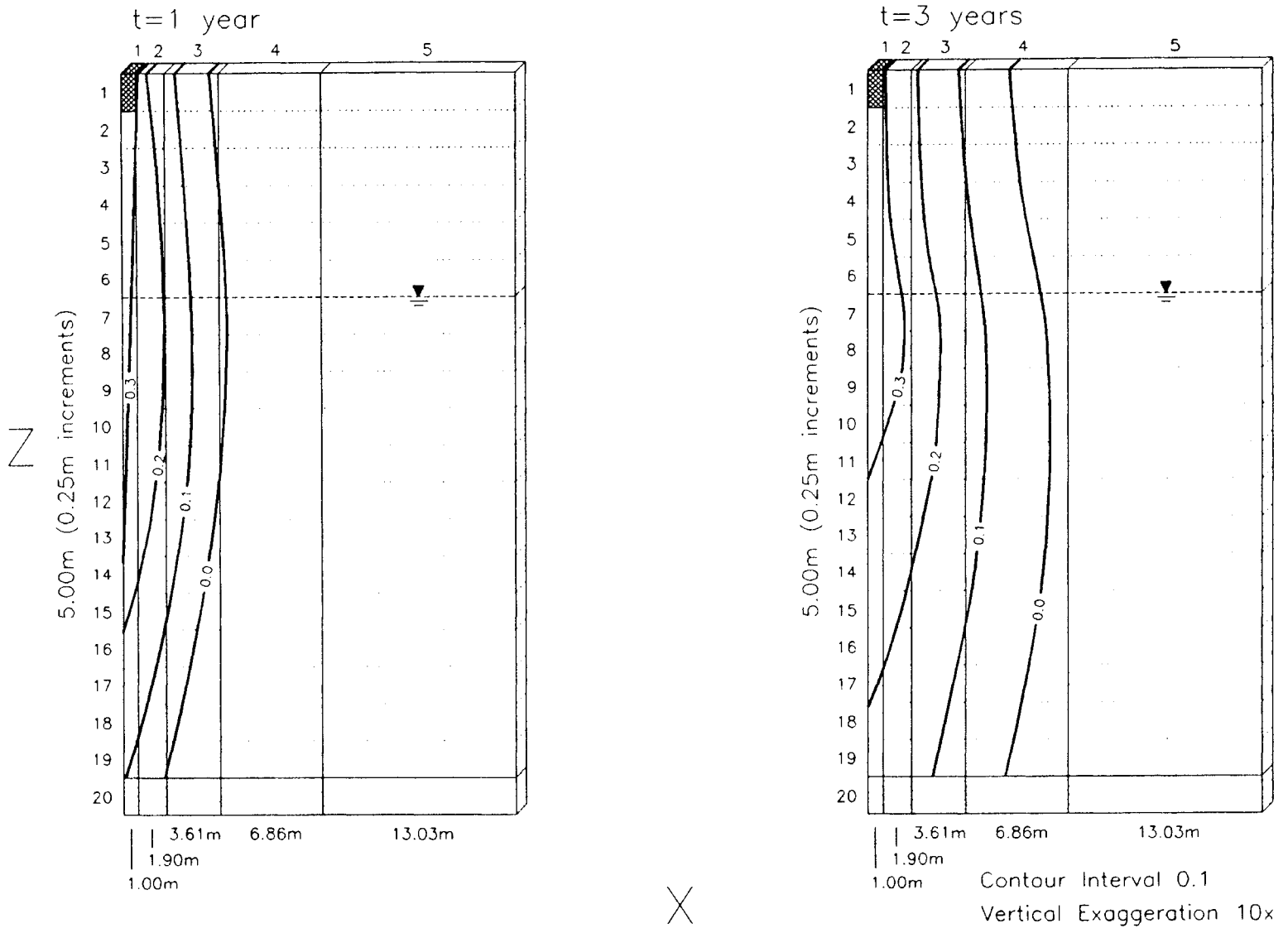

Figure 15. Infiltration of water at one and three years.

At time t=3 years, the introduced water extends approximately 11.6 meters laterally from its origin, and continues to enter the lower draining aquifer (Figure 16). Saturation contour levels range from 0-30%, with the maximum saturation of 35.5%, reported for the infiltrating water at grid block (1,7). The maximum saturation determined at the aquitard-aquifer interface is 10.2% (Appendix B).

Figure 16 provides the numerical solutions for the output times of five and 10 years. At time t=5 years, the water plume continues to expand both horizontally and vertically, enlarging the area of spill influence throughout the unsaturated and saturated zones. The plume now reaches a lateral distance 16.7 meters from the source. Maximum horizontal distance corresponds to a depth of approximately 2.1 meters below the ground surface. The water saturation contours on Figure 16 range from 0-30%. The highest saturation of the introduced water within the domain occurs at grid block (1,7), having a value of 35.8%. The maximum saturation reported at the aquitard-aquifer interface is 12.4% occurring at the grid block (1,19) (Appendix B).

At time t=10 years, the water plume shows further enlargement in the x-direction, extending approximately 20.0 meters laterally from the source. Maximum lateral movement corresponds to a depth of 2.4 meters below the surface. Saturation contours range from 0-30% (Figure 12) with the maximum "NAPL" saturation of 35.9%, at block (1,7). The maximum saturation reported at the aquitard-aquifer interface remains at 12.4% at the grid block (1,19) (Appendix B).

Phenol

Phenol is the first of the more-dense-than-water nonaqueous liquids (DNAPL)

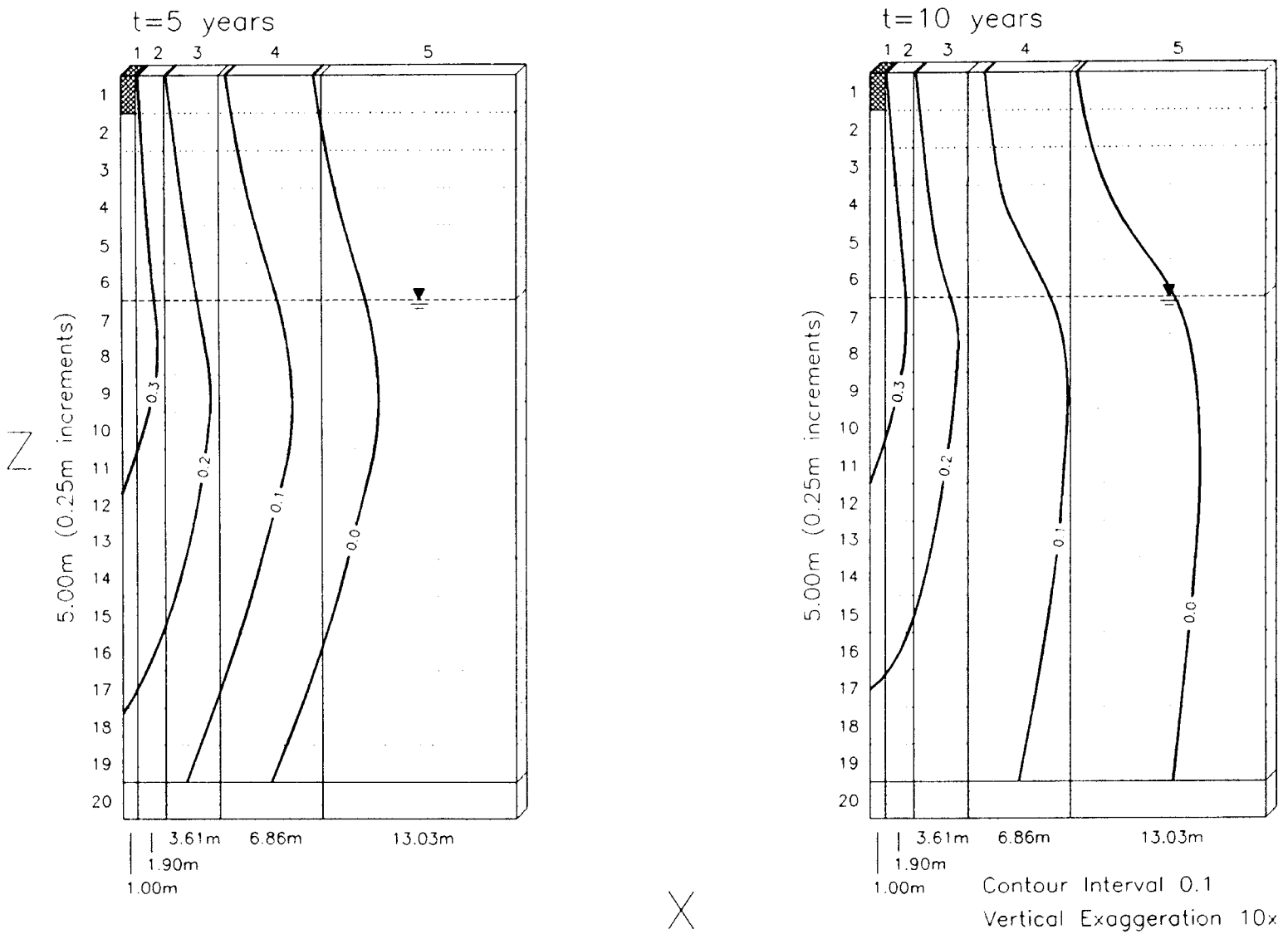

Figure 16. Infiltration of water at five and 10 years.

evaluated in this study. At time t=1 year, the contoured phenol saturation values range from 0-30% (Figure 17). The greatest saturation of DNAPL present in the domain is 36.3%, and occurs at grid block (1,2) (Appendix B). After one year of simulation, the contaminant plume has migrated downward through the unsaturated zone, through the saturated portion of the aquitard, and has extended into the lower draining aquifer. Movement of the DNAPL into the saturated zone is due to the greater density of phenol as compared to water; the density difference allows for gravity-driven vertical migration of the phenol. Maximum horizontal plume migration is 4.4 meters from the source.

For times t=3, 5, and 10 years (Figures 17 and 18), conditions present within the finite-difference grid representing the infiltration of phenol show virtually no change. The maximum DNAPL saturation remains constant at 36.3% for grid block (1,2) indicating a relatively uniform saturation profile has been established below the source. The exception is the area of spill influence which continues to increase, although not significantly. At the basal portion of the aquitard, i.e., layer 19, a noticeable widening of the phenol plume has occurred. The maximum distance of measurable spill influence has increased from 4.4 meters at one year to 7.7 meters at 10 years.

The infiltration pathway of phenol produced by the SWANFLOW simulation indicates vertical plume migration to be predominant. At one year, the phenol has long since reached the underlying aquifer that drains the aquitard. This actually happens at 240 days (see subsequent discussion on Vertical and Horizontal NAPL Infiltration Rates). The horizontal migration at one year is only 4.4 meters from the source and reaches 7.7 meters at 10 years. Given the vertically dominated infiltration of the phenol, it is likely a majority of the contaminant introduced into the subsurface will eventually pass through

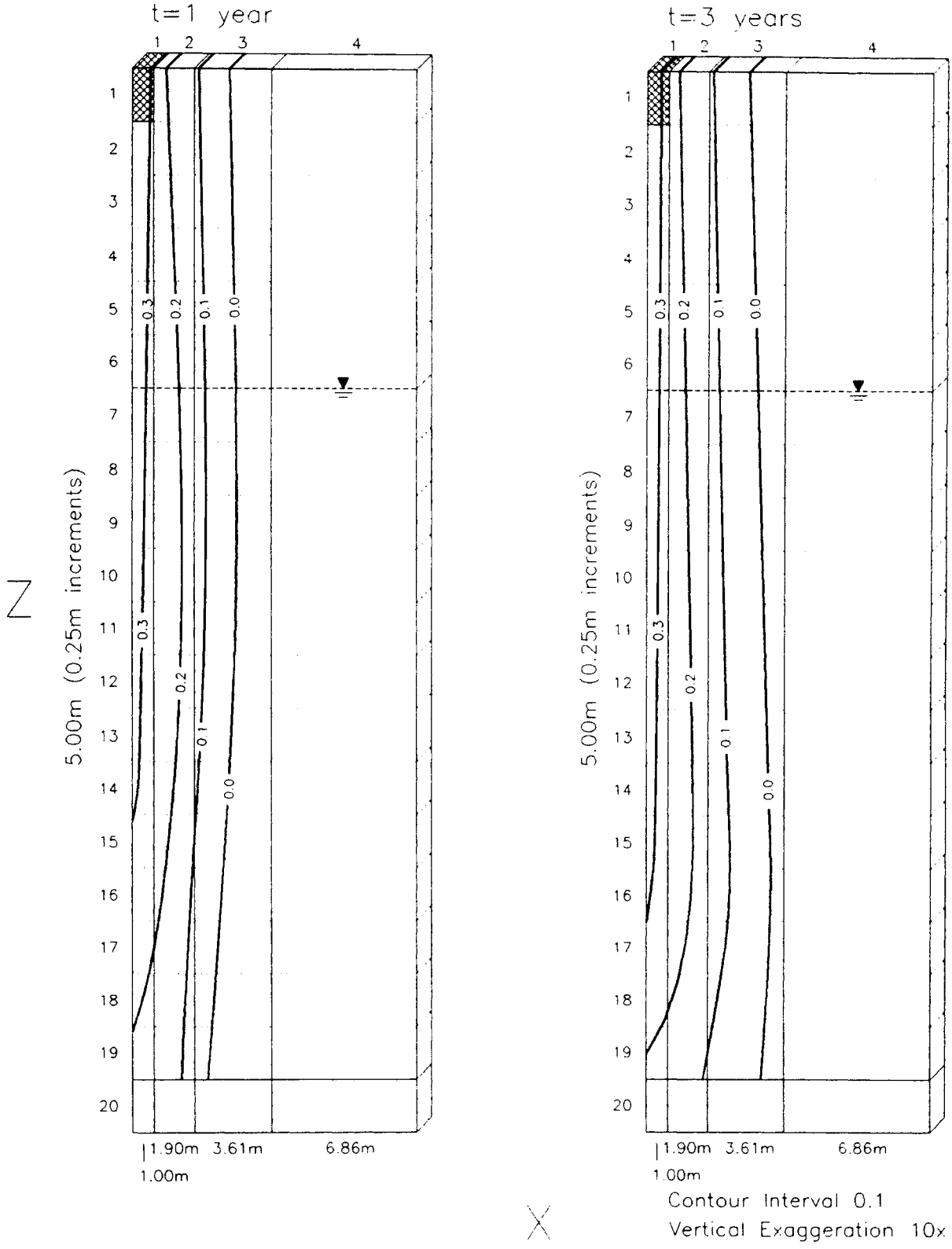

Figure 17. Infiltration of phenol at one and 3 years.

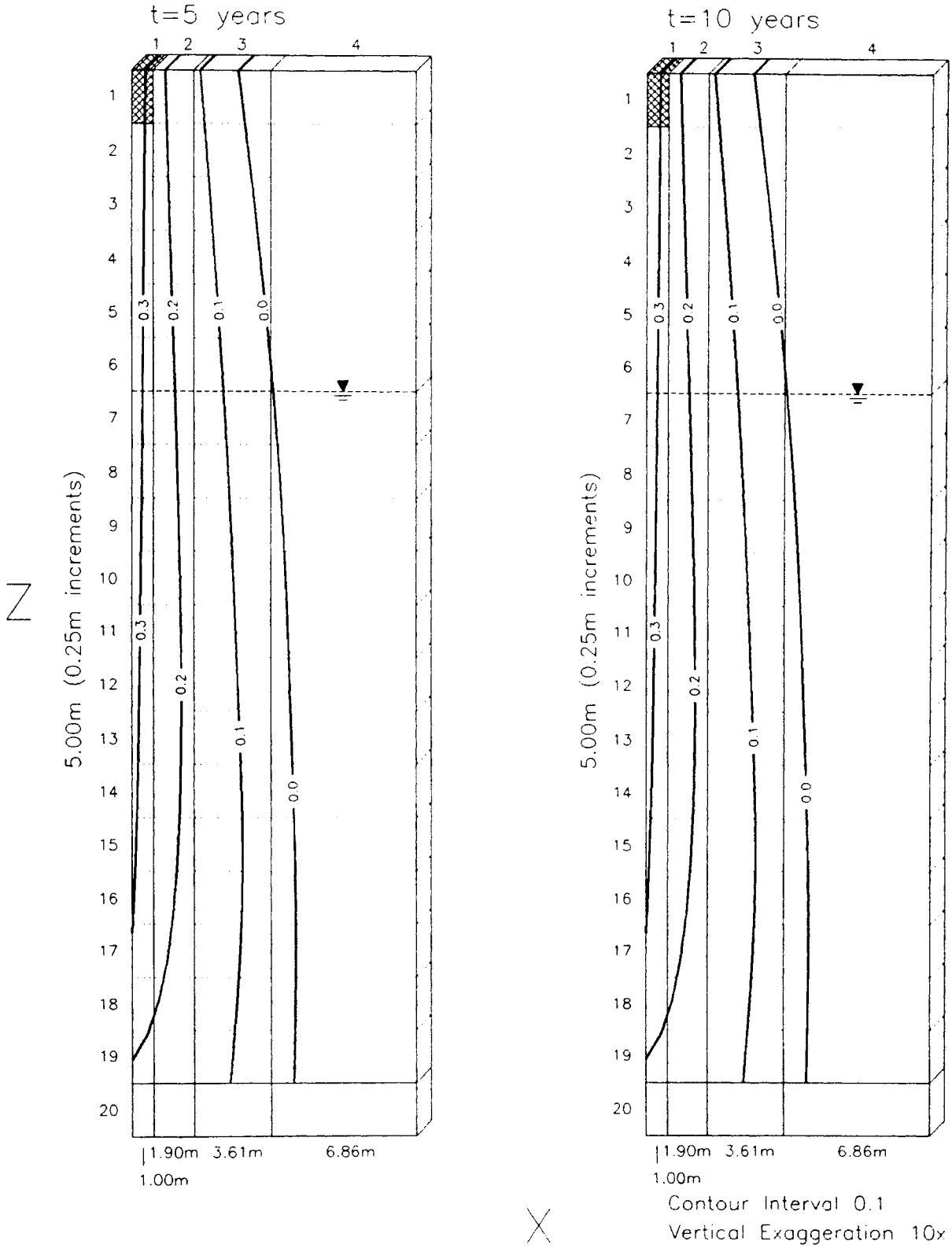

Figure 18. Infiltration of phenol at five and 10 years.

the aquitard and into the lower aquifer. The maximum reported DNAPL saturation is 36.3% indicating the area of spill influence consists of a variable mixture of phenol and water in the saturated zone, and phenol, water, and air in the unsaturated zone.

o-Nitrotoluene

o-Nitrotoluene is the second representative of the more-dense-than-water nonaqueous liquids included in this study. Initial conditions are the same as those described above (Table 3).

At time t=1 year, the contoured *o*-nitrotoluene saturation values range from 0-30% (Figure 19). The greatest saturation of DNAPL present in the domain is 22.6%, and occurs at grid block (1,1) (Appendix B). At one year, the dense fluid has long since reached the underlying aquifer that drains the aquitard. This happens 77 days after the beginning of the simulation. Maximum lateral migration of the DNAPL plume is 4.8 meters from the original source.

For times t=3, 5, and 10 years (Figures 19 and 20), no significant changes are observed in the geometries of the *o*-nitrotoluene plume. The maximum DNAPL saturation remains unchanged and constant at 22.6% in grid block (1,1) indicating a relatively uniform saturation profile has been established below the source. There is some increase in the width of the area of contaminant influence noted at the basal portion of the aquitard between the times of one and three years (Figure 19). However, the overall maximum distance of measurable spill influence remains unchanged at 4.8 meters at three years, and throughout the remainder of the 10 year simulation.

The infiltration pathway of *o*-nitrotoluene produced by the SWANFLOW

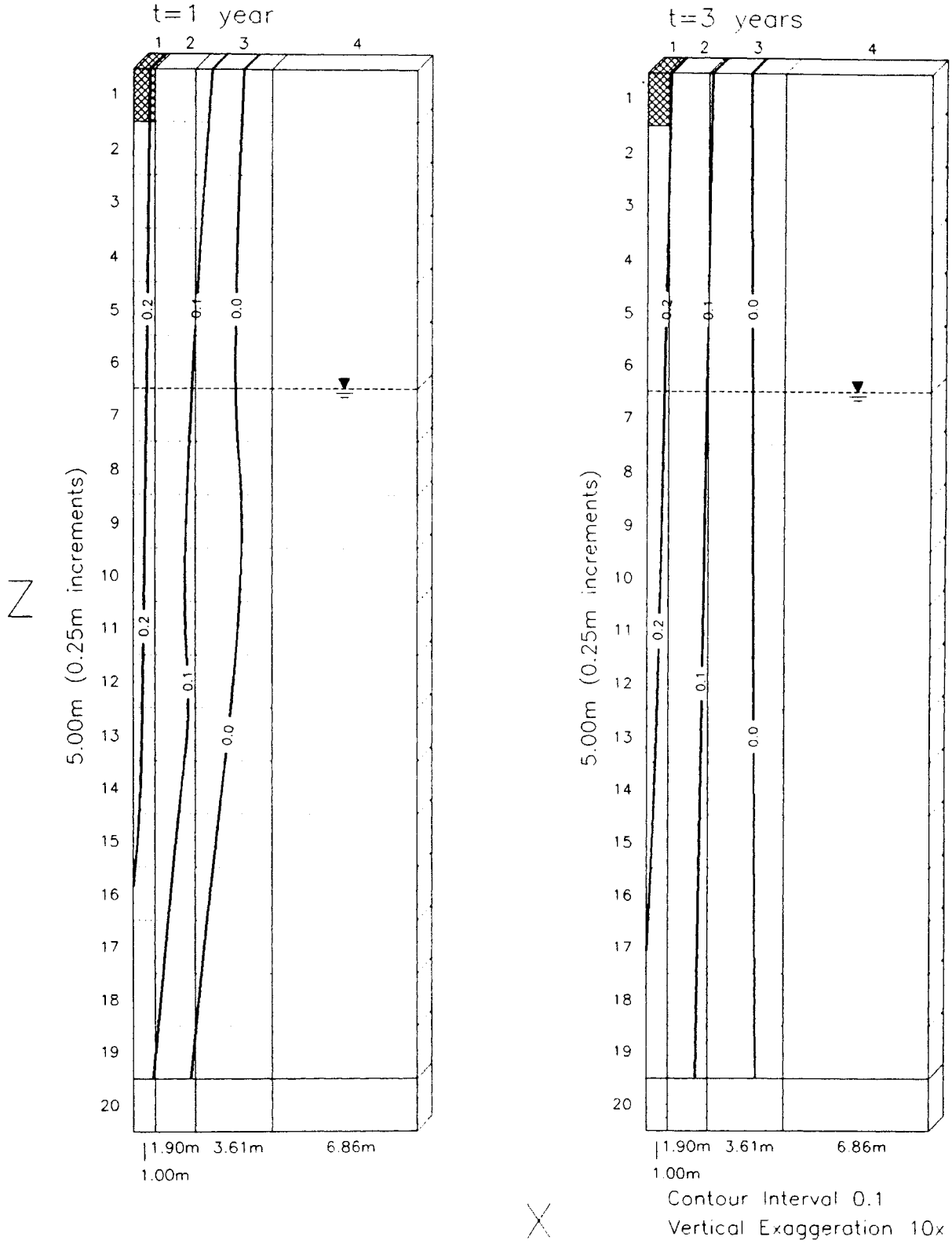

Figure 19. Infiltration of *o*-nitrotoluene at one and three years.

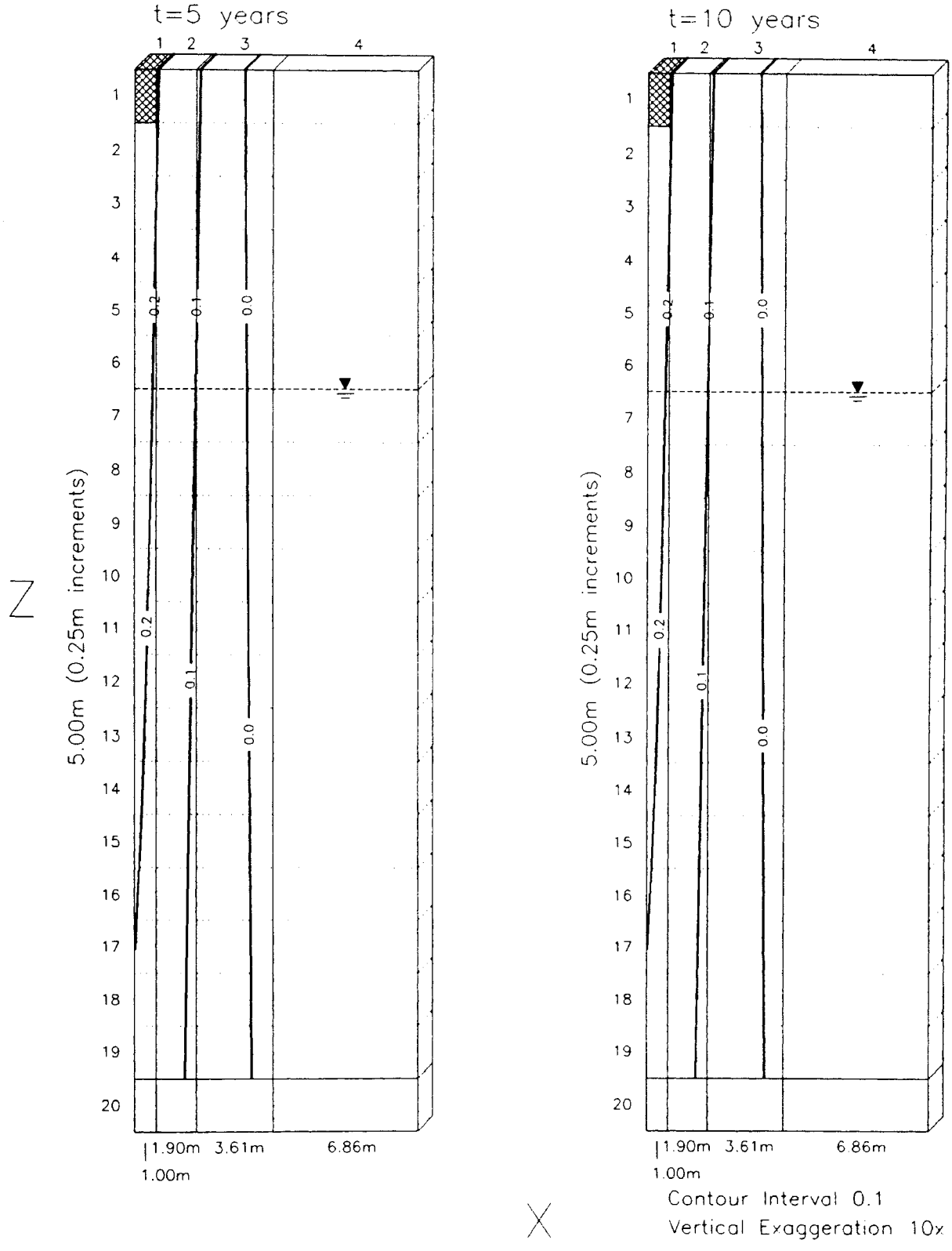

Figure 20. Infiltration of *o*-nitrotoluene at five and 10 years.

simulation indicates vertical plume migration to be predominant. As with the simulated infiltration of phenol, the vertically-dominated infiltration of the *o*-nitrotoluene, it is likely a majority of the contaminant introduced into the subsurface will eventually pass through the aquitard and into the lower draining aquifer.

Trichloroethene

Trichloroethene (TCE) is one of the more dense DNAPLs, with a density nearly 50% greater than water. Initial conditions are presented in the discussions above and in Table 3. NAPL entry occurs at grid block (1,1) as indicated in Figure 6. The TCE source remains constant throughout the 10 year duration of the simulation. Simulated output is generated at one, three, five, and 10 year intervals (Figures 21 and 22, Appendix B).

The numerical solution at one year provides the contoured TCE saturation a range of values from 0-30% (Figure 21). The greatest saturation of DNAPL present in the domain is 16.9%, and occurs at grid block (1,1) (Appendix B). Water and air have been displaced by the infiltrating TCE, evidenced by a decrease in their respective saturations. After one year of simulation, the contaminant plume has migrated downward through the unsaturated zone, through the saturated portion of the aquitard, and has extended into the lower draining aquifer. Maximum horizontal plume migration is 2.8 meters from the original source.

