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Item	Qty	Price	Total
VENT2D		free*	
VENT3D		$495	
SUBTOTAL			
SALES TAX 7% NV Residents only			
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Notes:
*http://www.hydro.unr.edu/home-pages/benson/v2d.html

Student discounts are available.

David A. Benson
624 Manor Dr.
Reno, NV 89509

VENT2D & VENT3D

Finite-difference models of multi-compound vapor transport and phase distribution

Do you want to model vapor extraction at a site with:

- A multi-compound NAPL in the soil, or
- Spatially variable permeability or contaminant distribution?

Then you need a model that:

- Predicts vapor velocities
- Transports a multitude of vapor-phase compounds
- Handles NAPL as a mass source/sink and
- Runs quickly and efficiently.

VENT2D AND VENT3D:

- Solve the soil-gas pressure distribution, and 2-D or 3-D vapor velocities on a grid;
- Simultaneously transport all vaporous compounds including water;
- Explicitly calculate the 4-phase partitioning (vapor, dissolved, adsorbed, and NAPL) at all nodes;
- Provide maps of total VOCs and all specified individual VOCs in soil and soil vapor; and,
- Provide several gasoline compositions listed in the literature.