For times t=3, 5, and 10 years (Figures 21 and 22), conditions present within the finite-difference grid show little change. The maximum DNAPL saturation remains constant at 16.9% for grid block (1,1). The exception is the area of spill influence which

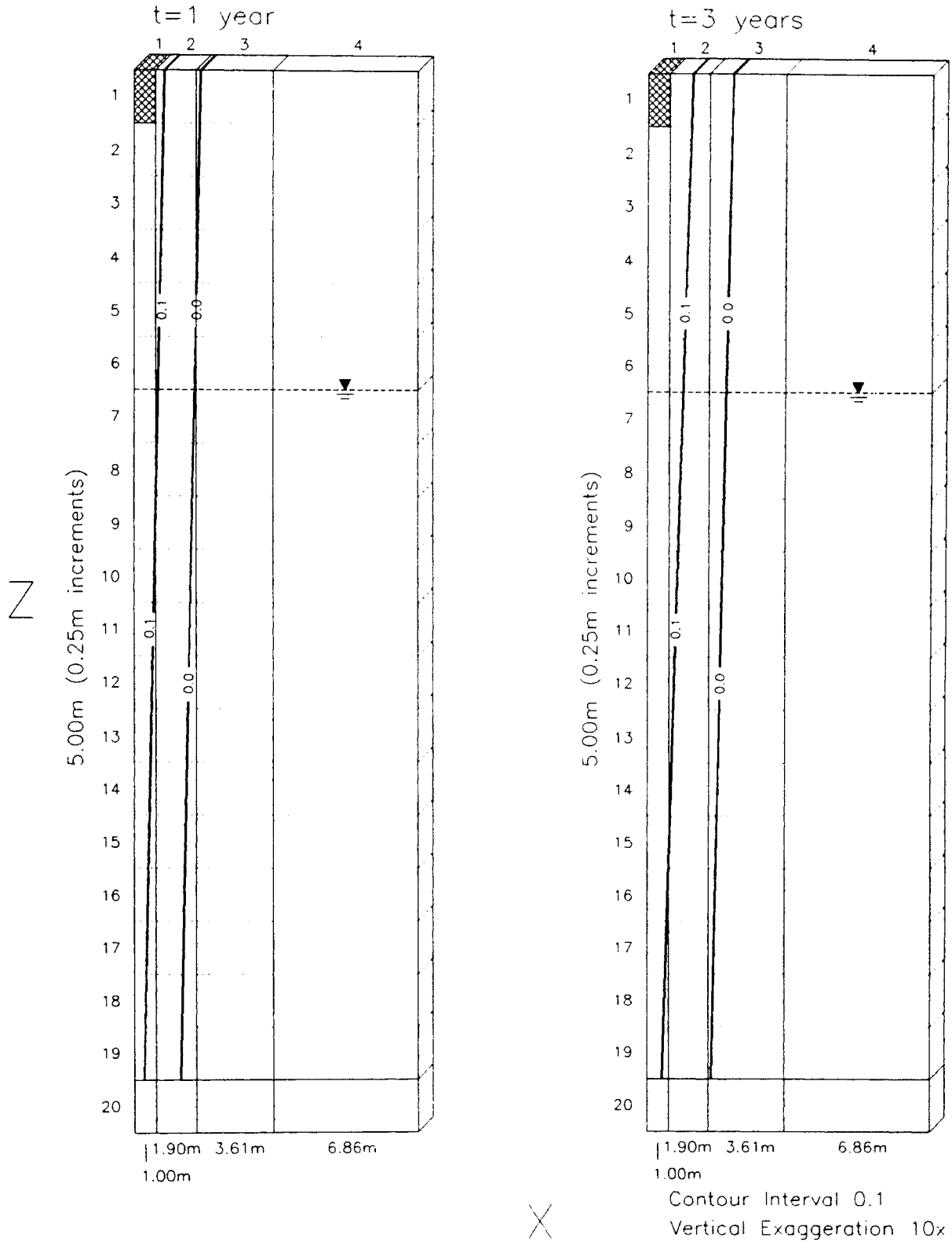

Figure 21. Infiltration of trichloroethene (TCE) at one and three years.

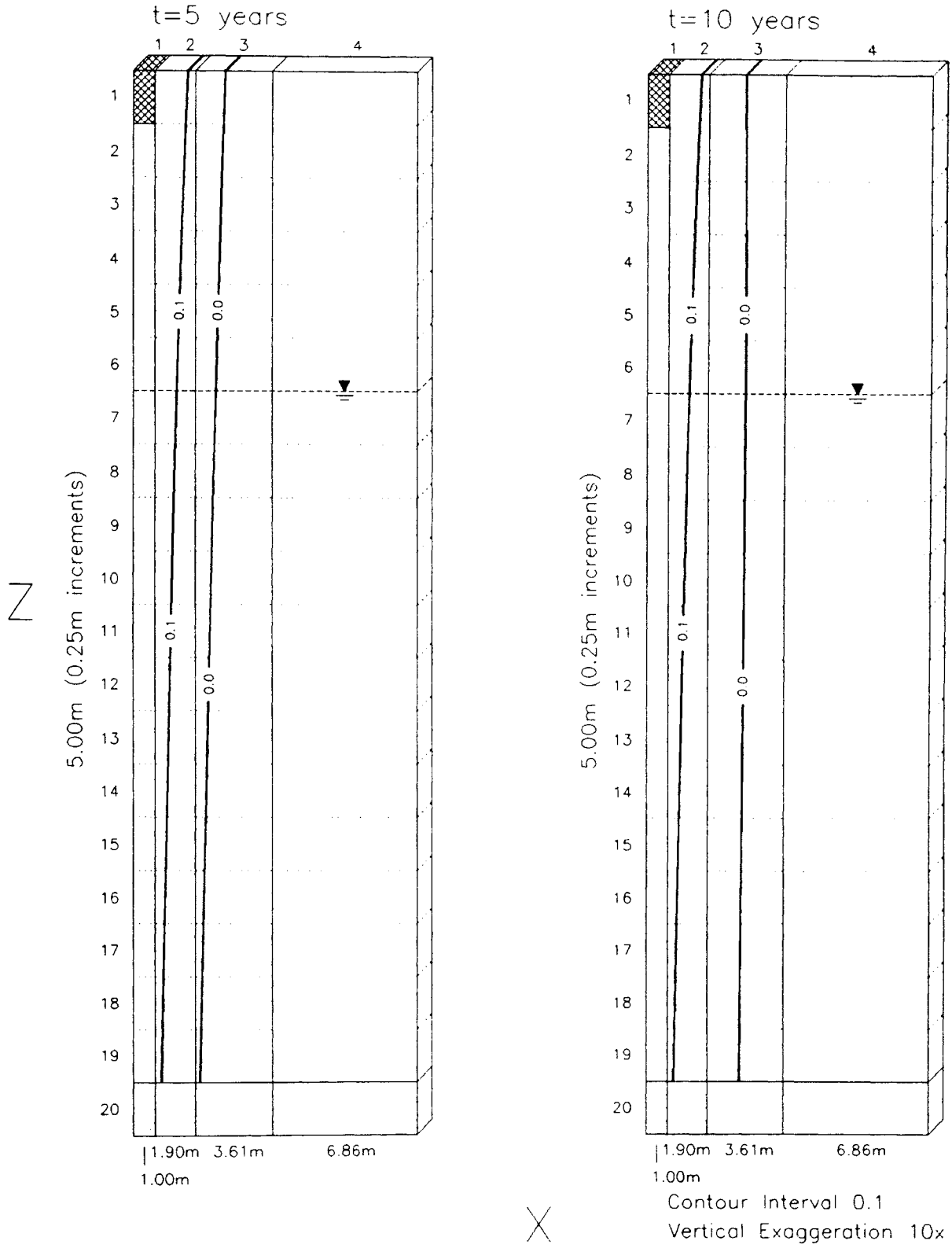

Figure 22. Infiltration of trichloroethene (TCE) at five and 10 years.

continues to show a uniform increase, although not a significant increase. The maximum distance of measurable spill influence has increased from 2.8 meters at one year to 4.2 meters at 10 years.

The infiltration pathway of TCE produced by the SWANFLOW simulation indicates vertical plume migration to be predominant. At 61 days, the TCE has reached the underlying aquifer that drains the aquitard. Given the vertically-dominated trend of infiltration for more-dense-than-water nonaqueous phase liquids, the majority of the contaminant will likely pass through the aquitard and into the lower aquifer. The maximum reported DNAPL saturation is 16.9%, while the maximum horizontal plume migration is 4.2 meters.

Tetrachloromethane

Tetrachloromethane (carbon tetrachloride) is the most dense NAPL included in this study, having a density 58% greater than that of water. Initial conditions are presented in the discussions above and summarized in Table 3. NAPL entry occurs at grid block (1,1) as indicated in Figure 6, which remains continuous throughout the 10 year duration of the simulation. Simulated output is generated at one, three, five, and 10 year intervals (Figures 23 and 24, Appendix B).

Figure 23 displays the numerical solution at one years. The contoured tetrachloromethane saturation values range from 0-30%. The greatest saturation of DNAPL present in the domain is 17.1%, and occurs at grid block (1,1) (Appendix B). Maximum lateral migration of the DNAPL plume is 2.2 meters from the original source.

For times t=3, 5, and 10 years (Figures 23 and 24), conditions present within the

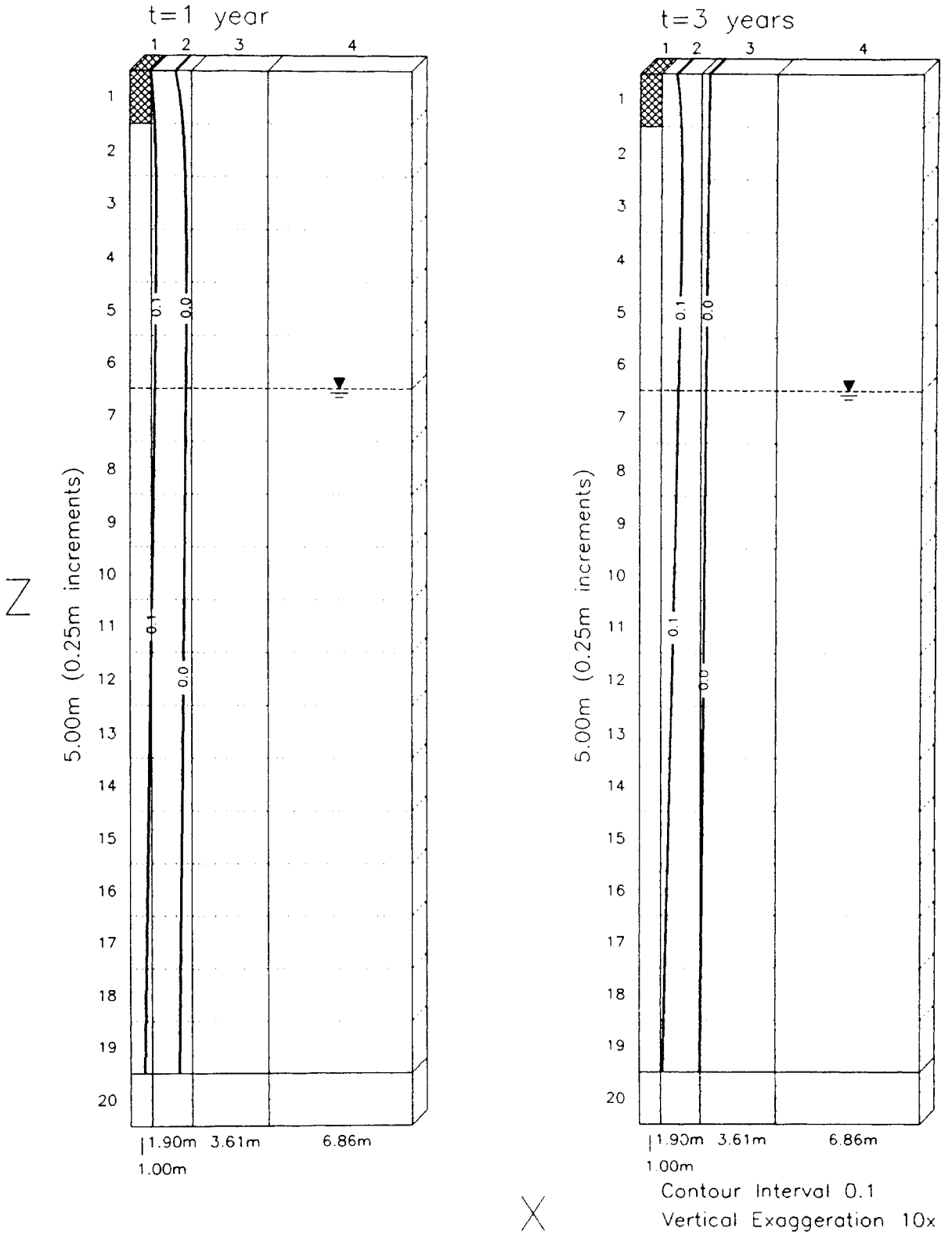

Figure 23. Infiltration of tetrachloromethane (carbon tetrachloride) at one and three years.

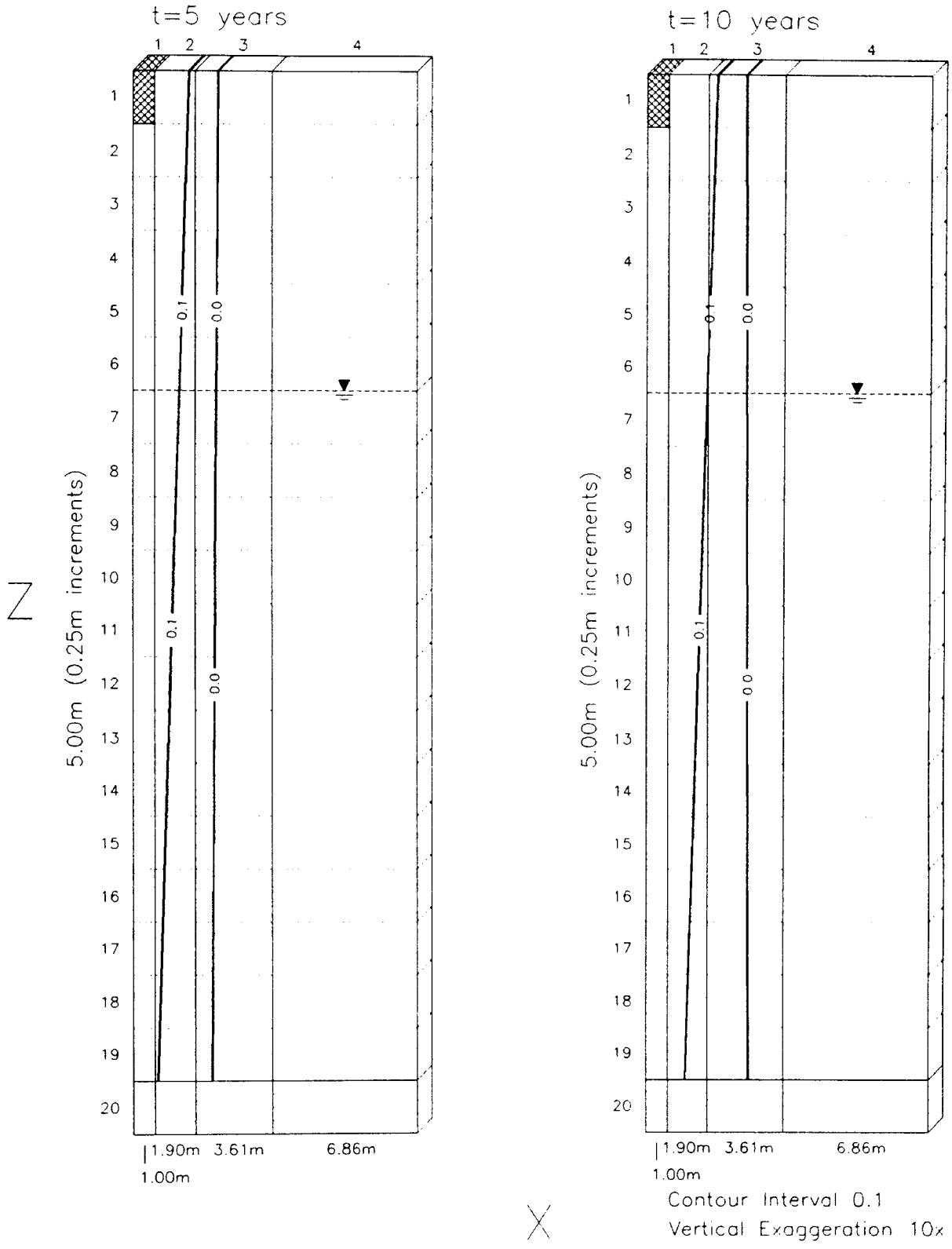

Figure 24. Infiltration of tetrachloromethane (carbon tetrachloride) at five and 10 years.

finite-difference grid show little change. The maximum DNAPL saturation remains constant at 17.1% for grid block (1,1) indicating a relatively uniform saturation profile has been established. The exception is the area of spill influence which continues to show a slight increase. The maximum distance of measurable spill influence has increased from 2.2 meters at one year to 4.3 meters at 10 years.

The area of contaminant influence produced by the infiltration of tetrachloromethane, as generated by the SWANFLOW code, exhibits an increase in the when compared with the pathway previously described for trichloroethene. An increase in the horizontal migration of contaminant in the subsurface is contrary to the trend observed for the phenol, *o*-nitrotoluene, and trichloroethene. These more-dense-than-water nonaqueous phase liquids demonstrate a decrease in horizontal migration as density increases. Also, the maximum saturation of DNAPL predictably decreases as the density increases. However, the maximum saturation of tetrachloromethane increases when compared to TCE, contrary to the observed trend. The tetrachloromethane appears to behave as if it were less dense than trichloroethene, whereas, it is actually more dense. The differences observed in the infiltration pathways of trichloroethene and tetrachloromethane, i.e., area of spill influence and maximum saturation, are likely due to the higher viscosity of the tetrachloromethane versus TCE.

Vertical and Horizontal NAPL Infiltration Rates

Vertical NAPL Infiltration Rates

To quantify the vertical infiltration pathways of the nonaqueous phase liquids described above, breakthrough times at the groundwater table and the lower draining

aquifer were compared for the nine liquids. Breakthrough at the groundwater table and lower draining aquifer is said to occur when the simulated NAPL reaches layers 7 and 20, respectively. Vertical infiltration rates are calculated in meters per day. Table 5 provides a summary of vertical breakthrough times determined from the SWANFLOW output (Appendix B). Summary data are plotted in Figure 25 to provide a graphical display of these breakthrough times to facilitate comparison. From Figure 25, it is readily apparent that the vertical infiltration rate is a function of NAPL density. Although viscosity has also been shown to influence infiltration (see discussions on motor oil and tetrachloromethane), it appears to have less influence as compared to density differences. Within the unsaturated and saturated zones, infiltration rates show a steady increase corresponding to the increase in NAPL density (Table 5). A second notable trend seen on Figure 25 and in Table 5 is the difference behavior between LNAPL and DNAPL as the nonaqueous liquid moves between the unsaturated and saturated zones. As would be expected, LNAPL infiltration rates are higher within the unsaturated zone than in the saturated zone, e.g., gasoline has an infiltration rate of 0.405E-3 meters per day within the unsaturated zone compared to 0.069E-3 meters per day in the saturated zone, approximately an order of magnitude difference. This slowing of LNAPL infiltration is most likely due to buoyancy effects experienced at and below the water table. Contrary to this is the behavior of DNAPL, which exhibits an increased infiltration rate as the contaminant moves from the unsaturated zone to the saturated zone. For example, tetrachloromethane infiltrates the unsaturated zone at a rate of 59.241E-3 meters per day, and increases to 90.529E-3 meters per day within the saturated zone, a 53% increase. This is likely due to the absence of the air phase within the saturated zone. Elimination

TABLE 5. Vertical NAPL Infiltration Rates

NAPL	Breakthrough at the Groundwater Table (days)	Unsaturated Zone Infiltration Rate (m/d)	NAPL/Water Infiltration Ratio Unsaturated Zone (unitless)	Breakthrough at the Lower Draining Aquifer (days)	Saturated Zone Infiltration Rate (m/d)	NAPL/Water Infiltration Ratio Saturated Zone (unitless)
Gasoline	3703.7*	0.405E-3	0.015	50,578.7*	0.069E-3	0.006
Kerosene	568.3	2.640E-3	0.098	27,314.8*	0.122E-3	0.012
p-Cymene	261.6	5.733E-3	0.213	11,469.9*	0.290E-3	0.028
10W-30 Motor Oil	135.4	11.078E-3	0.411	1,238.4	2.947E-3	0.280
Water	55.7	26.930E-3	1.000	364.5	10.525E-3	1.000
Phenol	53.9	27.829E-3	1.033	240.7	17.398E-3	1.653
o-Nitrotoluene	38.7	38.760E-3	1.439	115.6	42.263E-3	4.015
Trichloroethene	24.9	60.241E-3	2.237	60.8	90.529E-3	8.601
Tetrachloromethane	25.1	59.761E-3	2.219	60.8	91.036E-3	8.650

*Simulation runs are not within the scope of this study and are intended for comparison purposes only. Additional simulations were run to when breakthrough occurred. Output files are not provided.

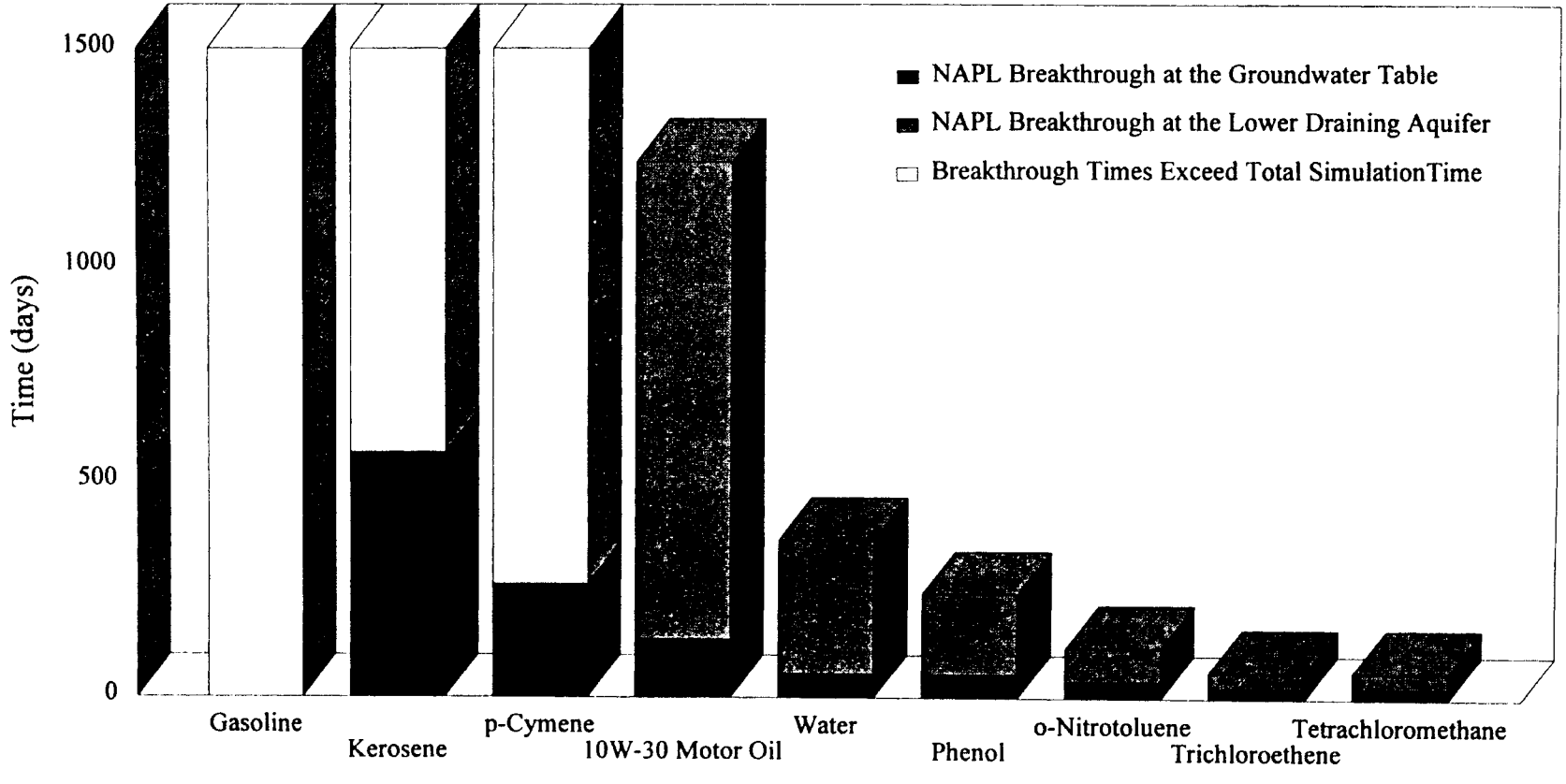

Figure 25. Breakthrough of vertically-infiltrating NAPL.

of the air phase results in a higher relative permeability for the NAPL, i.e., less competition for the available pore space in the absence of the third phase. Higher simulated vertical infiltration rates for DNAPL within the saturated zone versus the unsaturated zone are the result.

Horizontal NAPL Infiltration Rates

To evaluate horizontal infiltration, the maximum distance the NAPL migrated from the source was determined graphically from the contour plots of the nine liquids at one, three, five, and 10 years. These values are tabulated and plotted in Table 6 and Figure 26, respectively.

Figure 26 indicates a general decrease in the maximum extent of horizontal infiltration with increasing density. The influence of viscosity, as described for the LNAPL and DNAPL pairs, does result in some fluctuation between the graphed and "expected" values; however, the general trend persists throughout the spectrum of contaminant densities used for the simulations.

Discussion Summary

The concept of a floating "lens" [e.g., *Holzer*, 1976], often used to characterize the spill of a less-dense-than-water nonaqueous phase liquid, appears imprecise. The lens is more likely to be a thick zone of varying proportions of NAPL and water (and air if the unsaturated zone is under consideration). This suggests observations from monitoring wells, which essentially ignore capillary pressure effects, may not be representative of the conditions present in the adjacent aquifer. Capillary pressure is a property of the

TABLE 6. Horizontal NAPL Infiltration Rates (Unsaturated Zone)

NAPL	Total Horizontal Infiltration After 1 year (m)	Total Horizontal Infiltration After 3 years (m)	Total Horizontal Infiltration After 5 years (m)	Total Horizontal Infiltration After 10 years (m)	Horizontal Infiltration Rate for 10 years (m/d)	NAPL/Water Infiltration Ratio for 10 years (unitless)
Gasoline	30	60	90	175	47.945E-3	8.751
Kerosene	17	32	45	86	23.562E-3	4.300
p-Cymene	12	27	43	62	16.986E-3	3.100
10W-30 Motor Oil	5.6	9.9	11.0	20.6	5.644E-3	1.030
Water	6.5	11.6	16.7	20.0	5.479E-3	1.000
Phenol	4.4	7.7	7.7	7.7	2.110E-3	0.385
o-Nitrotoluene	4.8	4.8	4.8	4.8	1.315E-3	0.240
Trichloroethene	2.8	4.2	4.2	4.2	1.151E-3	0.210
Trichloromethane	2.2	4.3	4.3	4.3	1.178E-3	0.215

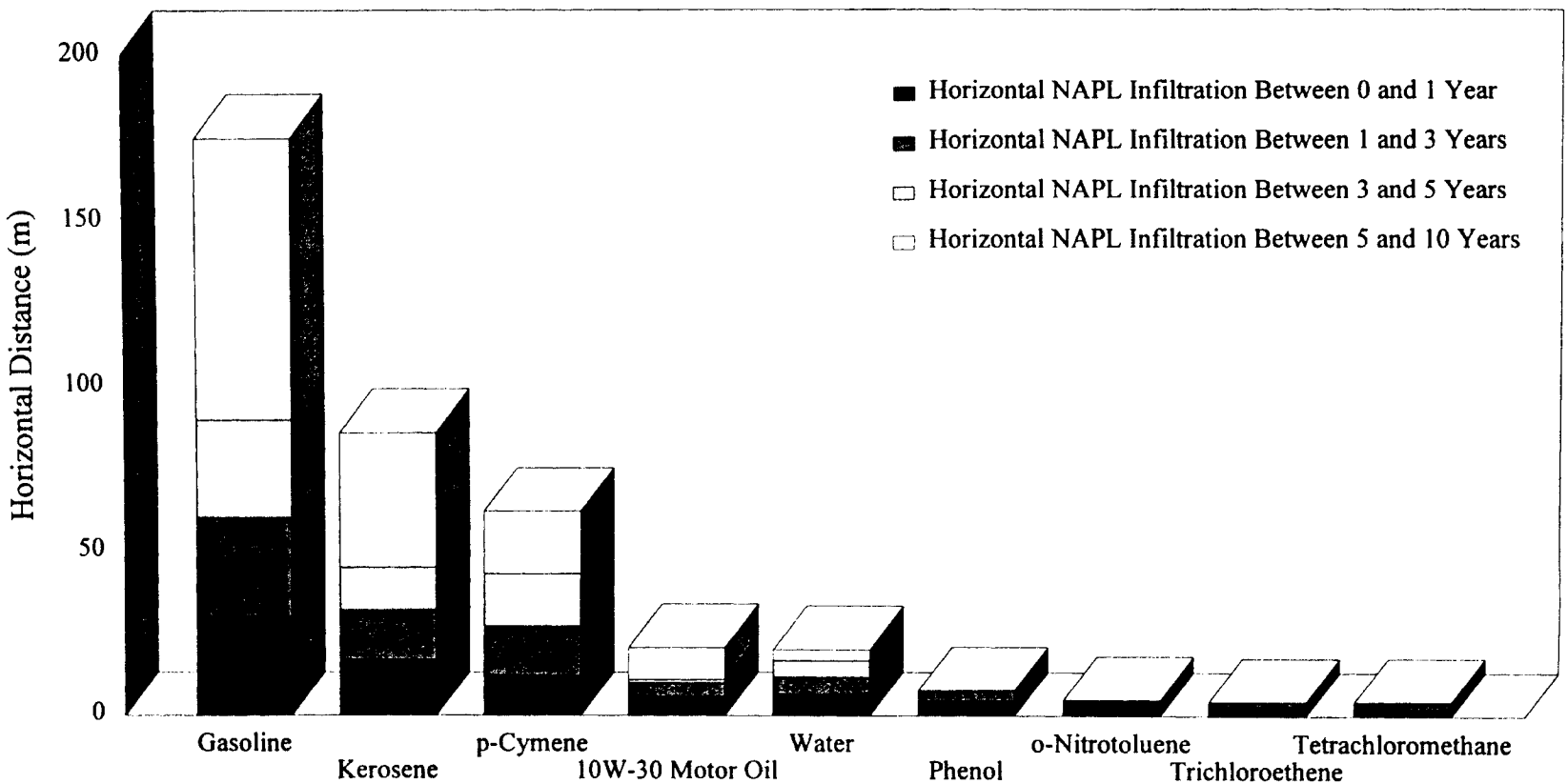

Figure 26. Horizontal NAPL infiltration rates.

macroscopic geometry of the void spaces in the porous media [*Fetter*, 1993]. The removal of the pore spaces, i.e., introduction of a well bore, eliminates capillary pressure forces within the affected area.

The lateral migration of the LNAPL can occur even within the unsaturated zone. Lateral spreading of the contaminant lens cannot be attributed solely to physical spreading at the water table due to buoyant forces acting on the less dense NAPL. Capillary forces likely play a significant role in lateral LNAPL movement.

The geometry of the area of spill influence, that is, the horizontal versus vertical dimensions, is a function of NAPL density and viscosity. However, density and viscosity act independently of one another. Low density NAPL, such as gasoline, produce an area of spill influence which is dominated by lateral migration with little vertical infiltration, which is likely a function of capillary forces. As LNAPL density increases and approaches that of water, the vertical component of migration becomes more prevalent than lateral migration. The infiltration of a high density NAPL, such as tetrachloromethane, results in an area of spill influence dominated by the vertical migration component due to gravity or buoyant forces.

The role of viscosity on infiltration varies for LNAPL and DNAPL. For a less-dense-than-water nonaqueous phase liquid, an increase in viscosity causes the LNAPL to behave as if its density has increased. For example, the area of contaminant influence produced by the infiltration of 10W-30 motor oil, generated by the SWANFLOW code, has decreased horizontally and increased vertically when compared with the pathway of *p*-cymene. Since the densities of the two less-dense-than-water nonaqueous phase liquids are approximately equivalent, the differences observed in their infiltration pathways, i.e.,

area of spill influence, is likely due to the higher viscosity of the motor oil versus the *p*-cymene. The effect of viscosity on DNAPL infiltration is the inverse of the description of the viscosity effects on LNAPL infiltration, i.e., an increase in viscosity behaves similarity to a decrease in density. This is evidenced by the comparison between trichloroethene and tetrachloromethane infiltration.

Immiscible fluid saturation appears to be a function of the fluid density and viscosity, again acting independently of one another. Generally, less-dense-than-water immiscible fluids attained higher saturation levels during the simulations than did the more dense liquids. Within the LNAPL grouping, immiscible fluid saturations increased as density increased. Conversely, the more-dense-than-water immiscible nonaqueous phase fluid saturations progressively decreased as density increased. Maximum saturation is also influenced by dynamic viscosity. As the dynamic viscosity of a nonaqueous liquid increases, a corresponding increase in the maximum saturation can be noted. The influence of viscosity differences on immiscible fluid saturations are somewhat more subtle than density differences, but can still be discerned. A comparison of infiltration characteristics of two less-dense-than-water nonaqueous phase liquids, e.g., *p*-cymene and 10W-30 motor oil, which have approximately the same density but an approximate two order of magnitude difference in dynamic viscosity, suggests a notable difference in their infiltration pathways can be attributed to the difference in viscosity. The maximum immiscible fluid saturation for motor oil is 11.4% greater than *p*-cymene. This difference is likely due to the greater dynamic viscosity of the motor oil. This is further supported by comparing the maximum saturations of trichloroethene (16.9%) and tetrachloromethane (17.1%). The dynamic viscosity of the tetrachloromethane is

approximately two times that of the trichloroethene (Table 1). Recall that as the density of a DNAPL increases, the maximum saturation decreases; therefore, we would expect the maximum tetrachloromethane saturation to be less than TCE. However, the maximum saturation of tetrachloromethane is greater, and it the result of its higher dynamic viscosity.

Breakthrough times for the downward-infiltrating nonaqueous immiscible liquids indicate infiltration rates increase as density increases. This is likely due to buoyant forces encountered by the less dense liquids. The implication of these results is that dense immiscible liquids present the greatest danger in terms of migration potential in that they travel faster and deeper. Lower density liquids, which travel slower and tend to remain at shallow depths, are more amenable to corrective measures. However, the increased area of spill influence can create additional remediation problems.

Generally, increasing NAPL density results in a decrease in the maximum extent of horizontal infiltration. The influence of viscosity, as described for the LNAPL and DNAPL pairs, does result in some fluctuation between the simulated and "expected" values based on density alone.

CONCLUSIONS

1. The concept of a floating lens consisting of only NAPL, often used to characterize the spill and infiltration of a less dense than water nonaqueous phase liquid (LNAPL), appears imprecise. The lens is more likely to be a thick zone of varying proportions of nonaqueous phase liquid and water (and air if the unsaturated zone is under consideration).

2. The geometry of the area of spill influence, i.e., the rate of horizontal versus vertical NAPL infiltration, are influenced by NAPL density and viscosity. These influences, however, act independently from each other. As the density of the NAPL increases, the rate at which the contaminant migrates horizontally decreases, while the vertical infiltration rate increases. The influence of dynamic viscosity on NAPL infiltration is somewhat more complex, and is dependent on whether the NAPL being considered is a less dense than water (LNAPL) or more dense than water (DNAPL). For less dense liquids, an increase in viscosity results in decreased horizontal infiltration and increased vertical infiltration. If viscosity is decreased, the opposite holds true. For more dense liquids, the influence of viscosity is the inverse of that described for LNAPL.

3. The maximum immiscible fluid saturation is a function of fluid density and viscosity. First, as the density of an LNAPL increases and approaches the density of water, the maximum NAPL saturation also increases. Second, as the density of a DNAPL

increases from the density of water, the maximum NAPL saturation decreases. Finally, for two nonaqueous phase liquids having approximately the same density and differing viscosities, the higher maximum saturation will be associated with the greater viscosity. This is true for both LNAPL and DNAPL.

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APPENDIX A

SWANFLOW Input Files

```
1.    title*
2-D Unsaturated-Saturated Infiltration of Gasoline
2.    date
7 May 1994
3.    run identifier
RUN1
4.    x, z, y, number of Newton-Raphson iterations, bandwidth, total time steps, steps between printing output, print
      potentials, number of SSOR iterations, coordinate system
    8   20    1    4    0  100    1    0    0    1    0
5-1.  balance error, initial time, water density, NAPL density, water viscosity, NAPL viscosity
   0.02000         0.    1000.00     730.00  1.000E-3  4.500E-4
5-2.  gravity term z-direction, gravity term x-direction, SSOR relaxation factor, SSOR convergence tolerance
     -9.80   0.00000       1.00 0.100E-04
6-1.  number of capillary pressure-relative permeability tables
    1
6-2a. number of entries in table
   13
6-2b. capillary pressure, water saturation, relative permeability water, relative permeability NAPL
  103425.0      -0.10   0.00000   1.00000
  103425.0       0.00   0.00000   1.00000
  103425.0       0.10   0.00000   0.82000
  103425.0       0.20   0.00000   0.68000
   27580.0       0.30   0.04000   0.55000
   10343.0       0.40   0.10000   0.43000
    7585.0       0.50   0.18000   0.31000
    7447.0       0.60   0.30000   0.20000
    7309.0       0.70   0.44000   0.12000
    7171.0       0.80   0.60000   0.05000
    7033.0       0.90   0.80000   0.00000
    6895.0       1.00   1.00000   0.00000
    6895.0       1.10   1.00000   0.00000
6-2c. number of entries in table, relative permeability of NAPL at residual water saturation
    2     0.680
6-2d. capillary pressure between NAPL and air, air saturation, relative permeability NAPL, relative permeability air
  -98000.0       1.00   -0.3200     1.000
       0.0       0.00    0.6800     0.000
7-1.  number of permeability classes
    1
7-2.  permeability x-, z-, y-directions
 0.100E-11 0.100E-11 0.100E-11
8-1.  number of porosity classes
    1
8-2.  reference porosity, aquifer compressibility, reference pressure
     0.300   1.0E-15       0.0
9a.   grid spacing x-direction
     1.000     1.900     3.610     6.859    13.032    24.761    47.046    89.387
9b.   grid spacing z-direction
     0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
     0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
     0.250     0.250     0.250     0.250
9c.   grid spacing y-direction
     1.000
10-1. number of property combination sets
    1
10-2. capillary pressure-relative permeability class number, permeability class number, porosity class number
    1    1    1
11.   number of active blocks per slice
  152
12.   grid block number
    1    2    3    4    5    6    7    8
    9   10   11   12   13   14   15   16
   17   18   19   20   21   22   23   24
   25   26   27   28   29   30   31   32
   33   34   35   36   37   38   39   40
   41   42   43   44   45   46   47   48
   49   50   51   52   53   54   55   56
   57   58   59   60   61   62   63   64
   65   66   67   68   69   70   71   72
   73   74   75   76   77   78   79   80
   81   82   83   84   85   86   87   88
   89   90   91   92   93   94   95   96
   97   98   99  100  101  102  103  104
  105  106  107  108  109  110  111  112
  113  114  115  116  117  118  119  120
  121  122  123  124  125  126  127  128
  129  130  131  132  133  134  135  136
  137  138  139  140  141  142  143  144
  145  146  147  148  149  150  151  152
   -1   -1   -1   -1   -1   -1   -1   -1
14-1. initial conditions-uniform or nonuniform
    1
14-3. initial NAPL pressure in each of the numbered grid blocks
 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
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*The numbered, italicized lines, corresponding to input card numbers, are for the reader's information only and are not included in the input file.

```
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
14-4. initial water saturation in each of the numbered grid blocks*
    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
15.   initial time step, min time step, max saturation change per time step, time step multiplier, time to read new
      recurrent data, number source/sink blocks, source/sink change
  1000000     10000   0.10000      1.500 3.1536E07     8    1
16-1. column number (i), slice number (j), total mass source rate, mass fraction of water in source term
    1     1 2.9459E-5     0.1206
16-2. layers over which source/sink is applied
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    2     1 6.0249E-6     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    3     1 1.1447E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    4     1 2.1750E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    5     1 4.1325E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    6     1 7.8517E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    7     1 1.4918E-4     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    8     1 2.8344E-4     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
15.   initial time step, min time step, max saturation change per time step, time step multiplier, time to read new
      recurrent data, number source/sink blocks, source/sink change
  1000000     10000   0.10000      1.500 9.4608E07     8    1
16-1. column number (i), slice number (j), total mass source rate, mass fraction of water in source term
    1     1 2.9459E-5     0.1206
16-2. layers over which source/sink is applied
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    2     1 6.0249E-6     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    3     1 1.1447E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    4     1 2.1750E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    5     1 4.1325E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    6     1 7.8517E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    7     1 1.4918E-4     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    8     1 2.8344E-4     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
15.   initial time step, min time step, max saturation change per time step, time step multiplier, time to read new
      recurrent data, number source/sink blocks, source/sink change
  1000000     10000   0.10000      1.500 1.5768E08     8    1
16-1. column number (i), slice number (j), total mass source rate, mass fraction of water in source term
    1     1 2.9459E-5     0.1206
16-2. layers over which source/sink is applied
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    2     1 6.0249E-6     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    3     1 1.1447E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    4     1 2.1750E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
```

*The numbered, italicized lines, corresponding to input card numbers, are for the reader's information only and are not included in the input file.

```
    5    1 4.1325E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    6    1 7.8517E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    7    1 1.4918E-4    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    8    1 2.8344E-4    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
15.  initial time step, min time step, max saturation change per time step, time step multiplier, time to read new
     recurrent data, number source/sink blocks, source/sink change*
   1000000     10000   0.10000     1.500 3.1536E08    8    1
16-1. column number (i), slice number (j), total mass source rate, mass fraction of water in source term
    1    1 2.9459E-5    0.1206
16-2. layers over which source/sink is applied
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    2    1 6.0249E-6    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    3    1 1.1447E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    4    1 2.1750E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    5    1 4.1325E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    6    1 7.8517E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    7    1 1.4918E-4    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    8    1 2.8344E-4    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
15.  zeros to end simulation
      0.        0.   0.00000     0.000     0.000    0    0
```

*The numbered, italicized lines, corresponding to input card numbers, are for the reader's information only and are not included in the input file.

```
2-D Unsaturated-Saturated Infiltration of Kerosene
7 May 1994
RUN1
    8   20     1    4     0  100     1    0     0    1     0
  0.02000         0.   1000.00    810.00  1.000E-3  2.050E-3
    -9.80  0.00000        1.00 0.100E-04
    1
   13
 103425.0      -0.10   0.00000   1.00000
 103425.0       0.00   0.00000   1.00000
 103425.0       0.10   0.00000   0.82000
 103425.0       0.20   0.00000   0.68000
  27580.0       0.30   0.04000   0.55000
  10343.0       0.40   0.10000   0.43000
   7585.0       0.50   0.18000   0.31000
   7447.0       0.60   0.30000   0.20000
   7309.0       0.70   0.44000   0.12000
   7171.0       0.80   0.60000   0.05000
   7033.0       0.90   0.80000   0.00000
   6895.0       1.00   1.00000   0.00000
   6895.0       1.10   1.00000   0.00000
    2     0.680
 -98000.0       1.00   -0.3200     1.000
      0.0       0.00    0.6800     0.000
    1
0.100E-11 0.100E-11 0.100E-11
    1
    0.300    1.0E-15       0.0
    1.000      1.900     3.610     6.859    13.032    24.761    47.046    89.387
    0.250      0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250      0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250      0.250     0.250     0.250
    1.000
    1
    1    1    1
  152
    1    2    3    4    5    6    7    8
    9   10   11   12   13   14   15   16
   17   18   19   20   21   22   23   24
   25   26   27   28   29   30   31   32
   33   34   35   36   37   38   39   40
   41   42   43   44   45   46   47   48
   49   50   51   52   53   54   55   56
   57   58   59   60   61   62   63   64
   65   66   67   68   69   70   71   72
   73   74   75   76   77   78   79   80
   81   82   83   84   85   86   87   88
   89   90   91   92   93   94   95   96
   97   98   99  100  101  102  103  104
  105  106  107  108  109  110  111  112
  113  114  115  116  117  118  119  120
  121  122  123  124  125  126  127  128
  129  130  131  132  133  134  135  136
  137  138  139  140  141  142  143  144
  145  146  147  148  149  150  151  152
   -1   -1   -1   -1   -1   -1   -1   -1
    1
-14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
-12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
 -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
 -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
 -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
 -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
  4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
  7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
  9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
 12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
 14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
 17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
 19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
 22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
 24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
   0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
   0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
   0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
   0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
   0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
   0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
  1000000     10000   0.10000     1.500 3.1536E07    8    1
    1    1 3.2339E-5    0.1087
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    2    1 6.0249E-6    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    3    1 1.1447E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
1000000     10000    0.10000     1.500 9.4608E07     8     1
 1     1 3.2339E-5     0.1087
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 2     1 6.0249E-6     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 3     1 1.1447E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
1000000     10000    0.10000     1.500 1.5768E08     8     1
 1     1 3.2339E-5     0.1087
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 2     1 6.0249E-6     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 3     1 1.1447E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
1000000     10000    0.10000     1.500 3.1536E08     8     1
 1     1 3.2339E-5     0.1087
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 2     1 6.0249E-6     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 3     1 1.1447E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
    0.          0.   0.00000     0.000     0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of p-Cymene [1-Methyl-4-(1-Methylethyl)-Benzene]
8 May 1994
RUN1
    8   20     1    4     0  150     1    0     0    1     0
   0.02000         0.   1000.00     857.30  1.000E-3  3.402E-3
     -9.80   0.00000       1.00 0.100E-04
    1
   13
  103425.0       -0.10  0.00000   1.00000
  103425.0        0.00  0.00000   1.00000
  103425.0        0.10  0.00000   0.82000
  103425.0        0.20  0.00000   0.68000
   27580.0        0.30  0.04000   0.55000
   10343.0        0.40  0.10000   0.43000
    7585.0        0.50  0.18000   0.31000
    7447.0        0.60  0.30000   0.20000
    7309.0        0.70  0.44000   0.12000
    7171.0        0.80  0.60000   0.05000
    7033.0        0.90  0.80000   0.00000
    6895.0        1.00  1.00000   0.00000
    6895.0        1.10  1.00000   0.00000
    2     0.680
  -98000.0        1.00  -0.3200     1.000
       0.0        0.00   0.6800     0.000
    1
 0.100E-11 0.100E-11 0.100E-11
    1
     0.300    1.0E-15       0.0
     1.000      1.900     3.610     6.859    13.032    24.761    47.046    89.387
     0.250      0.250     0.250     0.250     0.250     0.250     0.250     0.250
     0.250      0.250     0.250     0.250     0.250     0.250     0.250     0.250
     0.250      0.250     0.250     0.250
     1.000
    1
    1    1     1
  152
    1    2     3    4     5    6     7    8
    9   10    11   12    13   14    15   16
   17   18    19   20    21   22    23   24
   25   26    27   28    29   30    31   32
   33   34    35   36    37   38    39   40
   41   42    43   44    45   46    47   48
   49   50    51   52    53   54    55   56
   57   58    59   60    61   62    63   64
   65   66    67   68    69   70    71   72
   73   74    75   76    77   78    79   80
   81   82    83   84    85   86    87   88
   89   90    91   92    93   94    95   96
   97   98    99  100   101  102   103  104
  105  106   107  108   109  110   111  112
  113  114   115  116   117  118   119  120
  121  122   123  124   125  126   127  128
  129  130   131  132   133  134   135  136
  137  138   139  140   141  142   143  144
  145  146   147  148   149  150   151  152
   -1   -1    -1   -1    -1   -1    -1   -1
    1
 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.0C
  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   100000     10000   0.10000     1.250 3.1536E07     8     1
    1    1 3.4043E-5    0.1027
    1    0     0    0     0    0     0    0     0    0     0    0     0    0     0    0
    0    0     0    0
    2    1 6.0249E-6    1.0000
    1    0     0    0     0    0     0    0     0    0     0    0     0    0     0    C
    0    0     0    0
    3    1 1.1447E-5    1.0000
    1    0     0    0     0    0     0    0     0    0     0    0     0    0     0    0
```

```
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000     10000    0.10000      1.250 9.4608E07     8     1
1     1 3.4043E-5     0.1027
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000     10000    0.10000      1.250 1.5768E08     8     1
1     1 3.4043E-5     0.1027
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000     10000    0.10000      1.250 3.1536E08     8     1
1     1 3.4043E-5     0.1027
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
    0.          0.   0.00000      0.000      0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of 10W-30 Motor Oil
8 May 1994
RUN1
    8   20     1    4     0  150     1    0     0    1    0
  0.02000         0.   1000.00    869.00 1.000E-3  1.300E-1
    -9.80  0.00000        1.00 0.100E-04
    1
   13
 103425.0      -0.10   0.00000   1.00000
 103425.0       0.00   0.00000   1.00000
 103425.0       0.10   0.00000   0.82000
 103425.0       0.20   0.00000   0.68000
  27580.0       0.30   0.04000   0.55000
  10343.0       0.40   0.10000   0.43000
   7585.0       0.50   0.18000   0.31000
   7447.0       0.60   0.30000   0.20000
   7309.0       0.70   0.44000   0.12000
   7171.0       0.80   0.60000   0.05000
   7033.0       0.90   0.80000   0.00000
   6895.0       1.00   1.00000   0.00000
   6895.0       1.10   1.00000   0.00000
    2     0.680
 -98000.0       1.00   -0.3200     1.000
      0.0       0.00    0.6800     0.000
    1
 0.100E-11 0.100E-11 0.100E-11
    1
    0.300   1.0E-15       0.0
    1.000     1.900     3.610     6.859    13.032    24.761    47.046    89.387
    0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250     0.250     0.250
    1.000
    1
    1    1    1
  152
    1    2    3    4    5    6    7    8
    9   10   11   12   13   14   15   16
   17   18   19   20   21   22   23   24
   25   26   27   28   29   30   31   32
   33   34   35   36   37   38   39   40
   41   42   43   44   45   46   47   48
   49   50   51   52   53   54   55   56
   57   58   59   60   61   62   63   64
   65   66   67   68   69   70   71   72
   73   74   75   76   77   78   79   80
   81   82   83   84   85   86   87   88
   89   90   91   92   93   94   95   96
   97   98   99  100  101  102  103  104
  105  106  107  108  109  110  111  112
  113  114  115  116  117  118  119  120
  121  122  123  124  125  126  127  128
  129  130  131  132  133  134  135  136
  137  138  139  140  141  142  143  144
  145  146  147  148  149  150  151  152
   -1   -1   -1   -1   -1   -1   -1   -1
    1
-14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
-12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
 -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
 -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
 -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
 -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
  4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
  7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
  9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
 12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
 14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
 17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
 19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
 22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
 24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
   0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
   0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
   0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
   0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
   0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
   0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
  1000000     10000   0.10000     1.500 3.1536E07     8    1
    1    1 3.4464E-5    0.1013
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    2    1 6.0249E-6    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    3    1 1.1447E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.10000     1.500 9.4608E07     8     1
1     1 3.4464E-5     0.1013
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.10000     1.500 1.5768E08     8     1
1     1 3.4464E-5     0.1013
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.10000     1.500 3.1536E08     8     1
1     1 3.4464E-5     0.1013
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
    0.          0.    0.00000     0.000     0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of Water
8 May 1994
RUN1
    8   20     1    4     0  100     1    0     0    1     0
  0.02000          0.    1000.00   1000.00  1.000E-3  1.000E-3
    -9.80   0.00000        1.00 0.100E-04
    1
   13
 103425.0      -0.10   0.00000   1.00000
 103425.0       0.00   0.00000   1.00000
 103425.0       0.10   0.00000   0.82000
 103425.0       0.20   0.00000   0.68000
  27580.0       0.30   0.04000   0.55000
  10343.0       0.40   0.10000   0.43000
   7585.0       0.50   0.18000   0.31000
   7447.0       0.60   0.30000   0.20000
   7309.0       0.70   0.44000   0.12000
   7171.0       0.80   0.60000   0.05000
   7033.0       0.90   0.80000   0.00000
   6895.0       1.00   1.00000   0.00000
   6895.0       1.10   1.00000   0.00000
    2     0.680
 -98000.0       1.00   -0.3200     1.000
      0.0       0.00    0.6800     0.000
    1
0.100E-11 0.100E-11 0.100E-11
    1
    0.300   1.0E-15        0.0
    1.000     1.900      3.610     6.859    13.032    24.761    47.046    89.387
    0.250     0.250      0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250      0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250      0.250     0.250
    1.000
    1
    1    1    1
  152
    1    2    3    4    5    6    7    8
    9   10   11   12   13   14   15   16
   17   18   19   20   21   22   23   24
   25   26   27   28   29   30   31   32
   33   34   35   36   37   38   39   40
   41   42   43   44   45   46   47   48
   49   50   51   52   53   54   55   56
   57   58   59   60   61   62   63   64
   65   66   67   68   69   70   71   72
   73   74   75   76   77   78   79   80
   81   82   83   84   85   86   87   88
   89   90   91   92   93   94   95   96
   97   98   99  100  101  102  103  104
  105  106  107  108  109  110  111  112
  113  114  115  116  117  118  119  120
  121  122  123  124  125  126  127  128
  129  130  131  132  133  134  135  136
  137  138  139  140  141  142  143  144
  145  146  147  148  149  150  151  152
   -1   -1   -1   -1   -1   -1   -1   -1
    1
-14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
-12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
 -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
 -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
 -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
 -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
  4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
  7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
  9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
 12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
 14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
 17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
 19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
 22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
 24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
   0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
   0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
   0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
   0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
   0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
   0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   100000     10000   0.10000     1.500 3.1536E07    8    1
    1    1 3.9181E-5    0.0881
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    2    1 6.0249E-6    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    3    1 1.1447E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000      10000     0.10000      1.500 9.4608E07     8     1
1     1 3.9181E-5     0.0881
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000      10000     0.10000      1.500 1.5768E08     8     1
1     1 3.9181E-5     0.0881
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000      10000     0.10000      1.500 3.1536E08     8     1
1     1 3.9181E-5     0.0881
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
   0.          0.   0.00000      0.000      0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of Phenol
8 May 1994
RUN1
   8   20     1     4     0  100     1     0     0     1     0
  0.02000          0.   1000.00   1053.30  1.000E-3  4.076E-3
    -9.80   0.00000        1.00 0.100E-04
   1
  13
 103425.0     -0.10   0.00000   1.00000
 103425.0      0.00   0.00000   1.00000
 103425.0      0.10   0.00000   0.82000
 103425.0      0.20   0.00000   0.68000
  27580.0      0.30   0.04000   0.55000
  10343.0      0.40   0.10000   0.43000
   7585.0      0.50   0.18000   0.31000
   7447.0      0.60   0.30000   0.20000
   7309.0      0.70   0.44000   0.12000
   7171.0      0.80   0.60000   0.05000
   7033.0      0.90   0.80000   0.00000
   6895.0      1.00   1.00000   0.00000
   6895.0      1.10   1.00000   0.00000
   2      0.680
 -98000.0      1.00   -0.3200     1.000
      0.0      0.00    0.6800     0.000
   1
0.100E-11 0.100E-11 0.100E-11
   1
    0.300   1.0E-15       0.0
    1.000     1.900     3.610     6.859    13.032    24.761    47.046    89.387
    0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250     0.250     0.250
    1.000
   1
   1    1    1
 152
   1    2    3    4    5    6    7    8
   9   10   11   12   13   14   15   16
  17   18   19   20   21   22   23   24
  25   26   27   28   29   30   31   32
  33   34   35   36   37   38   39   40
  41   42   43   44   45   46   47   48
  49   50   51   52   53   54   55   56
  57   58   59   60   61   62   63   64
  65   66   67   68   69   70   71   72
  73   74   75   76   77   78   79   80
  81   82   83   84   85   86   87   88
  89   90   91   92   93   94   95   96
  97   98   99  100  101  102  103  104
 105  106  107  108  109  110  111  112
 113  114  115  116  117  118  119  120
 121  122  123  124  125  126  127  128
 129  130  131  132  133  134  135  136
 137  138  139  140  141  142  143  144
 145  146  147  148  149  150  151  152
  -1   -1   -1   -1   -1   -1   -1   -1
   1
-14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
-12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
 -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
 -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
 -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
 -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
  4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
  7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
  9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
 12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
 14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
 17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
 19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
 22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
 24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
   0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
   0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
   0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
   0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
   0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
   0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
  1000000     10000   0.10000     1.500 3.1536E07     8    1
   1    1 4.1101E-5   0.0836
   1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   0    0    0    0
   2    1 6.0249E-6   1.0000
   1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   0    0    0    0
   3    1 1.1447E-5   1.0000
   1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
1000000      10000   0.10000      1.500 9.4608E07     8     1
 1     1 4.1101E-5     0.0836
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 2     1 6.0249E-6     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 3     1 1.1447E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
1000000      10000   0.10000      1.500 1.5768E08     8     1
 1     1 4.1101E-5     0.0836
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 2     1 6.0249E-6     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 3     1 1.1447E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
1000000      10000   0.10000      1.500 3.1536E08     8     1
 1     1 4.1101E-5     0.0836
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 2     1 6.0249E-6     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 3     1 1.1447E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 4     1 2.1750E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 5     1 4.1325E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 6     1 7.8517E-5     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 7     1 1.4918E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
 8     1 2.8344E-4     1.0000
 1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
 0     0     0     0
    0.          0.   0.00000      0.000      0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of o-Nitrotoluene
8 May 1994
RUN1
    8   20     1     4     0  100     1     0     0     1     0
  0.02000          0.    1000.00    1152.90  1.000E-3  2.370E-3
    -9.80   0.00000        1.00 0.100E-04
    1
   13
 103425.0     -0.10    0.00000    1.00000
 103425.0      0.00    0.00000    1.00000
 103425.0      0.10    0.00000    0.82000
 103425.0      0.20    0.00000    0.68000
  27580.0      0.30    0.04000    0.55000
  10343.0      0.40    0.10000    0.43000
   7585.0      0.50    0.18000    0.31000
   7447.0      0.60    0.30000    0.20000
   7309.0      0.70    0.44000    0.12000
   7171.0      0.80    0.60000    0.05000
   7033.0      0.90    0.80000    0.00000
   6895.0      1.00    1.00000    0.00000
   6895.0      1.10    1.00000    0.00000
    2     0.680
 -98000.0      1.00    -0.3200      1.000
      0.0      0.00     0.6800      0.000
    1
 0.100E-11 0.100E-11 0.100E-11
    1
    0.300   1.0E-15        0.0
    1.000     1.900      3.610      6.859     13.032     24.761     47.046     89.387
    0.250     0.250      0.250      0.250      0.250      0.250      0.250      0.250
    0.250     0.250      0.250      0.250      0.250      0.250      0.250      0.250
    0.250     0.250      0.250      0.250
    1.000
    1
    1     1     1
  152
    1     2     3     4     5     6     7     8
    9    10    11    12    13    14    15    16
   17    18    19    20    21    22    23    24
   25    26    27    28    29    30    31    32
   33    34    35    36    37    38    39    40
   41    42    43    44    45    46    47    48
   49    50    51    52    53    54    55    56
   57    58    59    60    61    62    63    64
   65    66    67    68    69    70    71    72
   73    74    75    76    77    78    79    80
   81    82    83    84    85    86    87    88
   89    90    91    92    93    94    95    96
   97    98    99   100   101   102   103   104
  105   106   107   108   109   110   111   112
  113   114   115   116   117   118   119   120
  121   122   123   124   125   126   127   128
  129   130   131   132   133   134   135   136
  137   138   139   140   141   142   143   144
  145   146   147   148   149   150   151   152
   -1    -1    -1    -1    -1    -1    -1    -1
    1
 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1000000     10000    0.20000      1.500 3.1536E07     8     1
    1     1 4.4687E-5     0.0764
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    2     1 6.0249E-6     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0
    3     1 1.1447E-5     1.0000
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
```

```
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.20000     1.500 9.4608E07     8     1
1     1 4.4687E-5     0.0764
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.20000     1.500 1.5768E08     8     1
1     1 4.4687E-5     0.0764
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.20000     1.500 3.1536E08     8     1
1     1 4.4687E-5     0.0764
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
    0.          0.   0.00000     0.000     0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of Trichloroethene (TCE)
8 May 1994
RUN1
    8   20      1     4     0  150     1     0     0     1     0
  0.02000          0.    1000.00    1467.90  1.000E-3  5.660E-4
    -9.80    0.00000        1.00 0.100E-04
   1
  13
 103425.0      -0.10    0.00000    1.00000
 103425.0       0.00    0.00000    1.00000
 103425.0       0.10    0.00000    0.82000
 103425.0       0.20    0.00000    0.68000
  27580.0       0.30    0.04000    0.55000
  10343.0       0.40    0.10000    0.43000
   7585.0       0.50    0.18000    0.31000
   7447.0       0.60    0.30000    0.20000
   7309.0       0.70    0.44000    0.12000
   7171.0       0.80    0.60000    0.05000
   7033.0       0.90    0.80000    0.00000
   6895.0       1.00    1.00000    0.00000
   6895.0       1.10    1.00000    0.00000
   2      0.680
 -98000.0       1.00    -0.3200      1.000
      0.0       0.00     0.6800      0.000
   1
 0.100E-11 0.100E-11 0.100E-11
   1
    0.300    1.0E-15        0.0
    1.000      1.900      3.610      6.859     13.032     24.761     47.046     89.387
    0.250      0.250      0.250      0.250      0.250      0.250      0.250      0.250
    0.250      0.250      0.250      0.250      0.250      0.250      0.250      0.250
    0.250      0.250      0.250      0.250
    1.000
   1
   1    1    1
 152
   1    2    3    4    5    6    7    8
   9   10   11   12   13   14   15   16
  17   18   19   20   21   22   23   24
  25   26   27   28   29   30   31   32
  33   34   35   36   37   38   39   40
  41   42   43   44   45   46   47   48
  49   50   51   52   53   54   55   56
  57   58   59   60   61   62   63   64
  65   66   67   68   69   70   71   72
  73   74   75   76   77   78   79   80
  81   82   83   84   85   86   87   88
  89   90   91   92   93   94   95   96
  97   98   99  100  101  102  103  104
 105  106  107  108  109  110  111  112
 113  114  115  116  117  118  119  120
 121  122  123  124  125  126  127  128
 129  130  131  132  133  134  135  136
 137  138  139  140  141  142  143  144
 145  146  147  148  149  150  151  152
  -1   -1   -1   -1   -1   -1   -1   -1
   1
-14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
-12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
 -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
 -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
 -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
 -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
  4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
  7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
  9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
 12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
 14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
 17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
 19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
 22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
 24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
   0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
   0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
   0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
   0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
   0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
   0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   100000     10000    0.07500      1.250 3.1536E07     8    1
   1    1 5.6031E-5    0.0600
   1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   0    0    0    0
   2    1 6.0249E-6    1.0000
   1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   0    0    0    0
   3    1 1.1447E-5    1.0000
   1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000     10000   0.07500     1.250 9.4608E07     8     1
1     1 5.6031E-5     0.0600
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000     10000   0.07500     1.250 1.5768E08     8     1
1     1 5.6031E-5     0.0600
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
100000     10000   0.07500     1.250 3.1536E08     8     1
1     1 5.6031E-5     0.0600
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
    0.          0.   0.00000     0.000     0.000     0     0
```

```
2-D Unsaturated-Saturated Infiltration of Tetrachloromethane (Carbon Tetrachloride)
8 May 1994
RUN1
    8   20     1     4     0  100     1     0     0     1     0
  0.02000          0.  1000.00   1584.20  1.000E-3  9.690E-4
    -9.80   0.00000       1.00 0.100E-04
    1
   13
 103425.0     -0.10   0.00000   1.00000
 103425.0      0.00   0.00000   1.00000
 103425.0      0.10   0.00000   0.82000
 103425.0      0.20   0.00000   0.68000
  27580.0      0.30   0.04000   0.55000
  10343.0      0.40   0.10000   0.43000
   7585.0      0.50   0.18000   0.31000
   7447.0      0.60   0.30000   0.20000
   7309.0      0.70   0.44000   0.12000
   7171.0      0.80   0.60000   0.05000
   7033.0      0.90   0.80000   0.00000
   6895.0      1.00   1.00000   0.00000
   6895.0      1.10   1.00000   0.00000
    2    0.680
 -98000.0      1.00   -0.3200     1.000
      0.0      0.00    0.6800     0.000
    1
0.100E-11 0.100E-11 0.100E-11
    1
    0.300   1.0E-15       0.0
    1.000     1.900     3.610     6.859    13.032    24.761    47.046    89.387
    0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250     0.250     0.250     0.250     0.250     0.250     0.250
    0.250     0.250     0.250     0.250
    1.000
    1
    1    1    1
  152
    1    2    3    4    5    6    7    8
    9   10   11   12   13   14   15   16
   17   18   19   20   21   22   23   24
   25   26   27   28   29   30   31   32
   33   34   35   36   37   38   39   40
   41   42   43   44   45   46   47   48
   49   50   51   52   53   54   55   56
   57   58   59   60   61   62   63   64
   65   66   67   68   69   70   71   72
   73   74   75   76   77   78   79   80
   81   82   83   84   85   86   87   88
   89   90   91   92   93   94   95   96
   97   98   99  100  101  102  103  104
  105  106  107  108  109  110  111  112
  113  114  115  116  117  118  119  120
  121  122  123  124  125  126  127  128
  129  130  131  132  133  134  135  136
  137  138  139  140  141  142  143  144
  145  146  147  148  149  150  151  152
   -1   -1   -1   -1   -1   -1   -1   -1
    1
-14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00 -14700.00
-12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00 -12250.00
 -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00  -9800.00
 -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00  -7350.00
 -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00  -4900.00
 -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00  -2450.00
     0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00   2450.00
  4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00   4900.00
  7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00   7350.00
  9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00   9800.00
 12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00  12250.00
 14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00  14700.00
 17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00  17150.00
 19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00  19600.00
 22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00  22050.00
 24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00  24500.00
 26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00  26950.00
 29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00  29400.00
 31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00  31850.00
   0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500    0.8500
   0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750    0.8750
   0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000    0.9000
   0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250    0.9250
   0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500    0.9500
   0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750    0.9750
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
   1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
  1000000     10000   0.10000     1.500 3.1536E07    8    1
    1    1 6.0219E-5    0.0556
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    2    1 6.0249E-6    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0
    3    1 1.1447E-5    1.0000
    1    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
```

```
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.10000     1.500 9.4608E07     8     1
1     1 6.0219E-5     0.0556
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.10000     1.500 1.5768E08     8     1
1     1 6.0219E-5     0.0556
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
1000000     10000   0.10000     1.500 3.1536E08     8     1
1     1 6.0219E-5     0.0556
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
2     1 6.0249E-6     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
3     1 1.1447E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
4     1 2.1750E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
5     1 4.1325E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
6     1 7.8517E-5     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
7     1 1.4918E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
8     1 2.8344E-4     1.0000
1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
0     0     0     0
    0.        0.    0.00000     0.000     0.000     0     0
```

APPENDIX B

SWANFLOW Output Files

RUN NAME .... 2-D Unsaturated-Saturated Infiltration of Gasoline
DATE .... 7 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS):	8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS):	20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES):	1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS:	4
ESTIMATED BANDWIDTH:	0
MAXIMUM NUMBER OF TIME STEPS:	100
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT:	1
MAXIMUM NUMBER OF SSOR ITERATIONS:	1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION:	0.200000E-01
INITIAL TIME (SECONDS):	0.000000
DENSITY OF WATER:	1000.00
DENSITY OF NONAQUEOUS FLUID:	730.000
DYNAMIC VISCOSITY OF WATER:	0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID:	0.450000E-03
GRAVITATIONAL ACCELERATION (Z-DIRECTION):	-9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION):	0.000000
SSOR CONVERGENCE TOLERANCE:	0.100000E-04
SSOR RELAXATION FACTOR:	1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1	1.00	2	1.90	3	3.61	4	6.86	5	13.0	6	24.8	7	47.0	8	89.4

DZ

1	0.250	2	0.250	3	0.250	4	0.250	5	0.250	6	0.250	7	0.250	8	0.250
9	0.250	10	0.250	11	0.250	12	0.250	13	0.250	14	0.250	15	0.250	16	0.250
17	0.250	18	0.250	19	0.250	20	0.250								

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1	1	2	3	4	5	6	7	8
ROW 2	9	10	11	12	13	14	15	16
ROW 3	17	18	19	20	21	22	23	24
ROW 4	25	26	27	28	29	30	31	32
ROW 5	33	34	35	36	37	38	39	40
ROW 6	41	42	43	44	45	46	47	48
ROW 7	49	50	51	52	53	54	55	56
ROW 8	57	58	59	60	61	62	63	64
ROW 9	65	66	67	68	69	70	71	72
ROW 10	73	74	75	76	77	78	79	80
ROW 11	81	82	83	84	85	86	87	88

```
ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1

          ALL GRID BLOCKS IN SAME PROPERTY CLASS

          INITIAL NAPL PRESSURES

 -14700.     -14700.     -14700.     -14700.     -14700.     -14700.     -14700.     -14700.
 -12250.     -12250.     -12250.     -12250.     -12250.     -12250.     -12250.     -12250.
 -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0
 -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0
 -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0
 -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
  2450.0      2450.0      2450.0      2450.0      2450.0      2450.0      2450.0      2450.0
  4900.0      4900.0      4900.0      4900.0      4900.0      4900.0      4900.0      4900.0
  7350.0      7350.0      7350.0      7350.0      7350.0      7350.0      7350.0      7350.0
  9800.0      9800.0      9800.0      9800.0      9800.0      9800.0      9800.0      9800.0
  12250.      12250.      12250.      12250.      12250.      12250.      12250.      12250.
  14700.      14700.      14700.      14700.      14700.      14700.      14700.      14700.
  17150.      17150.      17150.      17150.      17150.      17150.      17150.      17150.
  19600.      19600.      19600.      19600.      19600.      19600.      19600.      19600.
  22050.      22050.      22050.      22050.      22050.      22050.      22050.      22050.
  24500.      24500.      24500.      24500.      24500.      24500.      24500.      24500.
  26950.      26950.      26950.      26950.      26950.      26950.      26950.      26950.
  29400.      29400.      29400.      29400.      29400.      29400.      29400.      29400.
  31850.      31850.      31850.      31850.      31850.      31850.      31850.      31850.

          INITIAL WATER SATURATIONS

 0.85000     0.85000     0.85000     0.85000     0.85000     0.85000     0.85000     0.85000
 0.87500     0.87500     0.87500     0.87500     0.87500     0.87500     0.87500     0.87500
 0.90000     0.90000     0.90000     0.90000     0.90000     0.90000     0.90000     0.90000
 0.92500     0.92500     0.92500     0.92500     0.92500     0.92500     0.92500     0.92500
 0.95000     0.95000     0.95000     0.95000     0.95000     0.95000     0.95000     0.95000
 0.97500     0.97500     0.97500     0.97500     0.97500     0.97500     0.97500     0.97500
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
...........................................................................................

                           WATER BALANCE          NAPL BALANCE

      CONSTANT PRES        -540.64                0.00000
      SOURCE/SINKS          510.86                22.234
      STORAGE               29.780               -22.234
      PER CENT ERROR       -0.37991E-09           0.87883E-12

           STEP NUMBER  20              SIMULATION TIME IN SECONDS 0.315E+08
           ****************                             IN MINUTES 0.526E+06
                                                        IN HOURS   0.876E+04
                                                        IN DAYS     365.
                                                        IN YEARS   0.999

           NAPL SATURATIONS

    SLICE        1

 0.42492     0.41937     0.40924     0.38632     0.14411     0.22204E-15-0.27756E-16 0.83267E-16
 0.41894     0.41384     0.40371     0.35699     0.22337E-01-0.27756E-16 0.12490E-15-0.55511E-16
 0.41313     0.40829     0.26205     0.17433E-01-0.30531E-15 0.29143E-15 0.13878E-15 0.27756E-16
 0.38339E-01 0.00000     0.13878E-16 0.27756E-16 0.69389E-16-0.12490E-15-0.20817E-15 0.13878E-16
 0.34694E-16 0.48572E-16-0.13878E-16 0.97145E-16-0.90206E-16 0.69389E-16 0.55511E-16 0.27756E-16
-0.11796E-15 0.19082E-15 0.90206E-16-0.20817E-16 0.76328E-16 0.13878E-16 0.41633E-16-0.31225E-16
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
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                   WATER BALANCE            NAPL BALANCE

  CONSTANT PRES     -5089.2                  0.00000
  SOURCE/SINKS       4811.2                  209.40
  STORAGE            277.92                 -209.40
  PER CENT ERROR   -0.84855E-09            -0.13980E-11

      STEP NUMBER  31          SIMULATION TIME  IN SECONDS 0.946E+08
      ***************                           IN MINUTES 0.158E+07
                                                IN HOURS   0.263E+05
                                                IN DAYS    0.109E+04
                                                IN YEARS    3.00

      NAPL SATURATIONS

  SLICE      1

0.46354     0.46300     0.45017     0.43807     0.41376     0.20619    -0.16653E-15 0.22204E-15
0.45748     0.45767     0.44463     0.43256     0.40821     0.91617E-01-0.13878E-15-0.13878E-16
0.45138     0.45245     0.43902     0.42703     0.29337     0.47964E-02 0.13878E-15 0.11102E-15
0.44521     0.45007     0.44997     0.24397     0.90182E-02-0.12490E-15-0.15266E-15 0.83267E-16
0.16062     0.86762E-01-0.15266E-15 0.11102E-15-0.19429E-15-0.69389E-17-0.90206E-16-0.62450E-16
-0.72858E-16 0.15266E-15 0.23592E-15 0.24286E-16-0.10408E-16-0.48572E-16 0.14572E-15-0.11796E-15
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000

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                   WATER BALANCE            NAPL BALANCE

  CONSTANT PRES     -2476.2                  0.00000
  SOURCE/SINKS       2338.1                  101.76
  STORAGE            138.07                 -101.76
  PER CENT ERROR    0.65985E-09              0.41057E-11

      STEP NUMBER  41          SIMULATION TIME  IN SECONDS 0.158E+09
      ***************                           IN MINUTES 0.263E+07
                                                IN HOURS   0.438E+05
                                                IN DAYS    0.182E+04
                                                IN YEARS    5.00

      NAPL SATURATIONS

  SLICE      1

0.48089     0.47757     0.47211     0.46142     0.43962     0.38823     0.55788E-01 0.16653E-15
0.47504     0.47209     0.46664     0.45594     0.43411     0.36475     0.41866E-02 0.69389E-16
0.46924     0.46658     0.46114     0.45042     0.42857     0.15915     0.00000     0.15266E-15
0.46352     0.46104     0.45560     0.44488     0.28533     0.83660E-02-0.26368E-15 0.11102E-15
0.46739     0.42984     0.34419     0.17223     0.88123E-03 0.15266E-15 0.14572E-15-0.90206E-16
0.58981E-16 0.12143E-15 0.10408E-15 0.24286E-16 0.76328E-16 0.31225E-16 0.34694E-16-0.18735E-15
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000

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                   WATER BALANCE            NAPL BALANCE

  CONSTANT PRES     -16762.                  0.00000
  SOURCE/SINKS       15842.                  689.48
  STORAGE            920.17                 -689.48
  PER CENT ERROR    0.10297E-08            -0.11625E-10

      STEP NUMBER  53          SIMULATION TIME  IN SECONDS 0.315E+09
      ***************                           IN MINUTES 0.526E+07
                                                IN HOURS   0.876E+05
                                                IN DAYS    0.365E+04
                                                IN YEARS    9.99

      NAPL SATURATIONS

  SLICE      1

0.49461     0.49363     0.49217     0.48942     0.47956     0.44647     0.42533     0.65243E-02
0.50570     0.50332     0.49916     0.49158     0.47410     0.44097     0.16990     0.43726E-04
0.49995     0.49784     0.49369     0.48610     0.46860     0.43543     0.12092     0.27756E-16
0.49424     0.49232     0.48818     0.48059     0.46307     0.39515     0.17963E-01-0.27756E-16
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0.48857     0.48678     0.48265     0.47506     0.46207     0.11732     0.15959E-15-0.13878E-15
0.49400     0.46674     0.40167     0.27018     0.54380E-01 0.90206E-16-0.11796E-15-0.35388E-15
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
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RUN NAME .... 2-D Unsaturated-Saturated Infiltration of Kerosene
DATE .... 7 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS): 8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS): 20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES): 1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS: 4
ESTIMATED BANDWIDTH: 0
MAXIMUM NUMBER OF TIME STEPS: 100
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT: 1
MAXIMUM NUMBER OF SSOR ITERATIONS: 1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION: 0.200000E-01
INITIAL TIME (SECONDS): 0.000000
DENSITY OF WATER: 1000.00
DENSITY OF NONAQUEOUS FLUID: 810.000
DYNAMIC VISCOSITY OF WATER: 0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID: 0.205000E-02
GRAVITATIONAL ACCELERATION (Z-DIRECTION): -9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION): 0.000000
SSOR CONVERGENCE TOLERANCE: 0.100000E-04
SSOR RELAXATION FACTOR: 1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1 1.00 2 1.90 3 3.61 4 6.86 5 13.0 6 24.8 7 47.0 8 89.4

DZ

1 0.250 2 0.250 3 0.250 4 0.250 5 0.250 6 0.250 7 0.250 8 0.250
9 0.250 10 0.250 11 0.250 12 0.250 13 0.250 14 0.250 15 0.250 16 0.250
17 0.250 18 0.250 19 0.250 20 0.250

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1 1 2 3 4 5 6 7 8
ROW 2 9 10 11 12 13 14 15 16
ROW 3 17 18 19 20 21 22 23 24
ROW 4 25 26 27 28 29 30 31 32
ROW 5 33 34 35 36 37 38 39 40
ROW 6 41 42 43 44 45 46 47 48
ROW 7 49 50 51 52 53 54 55 56
ROW 8 57 58 59 60 61 62 63 64
ROW 9 65 66 67 68 69 70 71 72
ROW 10 73 74 75 76 77 78 79 80
ROW 11 81 82 83 84 85 86 87 88

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ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1


         ALL GRID BLOCKS IN SAME PROPERTY CLASS

         INITIAL NAPL PRESSURES

 -14700.       -14700.       -14700.       -14700.       -14700.       -14700.       -14700.       -14700.
 -12250.       -12250.       -12250.       -12250.       -12250.       -12250.       -12250.       -12250.
 -9800.0       -9800.0       -9800.0       -9800.0       -9800.0       -9800.0       -9800.0       -9800.0
 -7350.0       -7350.0       -7350.0       -7350.0       -7350.0       -7350.0       -7350.0       -7350.0
 -4900.0       -4900.0       -4900.0       -4900.0       -4900.0       -4900.0       -4900.0       -4900.0
 -2450.0       -2450.0       -2450.0       -2450.0       -2450.0       -2450.0       -2450.0       -2450.0
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
  2450.0        2450.0        2450.0        2450.0        2450.0        2450.0        2450.0        2450.0
  4900.0        4900.0        4900.0        4900.0        4900.0        4900.0        4900.0        4900.0
  7350.0        7350.0        7350.0        7350.0        7350.0        7350.0        7350.0        7350.0
  9800.0        9800.0        9800.0        9800.0        9800.0        9800.0        9800.0        9800.0
  12250.        12250.        12250.        12250.        12250.        12250.        12250.        12250.
  14700.        14700.        14700.        14700.        14700.        14700.        14700.        14700.
  17150.        17150.        17150.        17150.        17150.        17150.        17150.        17150.
  19600.        19600.        19600.        19600.        19600.        19600.        19600.        19600.
  22050.        22050.        22050.        22050.        22050.        22050.        22050.        22050.
  24500.        24500.        24500.        24500.        24500.        24500.        24500.        24500.
  26950.        26950.        26950.        26950.        26950.        26950.        26950.        26950.
  29400.        29400.        29400.        29400.        29400.        29400.        29400.        29400.
  31850.        31850.        31850.        31850.        31850.        31850.        31850.        31850.

         INITIAL WATER SATURATIONS

 0.85000       0.85000       0.85000       0.85000       0.85000       0.85000       0.85000       0.85000
 0.87500       0.87500       0.87500       0.87500       0.87500       0.87500       0.87500       0.87500
 0.90000       0.90000       0.90000       0.90000       0.90000       0.90000       0.90000       0.90000
 0.92500       0.92500       0.92500       0.92500       0.92500       0.92500       0.92500       0.92500
 0.95000       0.95000       0.95000       0.95000       0.95000       0.95000       0.95000       0.95000
 0.97500       0.97500       0.97500       0.97500       0.97500       0.97500       0.97500       0.97500
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
  1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000        1.0000
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                         WATER BALANCE               NAPL BALANCE

    CONSTANT PRES         -1986.9                     0.00000
    SOURCE/SINKS           1879.0                     90.996
    STORAGE                107.83                    -90.996
    PER CENT ERROR        0.19553E-08                -0.78553E-11


      STEP NUMBER  23            SIMULATION TIME IN SECONDS 0.315E+08
      ***************                            IN MINUTES 0.526E+06
                                                 IN HOURS   0.876E+04
                                                 IN DAYS     365.
                                                 IN YEARS   0.999

         NAPL SATURATIONS

   SLICE       1

 0.45157       0.43651       0.41567       0.22401       0.50633E-03 0.00000       0.00000      -0.55511E-16
 0.45293       0.44001       0.41937       0.13332      -0.22204E-15 0.97145E-16-0.83267E-16-0.83267E-16
 0.45480       0.44344       0.42400       0.57027E-01-0.41633E-16-0.83267E-16 0.69389E-16-0.27756E-16
 0.45713       0.44684       0.24545       0.30992E-02 0.55511E-16-0.41633E-15-0.11102E-15 0.24980E-15
 0.49785       0.34601       0.41262E-01 0.27756E-16 0.83267E-16 0.34694E-16-0.11796E-15 0.13184E-15
 0.18409       0.12837E-15-0.10408E-16 0.27756E-16 0.21858E-15-0.48572E-16-0.69389E-17 0.16306E-15
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
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                    WATER BALANCE          NAPL BALANCE

    CONSTANT PRES     -2490.7               0.00000
    SOURCE/SINKS       2352.0               113.90
    STORAGE            138.70              -113.90
    PER CENT ERROR    -0.10708E-08         -0.18079E-10

       STEP NUMBER  29          SIMULATION TIME IN SECONDS 0.491E+08
       ***************                          IN MINUTES 0.819E+06
                                                IN HOURS   0.136E+05
                                                IN DAYS     569.
                                                IN YEARS    1.56

      NAPL SATURATIONS

   SLICE      1

 0.46699     0.45402     0.44067     0.39221     0.39985E-01 0.11102E-15 0.00000     -0.55511E-16
 0.46843     0.45748     0.44438     0.39357     0.45570E-02 0.12490E-15-0.41633E-16-0.19429E-15
 0.47030     0.46081     0.44821     0.17431     0.17432E-03-0.11102E-15 0.55511E-16 0.00000
 0.47255     0.46405     0.45719     0.10829     0.00000    -0.40246E-15-0.69389E-16 0.55511E-16
 0.47514     0.46719     0.26602     0.70383E-02 0.76328E-16 0.90206E-16-0.41633E-16 0.25674E-15
 0.41709     0.29026     0.32711E-01-0.14225E-15 0.76328E-16-0.69389E-16-0.10755E-15 0.79797E-16
 0.10554     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
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                    WATER BALANCE          NAPL BALANCE

    CONSTANT PRES     -627.97               0.00000
    SOURCE/SINKS       594.06               28.769
    STORAGE            33.901              -28.769
    PER CENT ERROR    0.16151E-08          -0.42728E-11

       STEP NUMBER  39          SIMULATION TIME IN SECONDS 0.946E+08
       ***************                          IN MINUTES 0.158E+07
                                                IN HOURS   0.263E+05
                                                IN DAYS    0.109E+04
                                                IN YEARS    3.00

      NAPL SATURATIONS

   SLICE      1

 0.48867     0.48211     0.46678     0.43546     0.28568     0.11167E-02 0.11102E-15 0.27756E-16
 0.49590     0.48567     0.47042     0.43906     0.16594     0.30511E-05-0.11102E-15-0.27756E-15
 0.49798     0.48916     0.47406     0.44265     0.12134    -0.18041E-15 0.13878E-16 0.83267E-16
 0.50041     0.49260     0.47770     0.44620     0.57374E-01-0.24980E-15 0.19429E-15-0.19429E-15
 0.50315     0.49603     0.48133     0.33539     0.68213E-02-0.13878E-16 0.69389E-16 0.24980E-15
 0.50619     0.49945     0.48506     0.12325     0.44364E-05-0.15266E-15-0.22898E-15 0.22898E-15
 0.50189     0.43253     0.19645     0.34374E-02 0.00000     0.00000     0.00000     0.00000
 0.18956     0.91832E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
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                    WATER BALANCE          NAPL BALANCE

    CONSTANT PRES     -4541.2               0.00000
    SOURCE/SINKS       4290.9               207.80
    STORAGE            250.31              -207.80
    PER CENT ERROR    0.47561E-09          -0.13445E-10

       STEP NUMBER  50          SIMULATION TIME IN SECONDS 0.158E+09
       ***************                          IN MINUTES 0.263E+07
                                                IN HOURS   0.438E+05
                                                IN DAYS    0.182E+04
                                                IN YEARS    5.00

      NAPL SATURATIONS

   SLICE      1

 0.49722     0.49332     0.48877     0.47212     0.41865     0.64023E-01 0.30531E-15 0.83267E-16
 0.51412     0.51148     0.49838     0.47577     0.42221     0.37631E-01-0.30531E-15-0.41633E-15
 0.52347     0.51497     0.50200     0.47941     0.42572     0.16478E-01 0.41633E-16 0.15266E-15
 0.52603     0.51839     0.50559     0.48304     0.33999     0.16796E-02 0.12490E-15-0.19429E-15
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0.52887    0.52177    0.50915    0.48667    0.14936    0.26856E-04 0.62450E-16 0.11796E-15
0.53197    0.52513    0.51269    0.49086    0.70897E-01-0.69389E-17-0.35041E-15 0.31919E-15
0.52239    0.51661    0.50706    0.24269    0.32416E-02 0.00000    0.00000    0.00000
0.50630    0.49392    0.30494    0.31599E-01 0.00000    0.00000    0.00000    0.00000
0.22930    0.16144    0.50748E-02 0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000

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                 WATER BALANCE          NAPL BALANCE

    CONSTANT PRES      -2732.3           0.00000
    SOURCE/SINKS        2581.4           125.01
    STORAGE             150.86          -125.01
    PER CENT ERROR     -0.98132E-09     -0.30284E-10

       STEP NUMBER  67            SIMULATION TIME IN SECONDS 0.315E+09
       ***************                            IN MINUTES 0.526E+07
                                                  IN HOURS   0.876E+05
                                                  IN DAYS    0.365E+04
                                                  IN YEARS    9.99

      NAPL SATURATIONS

   SLICE      1

0.51134    0.50795    0.50437    0.49791    0.48516    0.41679    0.26264E-01 0.55511E-16
0.52826    0.52551    0.52197    0.51551    0.48820    0.45580    0.16135E-02-0.52736E-15
0.54533    0.54305    0.53957    0.52839    0.49181    0.16028    0.19535E-04 0.26368E-15
0.56251    0.56051    0.55059    0.53204    0.49539    0.14853   -0.14092E-05-0.31919E-15
0.56896    0.56399    0.55422    0.53565    0.49894    0.13847    0.32613E-15 0.23592E-15
0.56998    0.56640    0.55783    0.53923    0.50246    0.76224E-01-0.38511E-15 0.35735E-15
0.55297    0.54962    0.54225    0.52780    0.47018    0.16262E-01 0.00000    0.00000
0.53606    0.53282    0.52557    0.51109    0.13588    0.82428E-04 0.00000    0.00000
0.51924    0.51602    0.50886    0.38183    0.29111E-01 0.00000    0.00000    0.00000
0.50262    0.48440    0.34075    0.71610E-01 0.00000    0.00000    0.00000    0.00000
0.19513    0.14791    0.33887E-02 0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
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RUN NAME .... 2-D Unsaturated-Saturated Infiltration of p-Cymene [1-Methyl-4-(1-Metnylethyl)-Benzene]
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS):	8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS):	20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES):	1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS:	4
ESTIMATED BANDWIDTH:	0
MAXIMUM NUMBER OF TIME STEPS:	150
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT:	1
MAXIMUM NUMBER OF SSOR ITERATIONS:	1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION:	0.200000E-01
INITIAL TIME (SECONDS):	0.000000
DENSITY OF WATER:	1000.00
DENSITY OF NONAQUEOUS FLUID:	857.300
DYNAMIC VISCOSITY OF WATER:	0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID:	0.340200E-02
GRAVITATIONAL ACCELERATION (Z-DIRECTION):	-9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION):	0.000000
SSOR CONVERGENCE TOLERANCE:	0.100000E-04
SSOR RELAXATION FACTOR:	1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1	1.00	2	1.90	3	3.61	4	6.86	5	13.0	6	24.8	7	47.0	8	89.4

DZ

1	0.250	2	0.250	3	0.250	4	0.250	5	0.250	6	0.250	7	0.250	8	0.250
9	0.250	10	0.250	11	0.250	12	0.250	13	0.250	14	0.250	15	0.250	16	0.250
17	0.250	18	0.250	19	0.250	20	0.250								

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1	1	2	3	4	5	6	7	8
ROW 2	9	10	11	12	13	14	15	16
ROW 3	17	18	19	20	21	22	23	24
ROW 4	25	26	27	28	29	30	31	32
ROW 5	33	34	35	36	37	38	39	40
ROW 6	41	42	43	44	45	46	47	48
ROW 7	49	50	51	52	53	54	55	56
ROW 8	57	58	59	60	61	62	63	64
ROW 9	65	66	67	68	69	70	71	72
ROW 10	73	74	75	76	77	78	79	80
ROW 11	81	82	83	84	85	86	87	88

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ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1


         ALL GRID BLOCKS IN SAME PROPERTY CLASS

         INITIAL NAPL PRESSURES

 -14700.     -14700.     -14700.     -14700.     -14700.     -14700.     -14700.     -14700.
 -12250.     -12250.     -12250.     -12250.     -12250.     -12250.     -12250      -12250.
 -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0
 -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0
 -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0
 -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
  2450.0      2450.0      2450.0      2450.0      2450.0      2450.0      2450.0      2450.0
  4900.0      4900.0      4900.0      4900.0      4900.0      4900.0      4900.0      4900.0
  7350.0      7350.0      7350.0      7350.0      7350.0      7350.0      7350.0      7350.0
  9800.0      9800.0      9800.0      9800.0      9800.0      9800.0      9800.0      9800.0
  12250.      12250.      12250.      12250.      12250.      12250.      12250.      12250.
  14700.      14700.      14700.      14700.      14700.      14700.      14700.      14700.
  17150.      17150.      17150.      17150.      17150.      17150.      17150.      17150.
  19600.      19600.      19600.      19600.      19600.      19600.      19600.      19600.
  22050.      22050.      22050.      22050.      22050.      22050.      22050.      22050.
  24500.      24500.      24500.      24500.      24500.      24500.      24500.      24500.
  26950.      26950.      26950.      26950.      26950.      26950.      26950.      26950.
  29400.      29400.      29400.      29400.      29400.      29400.      29400.      29400.
  31850.      31850.      31850.      31850.      31850.      31850.      31850.      31850.

         INITIAL WATER SATURATIONS

 0.85000     0.85000     0.85000     0.85000     0.85000     0.85000     0.85000     0.85000
 0.87500     0.87500     0.87500     0.87500     0.87500     0.87500     0.87500     0.87500
 0.90000     0.90000     0.90000     0.90000     0.90000     0.90000     0.90000     0.90000
 0.92500     0.92500     0.92500     0.92500     0.92500     0.92500     0.92500     0.92500
 0.95000     0.95000     0.95000     0.95000     0.95000     0.95000     0.95000     0.95000
 0.97500     0.97500     0.97500     0.97500     0.97500     0.97500     0.97500     0.97500
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000

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                    WATER BALANCE          NAPL BALANCE

     CONSTANT PRES      -1460.7              0.00000
     SOURCE/SINKS        1381.0              70.878
     STORAGE             79.751             -70.878
     PER CENT ERROR    -0.89195E-09        -0.10145E-10

          STEP NUMBER  25          SIMULATION TIME  IN SECONDS 0.226E+08
          ***************                           IN MINUTES 0.377E+06
                                                    IN HOURS   0.628E+04
                                                    IN DAYS     261.
                                                    IN YEARS   0.716

         NAPL SATURATIONS

    SLICE     1

 0.44165     0.42058     0.39446     0.23353E-01-0.19429E-15-0.27756E-16 0.11102E-15-0.27756E-16
 0.44651     0.42940     0.33235     0.36568E-02 0.12490E-15 0.41633E-16 0.83267E-16 0.97145E-16
 0.45214     0.43854     0.17832     0.29471E-03 0.13878E-16 0.13878E-16 0.83267E-16 0.13878E-15
 0.45839     0.44975     0.12190     0.11102E-15 0.27756E-16 0.13878E-16 0.27756E-15 0.11102E-15
 0.46509     0.32748     0.19766E-01 0.19429E-15-0.83267E-16 0.97145E-16 0.18735E-15-0.69389E-17
 0.32925     0.80955E-01 0.58981E-16-0.12490E-15 0.10061E-15-0.20470E-15-0.26715E-15 0.20123E-15
 0.94485E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
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                     WATER BALANCE             NAPL BALANCE

  CONSTANT PRES      -490.48                    0.00000
  SOURCE/SINKS        463.83                    23.805
  STORAGE             26.648                   -23.805
  PER CENT ERROR     -0.13299E-08              -0.11193E-11

      STEP NUMBER  30          SIMULATION TIME  IN SECONDS 0.315E+08
      ***************                           IN MINUTES 0.526E+06
                                                IN HOURS   0.876E+04
                                                IN DAYS     365.
                                                IN YEARS   0.999

     NAPL SATURATIONS

  SLICE       1

0.45137     0.42841     0.39960     0.81493E-01-0.19429E-15-0.83267E-16 0.13878E-15-0.27756E-16
0.45650     0.43716     0.40868     0.48107E-01 0.83267E-16 0.97145E-16 0.12490E-15 0.13878E-15
0.46248     0.44577     0.41874     0.21346E-01-0.41633E-16 0.69389E-16 0.69389E-16 0.24980E-15
0.46918     0.45430     0.25955     0.16065E-02 0.27756E-16-0.69389E-16 0.34694E-15 0.13878E-15
0.47656     0.46288     0.13308     0.24980E-15-0.12490E-15 0.97145E-16 0.17347E-15-0.18735E-15
0.48459     0.30912     0.18817E-01-0.58981E-16 0.11796E-15-0.18735E-15-0.41633E-15 0.14225E-15
0.27093     0.67339E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
.........................................................................

                     WATER BALANCE             NAPL BALANCE

  CONSTANT PRES      -228.29                    0.00000
  SOURCE/SINKS        216.85                    11.129
  STORAGE             11.445                   -11.129
  PER CENT ERROR     -0.65993E-09               0.45489E-11

      STEP NUMBER  58          SIMULATION TIME  IN SECONDS 0.946E+08
      ***************                           IN MINUTES 0.158E+07
                                                IN HOURS   0.263E+05
                                                IN DAYS    0.109E+04
                                                IN YEARS    3.00

     NAPL SATURATIONS

  SLICE       1

0.48851     0.47558     0.45479     0.41821     0.92027E-01-0.55511E-16 0.19429E-15-0.55511E-16
0.49920     0.48442     0.46378     0.42700     0.63672E-01 0.33307E-15 0.13878E-16 0.16653E-15
0.50546     0.49314     0.47276     0.43560     0.41359E-01 0.48572E-15 0.41633E-16 0.00000
0.51224     0.50178     0.48173     0.44397     0.20845E-01-0.23592E-15 0.23592E-15-0.83267E-16
0.51946     0.51041     0.49070     0.36146     0.33648E-02 0.90206E-16-0.48572E-16-0.76328E-16
0.52707     0.51903     0.49968     0.13234     0.71100E-04 0.24286E-16-0.68001E-15 0.55511E-16
0.52167     0.51596     0.50119     0.81444E-01 0.00000     0.00000     0.00000     0.00000
0.50862     0.50325     0.26321     0.70728E-02 0.00000     0.00000     0.00000     0.00000
0.41561     0.30899     0.51201E-01 0.00000     0.00000     0.00000     0.00000     0.00000
0.16164     0.54393E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
.........................................................................

                     WATER BALANCE             NAPL BALANCE

  CONSTANT PRES      -438.00                    0.00000
  SOURCE/SINKS        415.11                    21.305
  STORAGE             22.885                   -21.305
  PER CENT ERROR     -0.97356E-09               0.45524E-11

      STEP NUMBER  81          SIMULATION TIME  IN SECONDS 0.158E+09
      ***************                           IN MINUTES 0.263E+07
                                                IN HOURS   0.438E+05
                                                IN DAYS    0.182E+04
                                                IN YEARS    5.00

     NAPL SATURATIONS

  SLICE       1

0.49715     0.49136     0.48438     0.45319     0.37511     0.69580E-02 0.27756E-15-0.19429E-15
0.51541     0.51064     0.49341     0.46215     0.34361     0.70394E-03-0.55511E-16 0.26368E-15
0.53049     0.51941     0.50241     0.47105     0.15932     0.14913E-04 0.16653E-15-0.12490E-15
0.53741     0.52810     0.51138     0.47990     0.14921     0.31360E-05 0.22204E-15-0.33307E-15
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0.54470      0.53676      0.52033      0.48869      0.12722      0.83267E-16 0.13878E-16-0.18041E-15
0.55233      0.54541      0.52926      0.49741      0.80744E-01 0.13878E-15-0.63491E-15-0.69389E-16
0.54130      0.53650      0.52410      0.47621      0.25730E-01 0.00000      0.00000      0.00000
0.52817      0.52382      0.51159      0.22324      0.13649E-02 0.00000      0.00000      0.00000
0.51518      0.51117      0.48127      0.10165      0.61134E-06 0.00000      0.00000      0.00000
0.50232      0.47098      0.23181      0.64261E-02 0.00000      0.00000      0.00000      0.00000
0.29010      0.21901      0.14225E-01 0.00000      0.00000      0.00000      0.00000      0.00000
0.22825E-01 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
...................................................................................

                     WATER BALANCE          NAPL BALANCE

   CONSTANT PRES      -5443.2               0.00000
   SOURCE/SINKS        5145.4               264.08
   STORAGE             297.77              -264.08
   PER CENT ERROR     0.87556E-09          -0.37023E-11

     STEP NUMBER 112           SIMULATION TIME IN SECONDS 0.315E+09
     ***************                           IN MINUTES 0.526E+07
                                               IN HOURS   0.876E+05
                                               IN DAYS    0.365E+04
                                               IN YEARS    9.99

    NAPL SATURATIONS

  SLICE      1

0.51124      0.50594      0.50112      0.49270      0.46090      0.16966      0.22204E-15 0.13878E-15
0.52954      0.52532      0.52057      0.51215      0.46993      0.14094     -0.34694E-15 0.44409E-15
0.54808      0.54467      0.54002      0.52439      0.47894      0.11488      0.41633E-15 0.13878E-15
0.56681      0.56400      0.55777      0.53342      0.48794      0.89793E-01 0.56899E-15-0.38858E-15
0.58568      0.57926      0.56679      0.54242      0.49693      0.64045E-01 0.69389E-17-0.31225E-15
0.58704      0.58246      0.57315      0.55141      0.50591      0.39354E-01-0.90553E-15-0.19429E-15
0.57379      0.56975      0.56070      0.54170      0.50693      0.17729E-01 0.00000      0.00000
0.56065      0.55703      0.54823      0.52922      0.32723      0.23813E-02 0.00000      0.00000
0.54762      0.54431      0.53574      0.51674      0.11122      0.44367E-04 0.00000      0.00000
0.53469      0.53159      0.52324      0.50443      0.71426E-01 0.00000      0.00000      0.00000
0.52186      0.51888      0.51072      0.30628      0.86399E-02 0.00000      0.00000      0.00000
0.50911      0.50619      0.43019      0.10429      0.00000      0.00000      0.00000      0.00000
0.40545      0.36282      0.17980      0.20158E-02 0.00000      0.00000      0.00000      0.00000
0.16093      0.70927E-01 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
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RUN NAME .... 2-D Unsaturated-Saturated Infiltration of 10W-30 Motor Oil
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS):	8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS):	20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES):	1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS:	4
ESTIMATED BANDWIDTH:	0
MAXIMUM NUMBER OF TIME STEPS:	150
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT:	1
MAXIMUM NUMBER OF SSOR ITERATIONS:	1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION:	0.200000E-01
INITIAL TIME (SECONDS):	0.000000
DENSITY OF WATER:	1000.00
DENSITY OF NONAQUEOUS FLUID:	869.000
DYNAMIC VISCOSITY OF WATER:	0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID:	0.130000
GRAVITATIONAL ACCELERATION (Z-DIRECTION):	-9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION):	0.000000
SSOR CONVERGENCE TOLERANCE:	0.100000E-04
SSOR RELAXATION FACTOR:	1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1	1.00	2	1.90	3	3.61	4	6.86	5	13.0	6	24.8	7	47.0	8	89.4

DZ

1	0.250	2	0.250	3	0.250	4	0.250	5	0.250	6	0.250	7	0.250	8	0.250
9	0.250	10	0.250	11	0.250	12	0.250	13	0.250	14	0.250	15	0.250	16	0.250
17	0.250	18	0.250	19	0.250	20	0.250								

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1	1	2	3	4	5	6	7	8
ROW 2	9	10	11	12	13	14	15	16
ROW 3	17	18	19	20	21	22	23	24
ROW 4	25	26	27	28	29	30	31	32
ROW 5	33	34	35	36	37	38	39	40
ROW 6	41	42	43	44	45	46	47	48
ROW 7	49	50	51	52	53	54	55	56
ROW 8	57	58	59	60	61	62	63	64
ROW 9	65	66	67	68	69	70	71	72
ROW 10	73	74	75	76	77	78	79	80
ROW 11	81	82	83	84	85	86	87	88

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ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1

         ALL GRID BLOCKS IN SAME PROPERTY CLASS

         INITIAL NAPL PRESSURES

 -14700.     -14700.     -14700.     -14700.     -14700.     -14700.     -14700.     -14700.
 -12250.     -12250.     -12250.     -12250.     -12250.     -12250.     -12250.     -12250.
 -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0     -9800.0
 -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0     -7350.0
 -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0     -4900.0
 -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0     -2450.0
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
  2450.0      2450.0      2450.0      2450.0      2450.0      2450.0      2450.0      2450.0
  4900.0      4900.0      4900.0      4900.0      4900.0      4900.0      4900.0      4900.0
  7350.0      7350.0      7350.0      7350.0      7350.0      7350.0      7350.0      7350.0
  9800.0      9800.0      9800.0      9800.0      9800.0      9800.0      9800.0      9800.0
  12250.      12250.      12250.      12250.      12250.      12250.      12250.      12250.
  14700.      14700.      14700.      14700.      14700.      14700.      14700.      14700.
  17150.      17150.      17150.      17150.      17150.      17150.      17150.      17150.
  19600.      19600.      19600.      19600.      19600.      19600.      19600.      19600.
  22050.      22050.      22050.      22050.      22050.      22050.      22050.      22050.
  24500.      24500.      24500.      24500.      24500.      24500.      24500.      24500.
  26950.      26950.      26950.      26950.      26950.      26950.      26950.      26950.
  29400.      29400.      29400.      29400.      29400.      29400.      29400.      29400.
  31850.      31850.      31850.      31850.      31850.      31850.      31850.      31850.

         INITIAL WATER SATURATIONS

 0.85000     0.85000     0.85000     0.85000     0.85000     0.85000     0.85000     0.85000
 0.87500     0.87500     0.87500     0.87500     0.87500     0.87500     0.87500     0.87500
 0.90000     0.90000     0.90000     0.90000     0.90000     0.90000     0.90000     0.90000
 0.92500     0.92500     0.92500     0.92500     0.92500     0.92500     0.92500     0.92500
 0.95000     0.95000     0.95000     0.95000     0.95000     0.95000     0.95000     0.95000
 0.97500     0.97500     0.97500     0.97500     0.97500     0.97500     0.97500     0.97500
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
  1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000      1.0000
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                     WATER BALANCE          NAPL BALANCE

    CONSTANT PRES     -383.96                 0.00000
    SOURCE/SINKS       363.10                 18.896
    STORAGE            20.860                -18.896
    PER CENT ERROR   -0.19425E-08           -0.45312E-11


          STEP NUMBER  28           SIMULATION TIME IN SECONDS 0.117E+08
          ***************                           IN MINUTES 0.195E+06
                                                    IN HOURS   0.325E+04
                                                    IN DAYS     135.
                                                    IN YEARS   0.370

          NAPL SATURATIONS

   SLICE       1

 0.61190     0.36157     0.49102E-03 0.27756E-16-0.16653E-15 0.83267E-16 0.22204E-15 0.27756E-15
 0.59854     0.23606     0.71258E-04 0.13878E-16 0.18041E-15-0.11102E-15-0.33307E-15 0.97145E-16
 0.59008     0.15314    -0.16653E-15 0.36082E-15 0.27756E-16-0.41633E-16-0.13878E-16-0.12490E-15
 0.58572     0.88556E-01 0.16653E-15 0.37470E-15-0.40246E-15-0.20817E-15-0.40246E-15-0.24980E-15
 0.58270     0.41676E-01 0.43715E-15-0.36082E-15 0.97145E-16-0.29837E-15 0.19429E-15 0.21511E-15
 0.54076     0.12693E-01 0.12837E-15 0.93675E-16 0.17347E-15 0.31572E-15 0.16306E-15 0.13878E-16
 0.33880     0.45593E-03 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.32899E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
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                     WATER BALANCE             NAPL BALANCE

     CONSTANT PRES     -572.10                  0.00000
     SOURCE/SINKS       541.75                  28.193
     STORAGE            30.343                 -28.193
     PER CENT ERROR   -0.19935E-08              0.32764E-12

         STEP NUMBER  49            SIMULATION TIME IN SECONDS 0.315E+08
         ***************                            IN MINUTES 0.526E+06
                                                    IN HOURS   0.876E+04
                                                    IN DAYS     365.
                                                    IN YEARS   0.999

        NAPL SATURATIONS

  SLICE       1

0.66241     0.51882     0.55312E-01 0.83267E-16-0.55511E-16 0.11102E-15 0.27756E-15 0.49960E-15
0.65105     0.53546     0.47759E-01-0.19429E-15 0.23592E-15 0.55511E-16-0.45797E-15 0.12490E-15
0.63982     0.54998     0.37166E-01 0.48572E-15 0.13878E-16 0.55511E-16-0.18041E-15 0.27756E-16
0.62984     0.56310     0.26258E-01 0.37470E-15-0.34694E-15 0.97145E-16-0.31919E-15-0.26368E-15
0.62094     0.55643     0.15850E-01-0.24980E-15 0.48572E-16-0.12490E-15 0.33307E-15 0.29143E-15
0.61295     0.54416     0.77573E-02 0.22898E-15 0.69389E-17 0.30878E-15 0.86736E-16-0.11449E-15
0.60578     0.51936     0.21847E-02 0.00000     0.00000     0.00000     0.00000     0.00000
0.59587     0.22961     0.65667E-04 0.00000     0.00000     0.00000     0.00000     0.00000
0.56050     0.60449E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.52697     0.20756E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.37976     0.15846E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.16960E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000

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                     WATER BALANCE             NAPL BALANCE

     CONSTANT PRES     -235.34                  0.00000
     SOURCE/SINKS       222.63                  11.586
     STORAGE            12.708                 -11.586
     PER CENT ERROR   -0.70262E-06             -0.11208E-10

         STEP NUMBER  87            SIMULATION TIME IN SECONDS 0.946E+08
         ***************                            IN MINUTES 0.158E+07
                                                    IN HOURS   0.263E+05
                                                    IN DAYS    0.109E+04
                                                    IN YEARS    3.00

        NAPL SATURATIONS

  SLICE       1

0.68915     0.59403     0.46866     0.10428E-01 0.19429E-15 0.83267E-16 0.47184E-15 0.74940E-15
0.67704     0.61152     0.47755     0.85191E-02 0.62450E-15-0.31919E-15-0.37470E-15 0.55511E-16
0.66640     0.62755     0.48482     0.66358E-02-0.83267E-16 0.18041E-15-0.15266E-15-0.36082E-15
0.65697     0.62961     0.49026     0.46686E-02-0.83267E-16 0.18041E-15-0.59674E-15 0.97145E-16
0.64854     0.62591     0.49369     0.30428E-02 0.69389E-17-0.16653E-15 0.20817E-16 0.57593E-15
0.64096     0.62210     0.49516     0.12950E-02 0.59674E-15 0.41980E-15 0.14919E-15 0.11796E-15
0.63408     0.61826     0.33750     0.47440E-03 0.00000     0.00000     0.00000     0.00000
0.62780     0.61446     0.23128     0.20494E-03 0.00000     0.00000     0.00000     0.00000
0.62202     0.61072     0.18822     0.95108E-04 0.00000     0.00000     0.00000     0.00000
0.61668     0.60705     0.15376     0.36219E-04 0.00000     0.00000     0.00000     0.00000
0.61171     0.60345     0.12529     0.78023E-05 0.00000     0.00000     0.00000     0.00000
0.60706     0.59948     0.94458E-01 0.00000     0.00000     0.00000     0.00000     0.00000
0.60268     0.57808     0.63059E-01 0.00000     0.00000     0.00000     0.00000     0.00000
0.59095     0.55672     0.36994E-01 0.00000     0.00000     0.00000     0.00000     0.00000
0.56631     0.53525     0.18727E-01 0.00000     0.00000     0.00000     0.00000     0.00000
0.54216     0.51335     0.60769E-02 0.00000     0.00000     0.00000     0.00000     0.00000
0.51830     0.30530     0.34471E-03 0.00000     0.00000     0.00000     0.00000     0.00000
0.39226     0.54834E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.36650E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000

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                     WATER BALANCE             NAPL BALANCE

     CONSTANT PRES     -1686.1                 -2.5674
     SOURCE/SINKS       1597.1                  83.115
     STORAGE            88.989                 -80.548
     PER CENT ERROR   -0.20435E-04             -0.17108E-06

         STEP NUMBER  92            SIMULATION TIME IN SECONDS 0.107E+09
         ***************                            IN MINUTES 0.179E+07
                                                    IN HOURS   0.298E+05
                                                    IN DAYS    0.124E+04
                                                    IN YEARS    3.40

        NAPL SATURATIONS

  SLICE       1

0.69178     0.60267     0.49209     0.20292E-01 0.24980E-15 0.83267E-16 0.44409E-15 0.72164E-15
0.67974     0.62018     0.51140     0.17718E-01 0.72164E-15-0.22204E-15-0.49960E-15 0.41633E-16
0.66914     0.63622     0.51971     0.14879E-01-0.55511E-16 0.97145E-16-0.12490E-15-0.29143E-15
0.65974     0.63272     0.52627     0.11806E-01 0.41633E-16 0.22204E-15-0.56899E-15 0.20817E-15
0.65134     0.62899     0.53187     0.89505E-02 0.69389E-16-0.12490E-15 0.76328E-16 0.49960E-15
0.64377     0.62515     0.53665     0.58751E-02 0.68348E-15 0.48225E-15 0.14225E-15 0.16306E-15
```

0.63689	0.62126	0.52594	0.34706E-02	0.00000	0.00000	0.00000	0.00000
0.63061	0.61738	0.50881	0.14590E-02	0.00000	0.00000	0.00000	0.00000
0.62483	0.61357	0.30800	0.36165E-03	0.00000	0.00000	0.00000	0.00000
0.61948	0.60984	0.20538	0.13806E-03	0.00000	0.00000	0.00000	0.00000
0.61451	0.60622	0.16405	0.55662E-04	0.00000	0.00000	0.00000	0.00000
0.60985	0.60269	0.13220	0.15289E-04	0.00000	0.00000	0.00000	0.00000
0.60548	0.59531	0.10367	0.53324E-06	0.00000	0.00000	0.00000	0.00000
0.60135	0.57440	0.68734E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.58402	0.55363	0.41771E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.56055	0.53292	0.21170E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.53772	0.51223	0.76295E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.51547	0.33073	0.72234E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.37465	0.21473E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-448.86	-7.6943
SOURCE/SINKS	432.25	22.494
STORAGE	16.610	-14.800
PER CENT ERROR	0.42271E-03	-0.44562E-03

STEP NUMBER 109
****

SIMULATION TIME IN SECONDS 0.158E+09
IN MINUTES 0.263E+07
IN HOURS 0.438E+05
IN DAYS 0.182E+04
IN YEARS 5.00

NAPL SATURATIONS

SLICE 1

0.70013	0.63188	0.53715	0.89076E-01	0.13878E-15	0.13878E-15	0.38858E-15	0.49960E-15
0.68868	0.64948	0.55671	0.85635E-01	0.74940E-15	-0.22204E-15	-0.62450E-15	0.13878E-16
0.67819	0.64681	0.57595	0.81085E-01	-0.97145E-16	0.27756E-16	-0.24980E-15	-0.52736E-15
0.66883	0.64326	0.59491	0.75366E-01	0.69389E-16	0.31919E-15	-0.45797E-15	0.23592E-15
0.66041	0.63944	0.61001	0.68901E-01	-0.34694E-16	-0.50654E-15	0.34694E-16	0.55511E-15
0.65276	0.63547	0.60768	0.59899E-01	0.53083E-15	0.32960E-15	0.38164E-16	0.93675E-16
0.64574	0.63139	0.60526	0.50388E-01	0.00000	0.00000	0.00000	0.00000
0.63925	0.62727	0.60275	0.40458E-01	0.00000	0.00000	0.00000	0.00000
0.63320	0.62313	0.60095	0.31198E-01	0.00000	0.00000	0.00000	0.00000
0.62752	0.61902	0.58446	0.22836E-01	0.00000	0.00000	0.00000	0.00000
0.62215	0.61494	0.56748	0.15721E-01	0.00000	0.00000	0.00000	0.00000
0.61704	0.61092	0.54997	0.99688E-02	0.00000	0.00000	0.00000	0.00000
0.61216	0.60695	0.53187	0.53759E-02	0.00000	0.00000	0.00000	0.00000
0.60746	0.60306	0.51308	0.22307E-02	0.00000	0.00000	0.00000	0.00000
0.60291	0.59535	0.36828	0.33635E-03	0.00000	0.00000	0.00000	0.00000
0.59055	0.57206	0.12765	0.13102E-04	0.00000	0.00000	0.00000	0.00000
0.56318	0.54863	0.85549E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.53510	0.52484	0.47862E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.50590	0.50040	0.17298E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-3913.9	-131.10
SOURCE/SINKS	3840.9	199.88
STORAGE	72.956	-68.781
PER CENT ERROR	-0.15041E-01	-0.14490E-03

STEP NUMBER 131
****

SIMULATION TIME IN SECONDS 0.315E+09
IN MINUTES 0.526E+07
IN HOURS 0.876E+05
IN DAYS 0.365E+04
IN YEARS 9.99

NAPL SATURATIONS

SLICE 1

0.70130	0.64865	0.56187	0.43464	0.60890E-02	-0.13878E-15	0.66613E-15	0.47184E-15
0.69385	0.65605	0.58144	0.44487	0.49523E-02	-0.13878E-15	-0.61062E-15	-0.83267E-16
0.68341	0.65287	0.60070	0.45499	0.37110E-02	0.69389E-16	-0.37470E-15	-0.51348E-15
0.67407	0.64928	0.61973	0.46503	0.24667E-02	0.16653E-15	-0.68001E-15	0.30531E-15
0.66563	0.64542	0.61902	0.47490	0.15274E-02	-0.53429E-15	-0.55511E-16	0.50654E-15
0.65792	0.64137	0.61675	0.42433	0.61207E-03	0.33307E-15	-0.55511E-16	0.83267E-16
0.65081	0.63720	0.61442	0.26298	0.29018E-03	0.00000	0.00000	0.00000
0.64418	0.63295	0.61204	0.20196	0.16188E-03	0.00000	0.00000	0.00000
0.63797	0.62866	0.60962	0.17600	0.10517E-03	0.00000	0.00000	0.00000
0.63208	0.62436	0.60716	0.15824	0.66835E-04	0.00000	0.00000	0.00000
0.62645	0.62005	0.60467	0.14354	0.39146E-04	0.00000	0.00000	0.00000
0.62105	0.61575	0.60215	0.13112	0.20053E-04	0.00000	0.00000	0.00000
0.61583	0.61146	0.59757	0.12001	0.82515E-05	0.00000	0.00000	0.00000
0.61074	0.60718	0.58153	0.10783	0.17476E-05	0.00000	0.00000	0.00000
0.60576	0.60291	0.56517	0.89062E-01	0.00000	0.00000	0.00000	0.00000
0.60086	0.59151	0.54845	0.65655E-01	0.00000	0.00000	0.00000	0.00000
0.57509	0.56453	0.53136	0.44925E-01	0.00000	0.00000	0.00000	0.00000
0.54374	0.53637	0.51388	0.27006E-01	0.00000	0.00000	0.00000	0.00000
0.51062	0.50669	0.41949	0.87521E-02	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

RUN NAME .... 2-D Unsaturated-Saturated Infiltration of Water
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS): 8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS): 20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES): 1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS: 4
ESTIMATED BANDWIDTH: 0
MAXIMUM NUMBER OF TIME STEPS: 100
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT: 1
MAXIMUM NUMBER OF SSOR ITERATIONS: 1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION: 0.200000E-01
INITIAL TIME (SECONDS): 0.000000
DENSITY OF WATER: 1000.00
DENSITY OF NONAQUEOUS FLUID: 1000.00
DYNAMIC VISCOSITY OF WATER: 0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID: 0.100000E-02
GRAVITATIONAL ACCELERATION (Z-DIRECTION): -9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION): 0.000000
SSOR CONVERGENCE TOLERANCE: 0.100000E-04
SSOR RELAXATION FACTOR: 1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1	1.00	2	1.90	3	3.61	4	6.86	5	13.0	6	24.8	7	47.0	8	89.4

DZ

1	0.250	2	0.250	3	0.250	4	0.250	5	0.250	6	0.250	7	0.250	8	0.250
9	0.250	10	0.250	11	0.250	12	0.250	13	0.250	14	0.250	15	0.250	16	0.250
17	0.250	18	0.250	19	0.250	20	0.250								

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1	1	2	3	4	5	6	7	8
ROW 2	9	10	11	12	13	14	15	16
ROW 3	17	18	19	20	21	22	23	24
ROW 4	25	26	27	28	29	30	31	32
ROW 5	33	34	35	36	37	38	39	40
ROW 6	41	42	43	44	45	46	47	48
ROW 7	49	50	51	52	53	54	55	56
ROW 8	57	58	59	60	61	62	63	64
ROW 9	65	66	67	68	69	70	71	72
ROW 10	73	74	75	76	77	78	79	80
ROW 11	81	82	83	84	85	86	87	88

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ROW 12    89 90 91 92 93 94 95 96
ROW 13    97 98 99100101102103104
ROW 14   105106107108109110111112
ROW 15   113114115116117118119120
ROW 16   121122123124125126127128
ROW 17   129130131132133134135136
ROW 18   137138139140141142143144
ROW 19   145146147148149150151152
ROW 20    -1 -1 -1 -1 -1 -1 -1 -1
```

ALL GRID BLOCKS IN SAME PROPERTY CLASS

INITIAL NAPL PRESSURES

-14700.	-14700.	-14700.	-14700.	-14700.	-14700.	-14700.	-14700.
-12250.	-12250.	-12250.	-12250.	-12250.	-12250.	-12250	-12250.
-9800.0	-9800.0	-9800.0	-9800.0	-9800.0	-9800.0	-9800.0	-9800.0
-7350.0	-7350.0	-7350.0	-7350.0	-7350.0	-7350.0	-7350.0	-7350.0
-4900.0	-4900.0	-4900.0	-4900.0	-4900.0	-4900.0	-4900.0	-4900.0
-2450.0	-2450.0	-2450.0	-2450.0	-2450.0	-2450.0	-2450.0	-2450.0
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2450.0	2450.0	2450.0	2450.0	2450.0	2450.0	2450.0	2450.0
4900.0	4900.0	4900.0	4900.0	4900.0	4900.0	4900.0	4900.0
7350.0	7350.0	7350.0	7350.0	7350.0	7350.0	7350.0	7350.0
9800.0	9800.0	9800.0	9800.0	9800.0	9800.0	9800.0	9800.0
12250.	12250.	12250.	12250.	12250.	12250.	12250.	12250.
14700.	14700.	14700.	14700.	14700.	14700.	14700.	14700.
17150.	17150.	17150.	17150.	17150.	17150.	17150.	17150.
19600.	19600.	19600.	19600.	19600.	19600.	19600.	19600.
22050.	22050.	22050.	22050.	22050.	22050.	22050.	22050.
24500.	24500.	24500.	24500.	24500.	24500.	24500.	24500.
26950.	26950.	26950.	26950.	26950.	26950.	26950.	26950.
29400.	29400.	29400.	29400.	29400.	29400.	29400.	29400.
31850.	31850.	31850.	31850.	31850.	31850.	31850.	31850.

INITIAL WATER SATURATIONS

0.85000	0.85000	0.85000	0.85000	0.85000	0.85000	0.85000	0.85000
0.87500	0.87500	0.87500	0.87500	0.87500	0.87500	0.87500	0.87500
0.90000	0.90000	0.90000	0.90000	0.90000	0.90000	0.90000	0.90000
0.92500	0.92500	0.92500	0.92500	0.92500	0.92500	0.92500	0.92500
0.95000	0.95000	0.95000	0.95000	0.95000	0.95000	0.95000	0.95000
0.97500	0.97500	0.97500	0.97500	0.97500	0.97500	0.97500	0.97500
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

....

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-380.18	0.00000
SOURCE/SINKS	358.86	21.496
STORAGE	21.323	-21.496
PER CENT ERROR	-0.14979E-08	-0.49416E-11

STEP NUMBER 12
****

SIMULATION TIME		
	IN SECONDS	0.481E+07
	IN MINUTES	0.802E+05
	IN HOURS	0.134E+04
	IN DAYS	55.7
	IN YEARS	0.153

NAPL SATURATIONS

SLICE 1

0.29900	0.16250	0.13878E-15	-0.27756E-16	-0.27756E-16	0.16653E-15	-0.19429E-15	0.55511E-16
0.27955	0.97139E-01	0.23592E-15	0.00000	-0.41633E-16	0.00000	0.83267E-16	0.15266E-15
0.25657	0.63368E-01	-0.13878E-15	0.20817E-15	0.69389E-16	0.12490E-15	-0.20817E-15	0.12490E-15
0.23323	0.36769E-01	0.16653E-15	-0.24980E-15	0.83267E-16	0.13878E-15	0.12490E-15	-0.19429E-15
0.20796	0.18680E-01	-0.55511E-16	0.55511E-16	-0.13878E-15	0.11796E-15	-0.19429E-15	-0.83267E-16
0.17771	0.52690E-02	0.69389E-16	-0.34694E-16	-0.76328E-16	-0.48572E-16	0.65919E-16	-0.20817E-16
0.10546	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-856.76	-0.92995
SOURCE/SINKS	809.26	48.584
STORAGE	47.500	-47.658
PER CENT ERROR	-0.62813E-03	-0.79171E-02

STEP NUMBER 33
****

SIMULATION TIME IN SECONDS 0.315E+08
IN MINUTES 0.526E+06
IN HOURS 0.876E+04
IN DAYS 365.
IN YEARS 0.999

NAPL SATURATIONS

SLICE 1

0.33582	0.20227	0.48566E-01	0.27756E-16	-0.24980E-15	-0.27756E-16	0.33307E-15	0.19429E-15
0.32886	0.21492	0.64707E-01	-0.83267E-16	-0.15266E-15	-0.23592E-15	-0.29143E-15	0.27756E-15
0.32351	0.22439	0.74850E-01	-0.15266E-15	-0.97145E-16	0.31919E-15	0.00000	-0.27756E-16
0.31962	0.23300	0.83945E-01	-0.69389E-16	0.15266E-15	-0.24980E-15	-0.18041E-15	-0.41633E-16
0.31787	0.24201	0.92854E-01	-0.34694E-15	0.13184E-15	0.00000	-0.33307E-15	-0.62450E-16
0.31945	0.25247	0.10243	0.12143E-15	0.17000E-15	0.76328E-16	-0.13184E-15	-0.97145E-16
0.31977	0.26092	0.10797	0.11059E-03	0.00000	0.00000	0.00000	0.00000
0.30309	0.25017	0.10077	0.72048E-05	0.00000	0.00000	0.00000	0.00000
0.28689	0.23881	0.79977E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.27115	0.22696	0.62774E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.25570	0.21458	0.48176E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.24033	0.20149	0.35698E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.22479	0.18728	0.25327E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.20873	0.17201	0.16903E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19159	0.15503	0.93616E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.17310	0.13467	0.27107E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.15320	0.10733	0.24478E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.13081	0.32915E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10238	0.27510E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-942.28	-42.822
SOURCE/SINKS	929.34	55.793
STORAGE	12.937	-12.971
PER CENT ERROR	0.47287E-03	-0.15011E-02

STEP NUMBER 53
****

SIMULATION TIME IN SECONDS 0.946E+08
IN MINUTES 0.158E+07
IN HOURS 0.263E+05
IN DAYS 0.109E+04
IN YEARS 3.00

NAPL SATURATIONS

SLICE 1

0.34923	0.22561	0.16474	0.16636E-03	-0.19429E-15	-0.27756E-16	0.44409E-15	0.11102E-15
0.34540	0.24297	0.16217	0.76027E-03	-0.26368E-15	-0.18041E-15	-0.41633E-15	0.38858E-15
0.34376	0.25750	0.16033	0.25032E-02	-0.19429E-15	0.31919E-15	-0.69389E-16	-0.12490E-15
0.34428	0.27121	0.16573	0.77315E-02	0.23592E-15	-0.41633E-15	-0.47184E-15	0.41633E-16
0.34691	0.28512	0.18047	0.19897E-01	0.24286E-15	0.15266E-15	-0.19429E-15	-0.13878E-15
0.35206	0.29972	0.19956	0.40113E-01	0.23245E-15	-0.10408E-15	-0.65919E-16	-0.45103E-16
0.35492	0.31067	0.21717	0.63059E-01	0.00000	0.00000	0.00000	0.00000
0.34047	0.30201	0.21382	0.59837E-01	0.00000	0.00000	0.00000	0.00000
0.32641	0.29273	0.20976	0.56249E-01	0.00000	0.00000	0.00000	0.00000
0.31252	0.28287	0.20499	0.52525E-01	0.00000	0.00000	0.00000	0.00000
0.29858	0.27241	0.19945	0.49050E-01	0.00000	0.00000	0.00000	0.00000
0.28432	0.26126	0.19309	0.45611E-01	0.00000	0.00000	0.00000	0.00000
0.26960	0.24926	0.18594	0.23286E-01	0.00000	0.00000	0.00000	0.00000
0.25407	0.23616	0.17798	0.27617E-01	0.00000	0.00000	0.00000	0.00000
0.23723	0.22154	0.16899	0.22730E-01	0.00000	0.00000	0.00000	0.00000
0.21826	0.20467	0.15866	0.17728E-01	0.00000	0.00000	0.00000	0.00000
0.19563	0.18401	0.14641	0.12337E-01	0.00000	0.00000	0.00000	0.00000
0.16608	0.15769	0.13079	0.66280E-02	0.00000	0.00000	0.00000	0.00000
0.12323	0.11902	0.10701	0.10480E-02	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-2995.0	-150.49
SOURCE/SINKS	2967.4	178.15
STORAGE	27.594	-27.664
PER CENT ERROR	0.15735E-02	-0.12960E-02

STEP NUMBER 67
****

SIMULATION TIME IN SECONDS 0.158E+09
IN MINUTES 0.263E+07
IN HOURS 0.438E+05
IN DAYS 0.182E+04
IN YEARS 5.00

NAPL SATURATIONS

SLICE 1

0.35039	0.22759	0.16484	0.11460E-02	-0.55511E-16	-0.22204E-15	0.44409E-15	-0.27756E-16
0.34680	0.24526	0.16276	0.34872E-02	-0.27756E-15	-0.97145E-16	-0.43021E-15	0.33307E-15
0.34545	0.26017	0.16292	0.98482E-02	-0.11102E-15	0.37470E-15	-0.18041E-15	-0.20817E-15
0.34626	0.27427	0.17254	0.27456E-01	0.27756E-16	-0.36082E-15	-0.63838E-15	-0.11102E-15

0.34922	0.28851	0.18966	0.57569E-01	0.20123E-15	0.90206E-16	-0.18041E-15	-0.69389E-16
0.35458	0.30338	0.20961	0.95948E-01	0.12143E-15	-0.10408E-15	0.55511E-16	-0.22898E-15
0.35757	0.31445	0.22737	0.11557	0.60485E-03	0.00000	0.00000	0.00000
0.34322	0.30589	0.22405	0.11591	0.64908E-03	0.00000	0.00000	0.00000
0.32924	0.29668	0.21999	0.12169	0.22860E-03	0.00000	0.00000	0.00000
0.31540	0.28682	0.21514	0.11207	0.11971E-03	0.00000	0.00000	0.00000
0.30146	0.27631	0.20948	0.10720	0.64960E-04	0.00000	0.00000	0.00000
0.28716	0.26506	0.20293	0.10676	0.00000	0.00000	0.00000	0.00000
0.27235	0.25291	0.19533	0.74921E-01	0.00000	0.00000	0.00000	0.00000
0.25669	0.23961	0.18668	0.71741E-01	0.00000	0.00000	0.00000	0.00000
0.23966	0.22475	0.17686	0.61406E-01	0.00000	0.00000	0.00000	0.00000
0.22047	0.20757	0.16552	0.50101E-01	0.00000	0.00000	0.00000	0.00000
0.19758	0.18656	0.15199	0.37332E-01	0.00000	0.00000	0.00000	0.00000
0.16752	0.15956	0.13473	0.22532E-01	0.00000	0.00000	0.00000	0.00000
0.12397	0.11994	0.10855	0.44706E-02	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-15873.	-915.73
SOURCE/SINKS	15838.	950.82
STORAGE	34.932	-35.092
PER CENT ERROR	0.81766E-02	0.50519E-04

STEP NUMBER 83
****

SIMULATION TIME IN SECONDS 0.315E+09
IN MINUTES 0.526E+07
IN HOURS 0.876E+05
IN DAYS 0.365E+04
IN YEARS 9.99

NAPL SATURATIONS

SLICE 1

0.35086	0.22840	0.16487	0.36657E-02	0.22204E-15	-0.11102E-15	0.66613E-15	-0.13878E-15
0.34737	0.24620	0.16297	0.10670E-01	-0.23592E-15	0.00000	-0.11102E-15	0.37470E-15
0.34613	0.26127	0.16434	0.30133E-01	-0.11102E-15	0.49960E-15	-0.23592E-15	0.33307E-15
0.34707	0.27554	0.17604	0.74074E-01	-0.27756E-16	-0.48572E-15	0.68001E-15	-0.13878E-15
0.35016	0.28994	0.19413	0.12325	0.97145E-16	0.27756E-16	-0.38858E-15	0.69389E-16
0.35561	0.30492	0.21436	0.12191	0.63538E-03	-0.13878E-15	0.25674E-15	-0.22898E-15
0.35866	0.31606	0.23216	0.13938	0.12770E-01	0.00000	0.00000	0.00000
0.34435	0.30754	0.22888	0.13928	0.12749E-01	0.00000	0.00000	0.00000
0.33040	0.29837	0.22485	0.13874	0.12105E-01	0.00000	0.00000	0.00000
0.31658	0.28852	0.22005	0.13778	0.11537E-01	0.00000	0.00000	0.00000
0.30265	0.27800	0.21446	0.13641	0.10841E-01	0.00000	0.00000	0.00000
0.28835	0.26673	0.20798	0.13464	0.99652E-02	0.00000	0.00000	0.00000
0.27350	0.25453	0.20048	0.13244	0.89996E-02	0.00000	0.00000	0.00000
0.25778	0.24116	0.19170	0.12980	0.79883E-02	0.00000	0.00000	0.00000
0.24069	0.22619	0.18161	0.12662	0.65743E-02	0.00000	0.00000	0.00000
0.22140	0.20888	0.16983	0.12279	0.55478E-02	0.00000	0.00000	0.00000
0.19840	0.18773	0.15565	0.11802	0.38975E-02	0.00000	0.00000	0.00000
0.16813	0.16041	0.13741	0.11167	0.15970E-02	0.00000	0.00000	0.00000
0.12429	0.12037	0.10968	0.10127	0.10113E-03	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

RUN NAME .... 2-D Unsaturated-Saturated Infiltration of Phenol
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS): 8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS): 20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES): 1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS: 4
ESTIMATED BANDWIDTH: 0
MAXIMUM NUMBER OF TIME STEPS: 100
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT: 1
MAXIMUM NUMBER OF SSOR ITERATIONS: 1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION: 0.200000E-01
INITIAL TIME (SECONDS): 0.000000
DENSITY OF WATER: 1000.00
DENSITY OF NONAQUEOUS FLUID: 1053.30
DYNAMIC VISCOSITY OF WATER: 0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID: 0.407600E-02
GRAVITATIONAL ACCELERATION (Z-DIRECTION): -9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION): 0.000000
SSOR CONVERGENCE TOLERANCE: 0.100000E-04
SSOR RELAXATION FACTOR: 1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1 1.00 2 1.90 3 3.61 4 6.86 5 13.0 6 24.8 7 47.0 8 89.4

DZ

1 0.250 2 0.250 3 0.250 4 0.250 5 0.250 6 0.250 7 0.250 8 0.250
9 0.250 10 0.250 11 0.250 12 0.250 13 0.250 14 0.250 15 0.250 16 0.250
17 0.250 18 0.250 19 0.250 20 0.250

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1 1 2 3 4 5 6 7 8
ROW 2 9 10 11 12 13 14 15 16
ROW 3 17 18 19 20 21 22 23 24
ROW 4 25 26 27 28 29 30 31 32
ROW 5 33 34 35 36 37 38 39 40
ROW 6 41 42 43 44 45 46 47 48
ROW 7 49 50 51 52 53 54 55 56
ROW 8 57 58 59 60 61 62 63 64
ROW 9 65 66 67 68 69 70 71 72
ROW 10 73 74 75 76 77 78 79 80
ROW 11 81 82 83 84 85 86 87 88

```
ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1

          ALL GRID BLOCKS IN SAME PROPERTY CLASS

          INITIAL NAPL PRESSURES

 -14700.      -14700.      -14700.      -14700.      -14700.      -14700.      -14700.      -14700.
 -12250.      -12250.      -12250.      -12250.      -12250.      -12250.      -12250.      -12250.
 -9800.0      -9800.0      -9800.0      -9800.0      -9800.0      -9800.0      -9800.0      -9800.0
 -7350.0      -7350.0      -7350.0      -7350.0      -7350.0      -7350.0      -7350.0      -7350.0
 -4900.0      -4900.0      -4900.0      -4900.0      -4900.0      -4900.0      -4900.0      -4900.0
 -2450.0      -2450.0      -2450.0      -2450.0      -2450.0      -2450.0      -2450.0      -2450.0
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
  2450.0       2450.0       2450.0       2450.0       2450.0       2450.0       2450.0       2450.0
  4900.0       4900.0       4900.0       4900.0       4900.0       4900.0       4900.0       4900.0
  7350.0       7350.0       7350.0       7350.0       7350.0       7350.0       7350.0       7350.0
  9800.0       9800.0       9800.0       9800.0       9800.0       9800.0       9800.0       9800.0
  12250.       12250.       12250.       12250.       12250.       12250.       12250.       12250.
  14700.       14700.       14700.       14700.       14700.       14700.       14700.       14700.
  17150.       17150.       17150.       17150.       17150.       17150.       17150.       17150.
  19600.       19600.       19600.       19600.       19600.       19600.       19600.       19600.
  22050.       22050.       22050.       22050.       22050.       22050.       22050.       22050.
  24500.       24500.       24500.       24500.       24500.       24500.       24500.       24500.
  26950.       26950.       26950.       26950.       26950.       26950.       26950.       26950.
  29400.       29400.       29400.       29400.       29400.       29400.       29400.       29400.
  31850.       31850.       31850.       31850.       31850.       31850.       31850.       31850.

          INITIAL WATER SATURATIONS

 0.85000      0.85000      0.85000      0.85000      0.85000      0.85000      0.85000      0.85000
 0.87500      0.87500      0.87500      0.87500      0.87500      0.87500      0.87500      0.87500
 0.90000      0.90000      0.90000      0.90000      0.90000      0.90000      0.90000      0.90000
 0.92500      0.92500      0.92500      0.92500      0.92500      0.92500      0.92500      0.92500
 0.95000      0.95000      0.95000      0.95000      0.95000      0.95000      0.95000      0.95000
 0.97500      0.97500      0.97500      0.97500      0.97500      0.97500      0.97500      0.97500
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
.......................................................................................

                       WATER BALANCE            NAPL BALANCE

       CONSTANT PRES    -297.80                  0.00000
       SOURCE/SINKS      281.02                   17.786
       STORAGE           16.775                  -17.786
       PER CENT ERROR   0.12392E-08             -0.99275E-11

           STEP NUMBER  12            SIMULATION TIME IN SECONDS 0.466E+07
           ***************                            IN MINUTES 0.776E+05
                                                      IN HOURS   0.129E+04
                                                      IN DAYS      53.9
                                                      IN YEARS   0.148

          NAPL SATURATIONS

    SLICE       1

 0.34938      0.83930E-01 0.22204E-15 0.13878E-15 0.19429E-15-0.22204E-15-0.83267E-16-0.55511E-16
 0.33441      0.52690E-01 0.69389E-16 0.00000     0.00000    -0.69389E-16 0.16653E-15 0.22204E-15
 0.31569      0.32903E-01-0.13878E-16-0.18041E-15-0.97145E-16-0.97145E-16 0.11102E-15 0.41633E-16
 0.28783      0.18592E-01 0.83267E-16-0.13878E-15-0.41633E-16 0.00000    -0.69389E-16 0.97145E-16
 0.25291      0.84880E-02 0.76328E-16 0.83267E-16 0.13878E-15-0.48572E-16 0.17347E-15 0.13878E-15
 0.20426      0.19817E-02-0.21858E-15 0.69389E-17 0.24633E-15 0.13184E-15-0.52042E-16 0.69389E-16
 0.98995E-01 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
 0.00000      0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
```

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-703.68	-1.2165
SOURCE/SINKS	664.88	42.080
STORAGE	38.798	-40.863
PER CENT ERROR	-0.29463E-04	-0.10094E-03

STEP NUMBER 32 **********

SIMULATION TIME IN SECONDS 0.208E+08
IN MINUTES 0.347E+06
IN HOURS 0.578E+04
IN DAYS 241.
IN YEARS 0.659

NAPL SATURATIONS

SLICE 1

0.35855	0.17297	0.16192E-02	0.27756E-16	0.27756E-16	-0.24980E-15	-0.16653E-15	-0.22204E-15
0.36262	0.17840	0.26699E-02	0.13878E-16	-0.22204E-15	-0.30531E-15	0.83267E-16	0.13878E-15
0.35838	0.18047	0.32657E-02	-0.36082E-15	-0.69389E-16	-0.23592E-15	0.24980E-15	0.69389E-16
0.35447	0.18125	0.35119E-02	0.83267E-16	0.00000	0.41633E-16	-0.18041E-15	0.26368E-15
0.35065	0.18106	0.35574E-02	0.22204E-15	0.13878E-15	-0.27756E-16	0.12490E-15	0.41633E-16
0.34776	0.18116	0.35038E-02	0.15266E-15	0.21511E-15	0.44409E-15	-0.69389E-16	-0.10061E-15
0.34670	0.18296	0.39761E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.33420	0.18176	0.33701E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.32185	0.17707	0.25743E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.30925	0.16832	0.16607E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.29592	0.15448	0.86245E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.28170	0.13619	0.32776E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.26680	0.10032	0.21411E-05	0.00000	0.00000	0.00000	0.00000	0.00000
0.25127	0.40669E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.23555	0.27692E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.21866	0.17309E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.19875	0.86696E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17467	0.29511E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10744	0.18466E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-749.47	-27.030
SOURCE/SINKS	731.19	46.277
STORAGE	18.278	-19.247
PER CENT ERROR	0.13465E-06	-0.90745E-06

STEP NUMBER 38 **********

SIMULATION TIME IN SECONDS 0.315E+08
IN MINUTES 0.526E+06
IN HOURS 0.876E+04
IN DAYS 365.
IN YEARS 0.999

NAPL SATURATIONS

SLICE 1

0.35850	0.17298	0.31843E-02	0.00000	-0.55511E-16	-0.55511E-16	-0.11102E-15	-0.16653E-15
0.36312	0.17849	0.56028E-02	-0.13878E-16	-0.20817E-15	-0.33307E-15	0.27756E-16	0.55511E-16
0.35929	0.18077	0.74103E-02	-0.43021E-15	-0.13878E-15	-0.33307E-15	0.15266E-15	0.20817E-15
0.35611	0.18211	0.87448E-02	0.97145E-16	-0.41633E-16	-0.13878E-16	-0.15266E-15	0.26368E-15
0.35362	0.18337	0.98777E-02	0.22204E-15	0.15266E-15	0.48572E-16	0.15266E-15	-0.55511E-16
0.35243	0.18718	0.11347E-01	0.20123E-15	0.25327E-15	0.40246E-15	-0.20817E-16	-0.10755E-15
0.35367	0.19722	0.14740E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.34380	0.20217	0.14791E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.33476	0.20533	0.14322E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.32632	0.20732	0.13386E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.31827	0.20819	0.12201E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.31037	0.20796	0.10919E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.30225	0.20657	0.95194E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.29339	0.20382	0.82637E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.28344	0.19909	0.66951E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.27140	0.19112	0.47684E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.25499	0.17871	0.26142E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.22881	0.15778	0.12354E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.17566	0.12458	0.23079E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-8872.1	-498.97
SOURCE/SINKS	8816.2	557.98
STORAGE	55.895	-59.010
PER CENT ERROR	-0.70125E-06	-0.27999E-06

STEP NUMBER 46 **********

SIMULATION TIME IN SECONDS 0.946E+08
IN MINUTES 0.158E+07
IN HOURS 0.263E+05
IN DAYS 0.109E+04
IN YEARS 3.00

NAPL SATURATIONS

SLICE 1

0.35849	0.17298	0.11939E-01	-0.19429E-15	-0.83267E-16	0.24980E-15	-0.22204E-15	-0.19429E-15
0.36322	0.17852	0.21585E-01	-0.12490E-15	-0.13878E-15	-0.24980E-15	-0.55511E-16	0.41633E-16
0.35947	0.18089	0.29510E-01	-0.38858E-15	-0.97145E-16	-0.23592E-15	0.27756E-16	0.26368E-15
0.35644	0.18240	0.36207E-01	0.22204E-15	-0.13878E-15	-0.11102E-15	-0.69389E-16	0.15266E-15
0.35421	0.18401	0.42766E-01	0.29837E-15	0.12490E-15	0.97145E-16	0.00000	-0.62450E-16

0.35335	0.18861	0.52097E-01	0.19082E-15	0.35388E-15	0.41633E-15	-0.72858E-16	-0.11102E-15
0.35504	0.20009	0.69052E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.34567	0.20569	0.73945E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.33726	0.21020	0.77554E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.32961	0.21382	0.80040E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.32254	0.21665	0.81645E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.31579	0.21876	0.82507E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.30905	0.22012	0.82575E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.30179	0.22056	0.81868E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.29310	0.21972	0.79715E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.28188	0.21672	0.75257E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.26563	0.20954	0.66713E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.23850	0.19286	0.51779E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.18303	0.15142	0.24087E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-8828.3	-545.17
SOURCE/SINKS	8816.2	557.98
STORAGE	12.059	-12.806
PER CENT ERROR	-0.14240E-03	-0.54774E-03

STEP NUMBER 54 **********

SIMULATION TIME IN SECONDS 0.158E+09
IN MINUTES 0.263E+07
IN HOURS 0.438E+05
IN DAYS 0.182E+04
IN YEARS 5.00

NAPL SATURATIONS

SLICE 1

0.35849	0.17300	0.20247E-01	-0.11102E-15	-0.55511E-16	0.27756E-15	-0.19429E-15	-0.13878E-15
0.36324	0.17857	0.36130E-01	-0.15266E-15	-0.55511E-16	-0.31919E-15	0.41633E-16	0.27756E-16
0.35951	0.18099	0.48897E-01	-0.30531E-15	-0.20817E-15	-0.23592E-15	-0.97145E-16	0.33307E-15
0.35650	0.18260	0.59524E-01	0.18041E-15	-0.23592E-15	-0.20817E-15	-0.41633E-16	0.12490E-15
0.35431	0.18438	0.69794E-01	0.23592E-15	0.20817E-16	0.27756E-16	-0.48572E-16	-0.15266E-15
0.35351	0.18924	0.84109E-01	0.11102E-15	0.30184E-15	0.48225E-15	0.79797E-16	-0.22204E-15
0.35526	0.20106	0.10064	0.15966E-04	0.00000	0.00000	0.00000	0.00000
0.34596	0.20687	0.10135	0.47689E-04	0.00000	0.00000	0.00000	0.00000
0.33761	0.21159	0.10213	0.90192E-04	0.00000	0.00000	0.00000	0.00000
0.33004	0.21540	0.10298	0.13975E-03	0.00000	0.00000	0.00000	0.00000
0.32304	0.21842	0.10386	0.20718E-03	0.00000	0.00000	0.00000	0.00000
0.31637	0.22071	0.10478	0.26893E-03	0.00000	0.00000	0.00000	0.00000
0.30970	0.22225	0.10571	0.33436E-03	0.00000	0.00000	0.00000	0.00000
0.30251	0.22288	0.10663	0.40821E-03	0.00000	0.00000	0.00000	0.00000
0.29389	0.22219	0.10754	0.46503E-03	0.00000	0.00000	0.00000	0.00000
0.28267	0.21932	0.10837	0.50362E-03	0.00000	0.00000	0.00000	0.00000
0.26637	0.21221	0.10906	0.49281E-03	0.00000	0.00000	0.00000	0.00000
0.23914	0.19559	0.10901	0.43018E-03	0.00000	0.00000	0.00000	0.00000
0.18349	0.15315	0.10447	0.14937E-03	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-27004.	-1691.9
SOURCE/SINKS	26989.	1708.1
STORAGE	15.277	-16.249
PER CENT ERROR	0.91982E-02	-0.17635E-01

STEP NUMBER 64 **********

SIMULATION TIME IN SECONDS 0.315E+09
IN MINUTES 0.526E+07
IN HOURS 0.876E+05
IN DAYS 0.365E+04
IN YEARS 9.99

NAPL SATURATIONS

SLICE 1

0.35849	0.17302	0.39116E-01	-0.16653E-15	-0.83267E-16	0.41633E-15	-0.13878E-15	-0.55511E-16
0.36326	0.17866	0.66705E-01	-0.13878E-15	0.41633E-16	-0.22204E-15	-0.97145E-16	0.27756E-16
0.35955	0.18119	0.86986E-01	-0.30531E-15	-0.29143E-15	-0.33307E-15	-0.22204E-15	0.44409E-15
0.35657	0.18296	0.10265	0.19429E-15	-0.33307E-15	-0.31919E-15	-0.13878E-15	0.13878E-15
0.35443	0.18494	0.11677	0.62450E-16	-0.83267E-16	-0.11796E-15	-0.18041E-15	-0.11796E-15
0.35367	0.18999	0.11961	0.27649E-04	0.37123E-15	0.60368E-15	-0.31225E-16	-0.16306E-15
0.35545	0.20186	0.10116	0.22661E-03	0.00000	0.00000	0.00000	0.00000
0.34617	0.20764	0.10193	0.45851E-03	0.00000	0.00000	0.00000	0.00000
0.33785	0.21232	0.10278	0.72194E-03	0.00000	0.00000	0.00000	0.00000
0.33030	0.21611	0.10368	0.10099E-02	0.00000	0.00000	0.00000	0.00000
0.32331	0.21911	0.10463	0.13297E-02	0.00000	0.00000	0.00000	0.00000
0.31666	0.22139	0.10561	0.16548E-02	0.00000	0.00000	0.00000	0.00000
0.31000	0.22291	0.10660	0.19904E-02	0.00000	0.00000	0.00000	0.00000
0.30282	0.22352	0.10759	0.23359E-02	0.00000	0.00000	0.00000	0.00000
0.29420	0.22281	0.10855	0.26584E-02	0.00000	0.00000	0.00000	0.00000
0.28296	0.21990	0.10943	0.29428E-02	0.00000	0.00000	0.00000	0.00000
0.26664	0.21276	0.11011	0.31258E-02	0.00000	0.00000	0.00000	0.00000
0.23936	0.19610	0.11009	0.30612E-02	0.00000	0.00000	0.00000	0.00000
0.18364	0.15345	0.10512	0.14360E-02	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

RUN NAME .... 2-D Unsaturated-Saturated Infiltration of o-Nitrotoluene
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS):	8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS):	20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES):	1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS:	4
ESTIMATED BANDWIDTH:	0
MAXIMUM NUMBER OF TIME STEPS:	100
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT:	1
MAXIMUM NUMBER OF SSOR ITERATIONS:	1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION:	0.200000E-01
INITIAL TIME (SECONDS):	0.000000
DENSITY OF WATER:	1000.00
DENSITY OF NONAQUEOUS FLUID:	1152.90
DYNAMIC VISCOSITY OF WATER:	0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID:	0.237000E-02
GRAVITATIONAL ACCELERATION (Z-DIRECTION):	-9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION):	0.000000
SSOR CONVERGENCE TOLERANCE:	0.100000E-04
SSOR RELAXATION FACTOR:	1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1	1.00	2	1.90	3	3.61	4	6.86	5	13.0	6	24.8	7	47.0	8	89.4

DZ

1	0.250	2	0.250	3	0.250	4	0.250	5	0.250	6	0.250	7	0.250	8	0.250
9	0.250	10	0.250	11	0.250	12	0.250	13	0.250	14	0.250	15	0.250	16	0.250
17	0.250	18	0.250	19	0.250	20	0.250								

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1	1	2	3	4	5	6	7	8
ROW 2	9	10	11	12	13	14	15	16
ROW 3	17	18	19	20	21	22	23	24
ROW 4	25	26	27	28	29	30	31	32
ROW 5	33	34	35	36	37	38	39	40
ROW 6	41	42	43	44	45	46	47	48
ROW 7	49	50	51	52	53	54	55	56
ROW 8	57	58	59	60	61	62	63	64
ROW 9	65	66	67	68	69	70	71	72
ROW 10	73	74	75	76	77	78	79	80
ROW 11	81	82	83	84	85	86	87	88

```
ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1

          ALL GRID BLOCKS IN SAME PROPERTY CLASS

          INITIAL NAPL PRESSURES

 -14700.      -14700.      -14700.      -14700.      -14700.      -14700.      -14700.      -14700.
 -12250.      -12250.      -12250.      -12250.      -12250.      -12250.      -12250.      -12250.
 -9800.0      -9800.0      -9800.0      -9800.0      -9800.0      -9800.0      -9800.0      -9800.0
 -7350.0      -7350.0      -7350.0      -7350.0      -7350.0      -7350.0      -7350.0      -7350.0
 -4900.0      -4900.0      -4900.0      -4900.0      -4900.0      -4900.0      -4900.0      -4900.0
 -2450.0      -2450.0      -2450.0      -2450.0      -2450.0      -2450.0      -2450.0      -2450.0
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
  2450.0       2450.0       2450.0       2450.0       2450.0       2450.0       2450.0       2450.0
  4900.0       4900.0       4900.0       4900.0       4900.0       4900.0       4900.0       4900.0
  7350.0       7350.0       7350.0       7350.0       7350.0       7350.0       7350.0       7350.0
  9800.0       9800.0       9800.0       9800.0       9800.0       9800.0       9800.0       9800.0
  12250.       12250.       12250.       12250.       12250.       12250.       12250.       12250.
  14700.       14700.       14700.       14700.       14700.       14700.       14700.       14700.
  17150.       17150.       17150.       17150.       17150.       17150.       17150.       17150.
  19600.       19600.       19600.       19600.       19600.       19600.       19600.       19600.
  22050.       22050.       22050.       22050.       22050.       22050.       22050.       22050.
  24500.       24500.       24500.       24500.       24500.       24500.       24500.       24500.
  26950.       26950.       26950.       26950.       26950.       26950.       26950.       26950.
  29400.       29400.       29400.       29400.       29400.       29400.       29400.       29400.
  31850.       31850.       31850.       31850.       31850.       31850.       31850.       31850.

          INITIAL WATER SATURATIONS

 0.85000      0.85000      0.85000      0.85000      0.85000      0.85000      0.85000      0.85000
 0.87500      0.87500      0.87500      0.87500      0.87500      0.87500      0.87500      0.87500
 0.90000      0.90000      0.90000      0.90000      0.90000      0.90000      0.90000      0.90000
 0.92500      0.92500      0.92500      0.92500      0.92500      0.92500      0.92500      0.92500
 0.95000      0.95000      0.95000      0.95000      0.95000      0.95000      0.95000      0.95000
 0.97500      0.97500      0.97500      0.97500      0.97500      0.97500      0.97500      0.97500
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000
  1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000       1.0000

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       CONSTANT PRES      -286.13               0.00000
       SOURCE/SINKS        269.94               18.721
       STORAGE             16.196              -18.721
       PER CENT ERROR    -0.31064E-09          -0.24214E-10

           STEP NUMBER    7          SIMULATION TIME IN SECONDS 0.334E+07
           ***************                           IN MINUTES 0.556E+05
                                                     IN HOURS    927.
                                                     IN DAYS     38.6
                                                     IN YEARS   0.106

          NAPL SATURATIONS

     SLICE      1

 0.22559      0.35390E-01-0.19429E-15 0.13878E-15 0.83267E-16 0.83267E-16-0.16653E-15 0.11102E-15
 0.22300      0.20022E-01-0.41633E-16 0.13878E-16-0.55511E-16 0.83267E-16 0.12490E-15-0.27756E-16
 0.22051      0.14354E-01-0.41633E-16-0.83267E-16-0.97145E-16-0.41633E-16-0.13878E-15 0.13878E-16
 0.21527      0.88710E-02-0.69389E-16 0.55511E-16-0.83267E-16-0.13878E-16 0.69389E-16 0.00000
 0.20249      0.46924E-02 0.15266E-15-0.20817E-16 0.20817E-16-0.13878E-16 0.62450E-16-0.48572E-16
 0.18019      0.18291E-02-0.55511E-16-0.38164E-16-0.83267E-16 0.79797E-16 0.34694E-16-0.55511E-16
 0.16467      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
 0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
```

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-364.59	-7.9523
SOURCE/SINKS	350.41	24.303
STORAGE	14.181	-16.350
PER CENT ERROR	-0.40295E-04	-0.78779E-04

STEP NUMBER 19 **********

SIMULATION TIME IN SECONDS 0.999E+07
IN MINUTES 0.167E+06
IN HOURS 0.278E+04
IN DAYS 116.
IN YEARS 0.317

NAPL SATURATIONS

SLICE 1

0.22550	0.74919E-01	0.27756E-16	0.22204E-15	0.00000	-0.27756E-16	-0.22204E-15	-0.55511E-16
0.22213	0.60934E-01	0.27756E-16	-0.12490E-15	-0.27756E-16	0.13878E-15	0.43021E-15	-0.97145E-16
0.21836	0.54470E-01	-0.13878E-16	-0.27756E-16	-0.23592E-15	-0.97145E-16	-0.69389E-16	-0.13878E-16
0.21267	0.47878E-01	-0.69389E-16	0.15266E-15	-0.18041E-15	0.83267E-16	0.18041E-15	-0.23592E-15
0.20539	0.42262E-01	0.13878E-15	-0.20817E-15	0.11796E-15	0.34694E-16	0.16653E-15	0.13878E-15
0.19878	0.38155E-01	-0.27062E-15	-0.13184E-15	0.10408E-16	-0.11102E-15	-0.13878E-16	-0.55511E-16
0.19506	0.37800E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.19265	0.34709E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.19028	0.31325E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.18796	0.27812E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.18570	0.24317E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.18354	0.20972E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.18153	0.17837E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17981	0.14850E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17863	0.12001E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17840	0.92099E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17907	0.63160E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17453	0.26660E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.12515	0.66062E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-1924.9	-100.42
SOURCE/SINKS	1897.9	131.63
STORAGE	26.980	-31.216
PER CENT ERROR	0.73090E-05	-0.54253E-05

STEP NUMBER 26 **********

SIMULATION TIME IN SECONDS 0.315E+08
IN MINUTES 0.526E+06
IN HOURS 0.876E+04
IN DAYS 365.
IN YEARS 0.999

NAPL SATURATIONS

SLICE 1

0.22630	0.15211	0.13878E-15	0.83267E-16	0.55511E-16	-0.55511E-16	-0.36082E-15	0.13878E-15
0.22360	0.14261	0.00000	-0.97145E-16	-0.69389E-16	0.20817E-15	0.43021E-15	-0.12490E-15
0.22051	0.13640	0.55511E-16	-0.12490E-15	-0.26368E-15	-0.69389E-16	-0.83267E-16	-0.13878E-16
0.21573	0.12929	0.13878E-16	0.31919E-15	-0.33307E-15	-0.69389E-16	0.69389E-16	-0.31919E-15
0.20918	0.12233	0.27756E-16	-0.18041E-15	0.21511E-15	-0.76328E-16	0.27756E-15	0.17347E-15
0.20360	0.11765	-0.30878E-15	-0.19776E-15	-0.27756E-16	-0.14225E-15	-0.31225E-16	-0.27756E-16
0.20207	0.10085	-0.36364E-05	0.00000	0.00000	0.00000	0.00000	0.00000
0.20087	0.10162	0.79309E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.19956	0.10232	0.13033E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.19806	0.10293	0.14983E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.19665	0.10422	0.13681E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.19540	0.11551	0.12658E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.19428	0.13938	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.19270	0.95251E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.19106	0.91718E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.18920	0.88028E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.18644	0.83440E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.17979	0.74513E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.15488	0.47939E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-10213.	-701.52
SOURCE/SINKS	10208.	707.96
STORAGE	5.5767	-6.4402
PER CENT ERROR	-0.13812E-01	-0.23389E-04

STEP NUMBER 34 **********

SIMULATION TIME IN SECONDS 0.946E+08
IN MINUTES 0.158E+07
IN HOURS 0.263E+05
IN DAYS 0.109E+04
IN YEARS 3.00

NAPL SATURATIONS

SLICE 1

0.22644	0.16422	0.44121E-03	-0.27756E-16	0.00000	0.00000	-0.41633E-15	0.22204E-15
0.22391	0.16044	0.84661E-03	-0.22204E-15	-0.27756E-16	0.22204E-15	0.36082E-15	-0.22204E-15
0.22099	0.15520	0.12168E-02	-0.97145E-16	-0.23592E-15	-0.55511E-16	-0.97145E-16	-0.69389E-16
0.21644	0.14956	0.15285E-02	0.38858E-15	-0.34694E-15	-0.13878E-16	0.20817E-15	-0.26368E-15

0.21006	0.14014	0.17481E-02	-0.27062E-15	0.15266E-15	-0.13184E-15	0.10408E-15	0.34694E-15
0.20456	0.12197	0.19406E-02	-0.22551E-15	0.69389E-16	-0.62450E-16	-0.10408E-16	-0.93675E-16
0.20314	0.10419	0.24601E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.20202	0.10500	0.30640E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.20091	0.10579	0.36180E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19973	0.10653	0.41226E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19834	0.10725	0.45792E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19700	0.10794	0.50317E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19569	0.10859	0.55214E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19442	0.10922	0.62766E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19313	0.10983	0.52934E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19164	0.11040	0.51019E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.18921	0.11092	0.68625E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.18266	0.11123	0.69256E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.15707	0.10826	0.48866E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-8820.5	-606.12
SOURCE/SINKS	8815.9	611.42
STORAGE	4.5924	-5.3038
PER CENT ERROR	-0.10106E-01	-0.11963E-04

STEP NUMBER 42
****

SIMULATION TIME IN SECONDS 0.158E+09
IN MINUTES 0.263E+07
IN HOURS 0.438E+05
IN DAYS 0.182E+04
IN YEARS 5.00

NAPL SATURATIONS

SLICE 1

0.22644	0.16422	0.92528E-03	-0.83267E-16	-0.55511E-16	-0.11102E-15	-0.47184E-15	0.24980E-15
0.22391	0.16044	0.17806E-02	-0.30531E-15	-0.11102E-15	0.29143E-15	0.36082E-15	-0.19429E-15
0.22099	0.15520	0.25665E-02	-0.22204E-15	-0.34694E-15	-0.69389E-16	-0.97145E-16	0.69389E-16
0.21644	0.14956	0.32321E-02	0.33307E-15	-0.38858E-15	0.27756E-16	0.97145E-16	-0.27756E-15
0.21006	0.14014	0.36924E-02	-0.25674E-15	0.13184E-15	-0.11796E-15	0.48572E-16	0.42327E-15
0.20456	0.12197	0.40489E-02	-0.17000E-15	0.15613E-15	0.34694E-16	-0.15266E-15	0.62450E-16
0.20314	0.10419	0.50680E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.20202	0.10501	0.61731E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.20091	0.10579	0.72072E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19973	0.10654	0.81718E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19834	0.10726	0.90688E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19700	0.10794	0.99418E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.19570	0.10860	0.10831E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19442	0.10924	0.11952E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19313	0.10984	0.11416E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19165	0.11041	0.11612E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.18921	0.11094	0.13605E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.18266	0.11125	0.13862E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.15707	0.10828	0.99958E-02	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-27000.	-1857.3
SOURCE/SINKS	26988.	1871.7
STORAGE	12.509	-14.448
PER CENT ERROR	0.18758E-07	-0.78340E-10

STEP NUMBER 52
****

SIMULATION TIME IN SECONDS 0.315E+09
IN MINUTES 0.526E+07
IN HOURS 0.876E+05
IN DAYS 0.365E+04
IN YEARS 9.99

NAPL SATURATIONS

SLICE 1

0.22644	0.16422	0.21283E-02	-0.27756E-16	-0.11102E-15	-0.13878E-15	-0.52736E-15	0.27756E-15
0.22391	0.16044	0.40893E-02	-0.41633E-15	-0.55511E-16	0.26368E-15	0.15266E-15	-0.19429E-15
0.22099	0.15520	0.58848E-02	-0.11102E-15	-0.23592E-15	-0.55511E-16	-0.11102E-15	0.16653E-15
0.21644	0.14956	0.73994E-02	0.49960E-15	-0.30531E-15	0.55511E-16	0.24980E-15	-0.11102E-15
0.21006	0.14014	0.84258E-02	-0.31919E-15	0.12490E-15	-0.13878E-15	0.17347E-15	0.51348E-15
0.20456	0.12197	0.91477E-02	-0.32960E-15	0.12837E-15	-0.27756E-16	-0.16653E-15	0.19776E-15
0.20314	0.10419	0.11280E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.20202	0.10501	0.13511E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.20091	0.10579	0.15605E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19974	0.10655	0.17567E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19834	0.10727	0.19405E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19700	0.10796	0.21162E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19570	0.10862	0.22877E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19442	0.10926	0.24743E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19314	0.10987	0.25126E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.19165	0.11045	0.26100E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.18922	0.11099	0.28529E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.18266	0.11130	0.29170E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.15707	0.10831	0.21655E-01	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

RUN NAME .... 2-D Unsaturated-Saturated Infiltration of Trichloroethene (TCE)
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS):	8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS):	20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES):	1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS:	4
ESTIMATED BANDWIDTH:	0
MAXIMUM NUMBER OF TIME STEPS:	150
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT:	1
MAXIMUM NUMBER OF SSOR ITERATIONS:	1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION:	0.200000E-01
INITIAL TIME (SECONDS):	0.000000
DENSITY OF WATER:	1000.00
DENSITY OF NONAQUEOUS FLUID:	1467.90
DYNAMIC VISCOSITY OF WATER:	0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID:	0.566000E-03
GRAVITATIONAL ACCELERATION (Z-DIRECTION):	-9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION):	0.000000
SSOR CONVERGENCE TOLERANCE:	0.100000E-04
SSOR RELAXATION FACTOR:	1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1	1.00	2	1.90	3	3.61	4	6.86	5	13.0	6	24.8	7	47.0	8	89.4

DZ

1	0.250	2	0.250	3	0.250	4	0.250	5	0.250	6	0.250	7	0.250	8	0.250
9	0.250	10	0.250	11	0.250	12	0.250	13	0.250	14	0.250	15	0.250	16	0.250
17	0.250	18	0.250	19	0.250	20	0.250								

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1	1	2	3	4	5	6	7	8
ROW 2	9	10	11	12	13	14	15	16
ROW 3	17	18	19	20	21	22	23	24
ROW 4	25	26	27	28	29	30	31	32
ROW 5	33	34	35	36	37	38	39	40
ROW 6	41	42	43	44	45	46	47	48
ROW 7	49	50	51	52	53	54	55	56
ROW 8	57	58	59	60	61	62	63	64
ROW 9	65	66	67	68	69	70	71	72
ROW 10	73	74	75	76	77	78	79	80
ROW 11	81	82	83	84	85	86	87	88

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ROW 12     89 90 91 92 93 94 95 96
ROW 13     97 98 99100101102103104
ROW 14    105106107108109110111112
ROW 15    113114115116117118119120
ROW 16    121122123124125126127128
ROW 17    129130131132133134135136
ROW 18    137138139140141142143144
ROW 19    145146147148149150151152
ROW 20     -1 -1 -1 -1 -1 -1 -1 -1

          ALL GRID BLOCKS IN SAME PROPERTY CLASS

          INITIAL NAPL PRESSURES

-14700.    -14700.    -14700.    -14700.    -14700.    -14700.    -14700.    -14700.
-12250.    -12250.    -12250.    -12250.    -12250.    -12250.    -12250.    -12250.
-9800.0    -9800.0    -9800.0    -9800.0    -9800.0    -9800.0    -9800.0    -9800.0
-7350.0    -7350.0    -7350.0    -7350.0    -7350.0    -7350.0    -7350.0    -7350.0
-4900.0    -4900.0    -4900.0    -4900.0    -4900.0    -4900.0    -4900.0    -4900.0
-2450.0    -2450.0    -2450.0    -2450.0    -2450.0    -2450.0    -2450.0    -2450.0
0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
 2450.0     2450.0     2450.0     2450.0     2450.0     2450.0     2450.0     2450.0
 4900.0     4900.0     4900.0     4900.0     4900.0     4900.0     4900.0     4900.0
 7350.0     7350.0     7350.0     7350.0     7350.0     7350.0     7350.0     7350.0
 9800.0     9800.0     9800.0     9800.0     9800.0     9800.0     9800.0     9800.0
 12250.     12250.     12250.     12250.     12250.     12250.     12250.     12250.
 14700.     14700.     14700.     14700.     14700.     14700.     14700.     14700.
 17150.     17150.     17150.     17150.     17150.     17150.     17150.     17150.
 19600.     19600.     19600.     19600.     19600.     19600.     19600.     19600.
 22050.     22050.     22050.     22050.     22050.     22050.     22050.     22050.
 24500.     24500.     24500.     24500.     24500.     24500.     24500.     24500.
 26950.     26950.     26950.     26950.     26950.     26950.     26950.     26950.
 29400.     29400.     29400.     29400.     29400.     29400.     29400.     29400.
 31850.     31850.     31850.     31850.     31850.     31850.     31850.     31850.

          INITIAL WATER SATURATIONS

0.85000    0.85000    0.85000    0.85000    0.85000    0.85000    0.85000    0.85000
0.87500    0.87500    0.87500    0.87500    0.87500    0.87500    0.87500    0.87500
0.90000    0.90000    0.90000    0.90000    0.90000    0.90000    0.90000    0.90000
0.92500    0.92500    0.92500    0.92500    0.92500    0.92500    0.92500    0.92500
0.95000    0.95000    0.95000    0.95000    0.95000    0.95000    0.95000    0.95000
0.97500    0.97500    0.97500    0.97500    0.97500    0.97500    0.97500    0.97500
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000
 1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000     1.0000

............................................................................

                      WATER BALANCE          NAPL BALANCE

     CONSTANT PRES     -92.717                0.00000
     SOURCE/SINKS       87.394                 7.7355
     STORAGE            5.3234                -7.7355
     PER CENT ERROR    0.88534E-09           -0.14651E-10

           STEP NUMBER  16         SIMULATION TIME IN SECONDS 0.215E+07
           ***************                         IN MINUTES 0.359E+05
                                                   IN HOURS    598.
                                                   IN DAYS     24.9
                                                   IN YEARS   0.682E-01

          NAPL SATURATIONS

     SLICE     1

0.16913     0.40964E-02-0.11102E-15 0.11102E-15 0.19429E-15 0.83267E-16 0.27756E-16-0.27756E-16
0.16552     0.27242E-02-0.13878E-15-0.15266E-15 0.13878E-15 0.12490E-15-0.13878E-16-0.55511E-16
0.15991     0.22889E-02-0.41633E-16-0.69389E-16 0.12490E-15-0.11102E-15-0.55511E-16 0.27756E-16
0.15392     0.13033E-02 0.11102E-15-0.41633E-16 0.83267E-16 0.18041E-15-0.27756E-16-0.69389E-16
0.14555     0.80455E-03-0.34694E-16 0.62450E-16 0.18735E-15 0.48572E-16 0.55511E-16 0.12490E-15
0.13013     0.28090E-03-0.28796E-15 0.45103E-16-0.62450E-16-0.14572E-15-0.69389E-16 0.38164E-16
0.83147E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
```

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-89.670	-5.0492
SOURCE/SINKS	87.798	7.7713
STORAGE	1.8718	-2.7221
PER CENT ERROR	-0.14896E-04	-0.79712E-06

STEP NUMBER 37 **********

SIMULATION TIME IN SECONDS 0.525E+07
IN MINUTES 0.874E+05
IN HOURS 0.146E+04
IN DAYS 60.7
IN YEARS 0.166

NAPL SATURATIONS

SLICE 1

0.16915	0.10425E-01	-0.27756E-16	0.16653E-15	0.30531E-15	0.11102E-15	-0.11102E-15	0.24980E-15
0.16559	0.88932E-02	-0.27756E-16	-0.55511E-16	0.18041E-15	0.41633E-16	0.19429E-15	-0.24980E-15
0.15999	0.82134E-02	0.12490E-15	0.22204E-15	0.23592E-15	0.12490E-15	-0.83267E-16	-0.97145E-16
0.15400	0.69884E-02	0.55511E-16	0.41633E-16	-0.55511E-16	0.20817E-15	-0.19429E-15	-0.13878E-15
0.14566	0.61124E-02	0.11102E-15	-0.83267E-16	0.12490E-15	0.21511E-15	0.83267E-16	0.12490E-15
0.12699	0.49645E-02	-0.21511E-15	-0.90206E-16	-0.69389E-16	-0.10061E-15	0.12143E-15	-0.13184E-15
0.10843	0.40943E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10838	0.38243E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10834	0.35112E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10829	0.30323E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10825	0.28133E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10820	0.24883E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10816	0.20101E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10811	0.17984E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10807	0.14740E-02	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10802	0.98404E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10799	0.78589E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10805	0.44976E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10510	0.11815E-03	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-489.55	-39.671
SOURCE/SINKS	487.21	43.125
STORAGE	2.3398	-3.4530
PER CENT ERROR	0.45609E-03	-0.56092E-05

STEP NUMBER 54 **********

SIMULATION TIME IN SECONDS 0.315E+08
IN MINUTES 0.526E+06
IN HOURS 0.876E+04
IN DAYS 365.
IN YEARS 0.999

NAPL SATURATIONS

SLICE 1

0.16917	0.54173E-01	-0.27756E-16	0.13878E-15	0.22204E-15	0.00000	-0.27756E-16	0.27756E-15
0.16561	0.51654E-01	-0.69389E-16	0.41633E-16	0.69389E-16	0.13878E-15	0.55511E-16	-0.37470E-15
0.16003	0.49325E-01	0.13878E-15	0.16653E-15	0.23592E-15	0.55511E-16	-0.13878E-15	-0.83267E-16
0.15405	0.46467E-01	0.41633E-16	0.16653E-15	0.19429E-15	0.45797E-15	-0.13878E-15	-0.69389E-16
0.14574	0.43009E-01	0.20123E-15	-0.31919E-15	0.26368E-15	0.18041E-15	-0.13184E-15	0.22204E-15
0.12709	0.37127E-01	-0.51001E-15	0.48572E-16	0.16306E-15	-0.36776E-15	0.11796E-15	-0.20470E-15
0.10854	0.32952E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10851	0.32634E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10847	0.32284E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10844	0.31813E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10841	0.31530E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10837	0.31171E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10834	0.30698E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10831	0.30421E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10827	0.30061E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10824	0.29580E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10821	0.29313E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10816	0.28918E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10721	0.25592E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-5583.7	-473.92
SOURCE/SINKS	5570.8	493.08
STORAGE	12.988	-19.167
PER CENT ERROR	-0.13838E-06	-0.10249E-08

STEP NUMBER 76 **********

SIMULATION TIME IN SECONDS 0.946E+08
IN MINUTES 0.158E+07
IN HOURS 0.263E+05
IN DAYS 0.109E+04
IN YEARS 3.00

NAPL SATURATIONS

SLICE 1

0.16918	0.11549	-0.83267E-16	0.27756E-16	0.19429E-15	0.83267E-16	-0.27756E-16	0.27756E-16
0.16565	0.11204	0.24980E-15	0.27756E-16	0.13878E-16	0.41633E-15	-0.11102E-15	-0.63838E-15
0.16008	0.10773	0.16653E-15	0.18041E-15	0.36082E-15	0.16653E-15	-0.30531E-15	-0.43021E-15
0.15412	0.10293	-0.11102E-15	0.30531E-15	0.69389E-16	0.72164E-15	-0.41633E-16	-0.23592E-15

0.14586	0.96354E-01	0.32613E-15	-0.48572E-16	0.11796E-15	0.27062E-15	-0.97145E-16	0.10408E-15
0.12722	0.83789E-01	-0.74246E-15	-0.76328E-16	0.28449E-15	-0.29143E-15	0.10408E-16	-0.34694E-15
0.10870	0.73708E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10869	0.73471E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10867	0.73220E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10865	0.72912E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10864	0.72691E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10862	0.72435E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10861	0.72125E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10859	0.71906E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10857	0.71649E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10856	0.71335E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10854	0.71122E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10851	0.70815E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10753	0.65352E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-5576.9	-483.99
SOURCE/SINKS	5570.8	493.08
STORAGE	6.1642	-9.0968
PER CENT ERROR	0.17384E-01	-0.18556E-03

STEP NUMBER 98
****

SIMULATION TIME IN SECONDS 0.158E+09
IN MINUTES 0.263E+07
IN HOURS 0.438E+05
IN DAYS 0.182E+04
IN YEARS 5.00

NAPL SATURATIONS

SLICE 1

0.16919	0.14432	-0.11102E-15	0.55511E-16	0.24980E-15	-0.11102E-15	0.55511E-16	-0.16653E-15
0.16566	0.14065	0.22204E-15	-0.15266E-15	0.83267E-16	0.48572E-15	0.27756E-16	-0.88818E-15
0.16010	0.13556	-0.13878E-15	0.38858E-15	0.47184E-15	0.18041E-15	-0.26368E-15	-0.77716E-15
0.15415	0.13002	-0.12490E-15	0.15266E-15	-0.55511E-16	0.83267E-15	0.13878E-15	-0.56899E-15
0.14591	0.12229	0.31225E-15	0.10408E-15	0.00000	0.19429E-15	-0.20817E-15	-0.17347E-15
0.12729	0.10654	-0.60021E-15	-0.76328E-16	0.17347E-16	-0.17694E-15	0.16306E-15	-0.58981E-15
0.10878	0.92783E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10877	0.92644E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10877	0.92499E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10876	0.92329E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10875	0.92198E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10874	0.92052E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10873	0.91882E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10873	0.91754E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10872	0.91608E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10871	0.91438E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10870	0.91314E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10869	0.91127E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.10769	0.86322E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-15370.	-1360.9
SOURCE/SINKS	15371.	1360.5
STORAGE	-0.23245	0.35000
PER CENT ERROR	-0.16253E-01	0.30362E-02

STEP NUMBER 124
****

SIMULATION TIME IN SECONDS 0.315E+09
IN MINUTES 0.526E+07
IN HOURS 0.876E+05
IN DAYS 0.365E+04
IN YEARS 9.99

NAPL SATURATIONS

SLICE 1

0.16919	0.16393	0.10423E-05	0.27756E-15	0.30531E-15	-0.16653E-15	0.30531E-15	-0.27756E-15
0.16568	0.15979	-0.24618E-05	-0.27756E-15	0.69389E-16	0.36082E-15	-0.69389E-16	-0.99920E-15
0.16012	0.15421	-0.63338E-06	0.63838E-15	0.45797E-15	0.12490E-15	-0.13878E-15	-0.87430E-15
0.15418	0.14824	0.30510E-05	-0.29143E-15	0.13878E-15	0.84655E-15	0.69389E-16	-0.73552E-15
0.14595	0.13795	0.81327E-05	0.19429E-15	-0.13878E-15	0.13878E-16	-0.34694E-15	-0.30531E-15
0.12733	0.11917	0.21366E-04	-0.26021E-15	0.26715E-15	-0.35388E-15	0.21511E-15	-0.79103E-15
0.10883	0.10001	0.26137E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10882	0.10002	0.36409E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10882	0.10002	0.46478E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10882	0.10002	0.56366E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10881	0.10002	0.65950E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10881	0.10002	0.75358E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10880	0.10003	0.84560E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10880	0.10003	0.94203E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10880	0.10003	0.98938E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.10879	0.10003	0.10745E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.10879	0.10003	0.11588E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.10877	0.10004	0.12416E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.10777	0.10003	0.11436E-03	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

RUN NAME .... Unsaturated-Saturated Infiltration of Tetrachloromethane (Carbon Tetrachloride)
DATE .... 8 May 1994 RUN NO RUN1

NUMBER OF BLOCKS IN THE X-DIRECTION (COLUMNS): 8
NUMBER OF BLOCKS IN THE Z-DIRECTION (LAYERS): 20
NUMBER OF BLOCKS IN THE Y-DIRECTION (SLICES): 1
MAXIMUM NUMBER OF NEWTON-RAPHSON ITERATIONS: 4
ESTIMATED BANDWIDTH: 0
MAXIMUM NUMBER OF TIME STEPS: 100
NUMBER OF TIME STEPS BETWEEN PRINTING OUTPUT: 1
MAXIMUM NUMBER OF SSOR ITERATIONS: 1

BALANCE ERROR (%) FOR CONTROL OF NEWTON-RAPHSON ITERATION: 0.200000E-01
INITIAL TIME (SECONDS): 0.000000
DENSITY OF WATER: 1000.00
DENSITY OF NONAQUEOUS FLUID: 1584.20
DYNAMIC VISCOSITY OF WATER: 0.100000E-02
DYNAMIC VISCOSITY OF NONAQUEOUS FLUID: 0.969000E-03
GRAVITATIONAL ACCELERATION (Z-DIRECTION): -9.80000
GRAVITATIONAL ACCELERATION (X-DIRECTION): 0.000000
SSOR CONVERGENCE TOLERANCE: 0.100000E-04
SSOR RELAXATION FACTOR: 1.00000

NUMBER OF PC VS KR TABLES: 1

DATA SET: 1

PC	SW	KRW	KRN
103425.000	-0.100	0.00000	1.00000
103425.000	0.000	0.00000	1.00000
103425.000	0.100	0.00000	0.82000
103425.000	0.200	0.00000	0.68000
27580.000	0.300	0.04000	0.55000
10343.000	0.400	0.10000	0.43000
7585.000	0.500	0.18000	0.31000
7447.000	0.600	0.30000	0.20000
7309.000	0.700	0.44000	0.12000
7171.000	0.800	0.60000	0.05000
7033.000	0.900	0.80000	0.00000
6895.000	1.000	1.00000	0.00000
6895.000	1.100	1.00000	0.00000

DATA SET: 1 PNWSWR: 0.680

PCAN	SAIR	PRNA	PRA
-98000.000	1.000	-0.32000	1.00000
0.000	0.000	0.68000	0.00000

1 PERMEABILITY SETS

SET 1 0.10000E-11 0.10000E-11 0.10000E-11

1 POROSITY SETS

SET 1 0.30000 0.10000E-14 0.00000

DX

1 1.00 2 1.90 3 3.61 4 6.86 5 13.0 6 24.8 7 47.0 8 89.4

DZ

1 0.250 2 0.250 3 0.250 4 0.250 5 0.250 6 0.250 7 0.250 8 0.250
9 0.250 10 0.250 11 0.250 12 0.250 13 0.250 14 0.250 15 0.250 16 0.250
17 0.250 18 0.250 19 0.250 20 0.250

DY

1 1.00

1 PROPERTY COMBINATION SETS

SET 1 1 1 1

NUMBER OF ACTIVE BLOCKS

SLICE 1 152

GRID BLOCK NUMBERS

ROW 1 1 2 3 4 5 6 7 8
ROW 2 9 10 11 12 13 14 15 16
ROW 3 17 18 19 20 21 22 23 24
ROW 4 25 26 27 28 29 30 31 32
ROW 5 33 34 35 36 37 38 39 40
ROW 6 41 42 43 44 45 46 47 48
ROW 7 49 50 51 52 53 54 55 56
ROW 8 57 58 59 60 61 62 63 64
ROW 9 65 66 67 68 69 70 71 72
ROW 10 73 74 75 76 77 78 79 80
ROW 11 81 82 83 84 85 86 87 88

ROW 12	89 90 91 92 93 94 95 96
ROW 13	97 98 99100101102103104
ROW 14	105106107108109110111112
ROW 15	113114115116117118119120
ROW 16	121122123124125126127128
ROW 17	129130131132133134135136
ROW 18	137138139140141142143144
ROW 19	145146147148149150151152
ROW 20	-1 -1 -1 -1 -1 -1 -1 -1

ALL GRID BLOCKS IN SAME PROPERTY CLASS

INITIAL NAPL PRESSURES

-14700.	-14700.	-14700.	-14700.	-14700.	-14700.	-14700.	-14700.
-12250.	-12250.	-12250.	-12250.	-12250.	-12250.	-12250.	-12250.
-9800.0	-9800.0	-9800.0	-9800.0	-9800.0	-9800.0	-9800.0	-9800.0
-7350.0	-7350.0	-7350.0	-7350.0	-7350.0	-7350.0	-7350.0	-7350.0
-4900.0	-4900.0	-4900.0	-4900.0	-4900.0	-4900.0	-4900.0	-4900.0
-2450.0	-2450.0	-2450.0	-2450.0	-2450.0	-2450.0	-2450.0	-2450.0
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2450.0	2450.0	2450.0	2450.0	2450.0	2450.0	2450.0	2450.0
4900.0	4900.0	4900.0	4900.0	4900.0	4900.0	4900.0	4900.0
7350.0	7350.0	7350.0	7350.0	7350.0	7350.0	7350.0	7350.0
9800.0	9800.0	9800.0	9800.0	9800.0	9800.0	9800.0	9800.0
12250.	12250.	12250.	12250.	12250.	12250.	12250.	12250.
14700.	14700.	14700.	14700.	14700.	14700.	14700.	14700.
17150.	17150.	17150.	17150.	17150.	17150.	17150.	17150.
19600.	19600.	19600.	19600.	19600.	19600.	19600.	19600.
22050.	22050.	22050.	22050.	22050.	22050.	22050.	22050.
24500.	24500.	24500.	24500.	24500.	24500.	24500.	24500.
26950.	26950.	26950.	26950.	26950.	26950.	26950.	26950.
29400.	29400.	29400.	29400.	29400.	29400.	29400.	29400.
31850.	31850.	31850.	31850.	31850.	31850.	31850.	31850.

INITIAL WATER SATURATIONS

0.85000	0.85000	0.85000	0.85000	0.85000	0.85000	0.85000	0.85000
0.87500	0.87500	0.87500	0.87500	0.87500	0.87500	0.87500	0.87500
0.90000	0.90000	0.90000	0.90000	0.90000	0.90000	0.90000	0.90000
0.92500	0.92500	0.92500	0.92500	0.92500	0.92500	0.92500	0.92500
0.95000	0.95000	0.95000	0.95000	0.95000	0.95000	0.95000	0.95000
0.97500	0.97500	0.97500	0.97500	0.97500	0.97500	0.97500	0.97500
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-134.75	0.00000
SOURCE/SINKS	127.01	12.139
STORAGE	7.7453	-12.139
PER CENT ERROR	-0.11289E-08	-0.38560E-10

STEP NUMBER 11
****

SIMULATION TIME	
IN SECONDS	0.217E+07
IN MINUTES	0.362E+05
IN HOURS	604.
IN DAYS	25.1
IN YEARS	0.688E-01

NAPL SATURATIONS

SLICE 1

0.17113	-0.25966E-01	-0.55511E-16	0.16653E-15	0.19429E-15	-0.13878E-15	-0.16653E-15	0.00000
0.16775	0.30131E-02	0.00000	-0.19429E-15	0.11102E-15	-0.69389E-16	0.27756E-16	0.15266E-15
0.16215	0.22368E-02	-0.19429E-15	-0.19429E-15	0.13878E-16	-0.41633E-16	-0.83267E-16	-0.27756E-16
0.15616	0.14688E-02	-0.27756E-16	-0.55511E-16	-0.15266E-15	-0.41633E-16	-0.83267E-16	0.69389E-16
0.14859	0.89709E-03	0.41633E-16	-0.97145E-16	-0.10408E-15	0.20817E-16	-0.20817E-16	0.18041E-15
0.13858	0.32917E-03	0.17694E-15	-0.20817E-16	0.34694E-17	-0.69389E-17	0.24286E-16	-0.27756E-16
0.12986	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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                        WATER BALANCE          NAPL BALANCE

    CONSTANT PRES        -146.58                -7.9833
    SOURCE/SINKS          142.98                 13.665
    STORAGE               3.6023                -5.6820
    PER CENT ERROR     -0.49463E-04           -0.22668E-05


        STEP NUMBER  28          SIMULATION TIME IN SECONDS 0.525E+07
        **************                         IN MINUTES 0.874E+05
                                               IN HOURS   0.146E+04
                                               IN DAYS     60.7
                                               IN YEARS   0.166

      NAPL SATURATIONS

  SLICE     1

0.17115    -0.19909E-01 0.22204E-15 0.38858E-15 0.55511E-16 0.00000    -0.11102E-15-0.55511E-16
0.16781     0.80393E-02 0.69389E-16-0.83267E-16-0.16653E-15 0.55511E-16-0.11102E-15 0.12490E-15
0.16222     0.70816E-02-0.37470E-15-0.16653E-15-0.97145E-16-0.27756E-16-0.22204E-15 0.20817E-15
0.15625     0.61241E-02-0.83267E-16-0.18041E-15-0.20817E-15-0.41633E-16-0.18041E-15 0.11102E-15
0.14870     0.52812E-02 0.55511E-16-0.90206E-16-0.17347E-15 0.41633E-16-0.41633E-15 0.10408E-15
0.13008     0.42020E-02 0.25327E-15 0.13878E-16-0.39552E-15-0.79797E-16 0.18041E-15 0.15266E-15
0.11165     0.36038E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11160     0.30642E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11154     0.29695E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11149     0.27166E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11144     0.23200E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11139     0.21513E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11134     0.16188E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11128     0.15380E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11123     0.12817E-02 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11120     0.87891E-03 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11124     0.69512E-03 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11105     0.42263E-03 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.10642     0.14408E-03 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000

                        WATER BALANCE          NAPL BALANCE

    CONSTANT PRES        -5100.6                -450.60
    SOURCE/SINKS          5078.8                 485.41
    STORAGE               21.850                -34.804
    PER CENT ERROR     -0.17576E-06           -0.29528E-08


        STEP NUMBER  37          SIMULATION TIME IN SECONDS 0.315E+08
        **************                         IN MINUTES 0.526E+06
                                               IN HOURS   0.876E+04
                                               IN DAYS     365.
                                               IN YEARS   0.999

      NAPL SATURATIONS

  SLICE     1

0.17117     0.23503E-01 0.22204E-15 0.30531E-15-0.55511E-16 0.13878E-15-0.11102E-15 0.00000
0.16784     0.44052E-01-0.69389E-16-0.55511E-16-0.20817E-15 0.15266E-15-0.13878E-15 0.13878E-15
0.16226     0.41816E-01-0.37470E-15-0.24980E-15-0.11102E-15-0.12490E-15-0.69389E-16 0.20817E-15
0.15630     0.39501E-01-0.16653E-15-0.83267E-16-0.26368E-15-0.27756E-16-0.18041E-15 0.15266E-15
0.14878     0.36731E-01 0.48572E-16 0.90206E-16-0.23592E-15 0.18735E-15-0.34694E-15 0.23592E-15
0.13018     0.31728E-01 0.27062E-15-0.76328E-16-0.53776E-15-0.10755E-15 0.19429E-15 0.72858E-16
0.11176     0.28237E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11172     0.27725E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11168     0.27558E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11164     0.27268E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11160     0.26866E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11156     0.26641E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11151     0.26134E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11147     0.25977E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11143     0.25685E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11139     0.25278E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11135     0.25043E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11130     0.24716E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.11019     0.22188E-01 0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000

                        WATER BALANCE          NAPL BALANCE

    CONSTANT PRES        -8836.3                -808.46
    SOURCE/SINKS          8814.9                 842.50
    STORAGE               21.371                -34.040
    PER CENT ERROR     -0.75431E-06           -0.43515E-08


        STEP NUMBER  45          SIMULATION TIME IN SECONDS 0.946E+08
        **************                         IN MINUTES 0.158E+07
                                               IN HOURS   0.263E+05
                                               IN DAYS    0.109E+04
                                               IN YEARS    3.00

      NAPL SATURATIONS

  SLICE     1

0.17118     0.90372E-01 0.19429E-15 0.27756E-15 0.83267E-16 0.13878E-15-0.27756E-16-0.13878E-15
0.16788     0.99815E-01 0.41633E-16-0.15266E-15-0.12490E-15 0.22204E-15-0.19429E-15-0.13878E-16
0.16232     0.95840E-01-0.49960E-15-0.34694E-15-0.24980E-15-0.26368E-15-0.13878E-16 0.97145E-16
0.15637     0.91652E-01-0.13878E-16 0.55511E-16-0.27756E-15-0.16653E-15-0.27756E-15 0.55511E-16
```

0.14890	0.86263E-01	0.83267E-16	0.90206E-16	-0.33307E-15	0.28449E-15	-0.49960E-15	0.18735E-15
0.13032	0.75196E-01	0.34001E-15	-0.58981E-16	-0.44062E-15	-0.21858E-15	0.24980E-15	0.69389E-16
0.11193	0.66426E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11191	0.66061E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11188	0.65884E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11186	0.65641E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11184	0.65336E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11182	0.65128E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11179	0.64766E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11177	0.64595E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11175	0.64350E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11172	0.64043E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11170	0.63831E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11166	0.63535E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11053	0.58883E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-8826.8	-823.59
SOURCE/SINKS	8814.9	842.50
STORAGE	11.870	-18.906
PER CENT ERROR	-0.21541E-06	-0.68043E-09

STEP NUMBER 53 SIMULATION TIME IN SECONDS 0.158E+09
****
IN MINUTES 0.263E+07
IN HOURS 0.438E+05
IN DAYS 0.182E+04
IN YEARS 5.00

NAPL SATURATIONS

SLICE 1

0.17120	0.12713	0.11102E-15	0.16653E-15	0.55511E-16	0.11102E-15	0.27756E-16	-0.27756E-15
0.16790	0.13064	-0.41633E-16	-0.55511E-16	-0.24980E-15	0.24980E-15	-0.30531E-15	-0.11102E-15
0.16235	0.12584	-0.63838E-15	-0.44409E-15	-0.26368E-15	-0.26368E-15	0.97145E-16	0.11102E-15
0.15641	0.12075	0.13878E-16	-0.27756E-16	-0.41633E-15	-0.29143E-15	-0.30531E-15	0.00000
0.14897	0.11416	0.90206E-16	0.90206E-16	0.31225E-15	0.40939E-15	-0.51348E-15	0.13878E-15
0.13040	0.99735E-01	0.28796E-15	-0.45103E-16	-0.50307E-15	-0.65919E-16	0.29143E-15	-0.62450E-16
0.11202	0.87418E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11201	0.87185E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11200	0.87055E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11199	0.86889E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11197	0.86690E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11196	0.86544E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11195	0.86314E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11194	0.86189E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11192	0.86024E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11191	0.85825E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11190	0.85678E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11187	0.85466E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11073	0.80790E-01	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

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	WATER BALANCE	NAPL BALANCE
CONSTANT PRES	-26988.	-2574.0
SOURCE/SINKS	26985.	2579.1
STORAGE	3.1597	-5.0723
PER CENT ERROR	0.16848E-02	-0.42226E-03

STEP NUMBER 63 SIMULATION TIME IN SECONDS 0.315E+09
****
IN MINUTES 0.526E+07
IN HOURS 0.876E+05
IN DAYS 0.365E+04
IN YEARS 9.99

NAPL SATURATIONS

SLICE 1

0.17120	0.16071	0.27756E-15	0.27756E-15	0.83267E-16	0.16653E-15	0.19429E-15	-0.38858E-15
0.16792	0.15898	-0.41633E-16	0.41633E-16	-0.97145E-16	0.37470E-15	-0.34694E-15	-0.26368E-15
0.16238	0.15354	-0.69389E-15	-0.70777E-15	-0.24980E-15	-0.29143E-15	0.18041E-15	0.00000
0.15645	0.14773	0.41633E-16	0.69389E-16	0.36082E-15	-0.24980E-15	-0.15266E-15	-0.97145E-16
0.14904	0.14036	0.14572E-15	-0.48572E-16	-0.34001E-15	0.24980E-15	-0.38164E-15	0.90206E-16
0.13048	0.11917	0.36766E-05	0.62450E-16	-0.59674E-15	-0.24286E-16	0.36429E-15	-0.17694E-15
0.11211	0.10001	0.98171E-05	0.00000	0.00000	0.00000	0.00000	0.00000
0.11210	0.10001	0.16259E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11210	0.10001	0.22608E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11209	0.10002	0.28860E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11208	0.10002	0.35008E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11208	0.10002	0.41071E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11207	0.10003	0.47025E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11207	0.10003	0.52903E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11206	0.10003	0.58694E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11205	0.10003	0.64390E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11205	0.10004	0.70006E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11203	0.10004	0.75506E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.11088	0.10004	0.35764E-04	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

VITA

David Alan Balthazor

Candidate for the Degree of

Master of Science

Thesis: AN EXAMINATION OF DENSITY AND VISCOSITY DEPENDENT INFILTRATION OF IMMISCIBLE NONAQUEOUS PHASE LIQUIDS USING THE NUMERICAL MODEL "SWANFLOW"

Major Field: Civil Engineering

Biographical:

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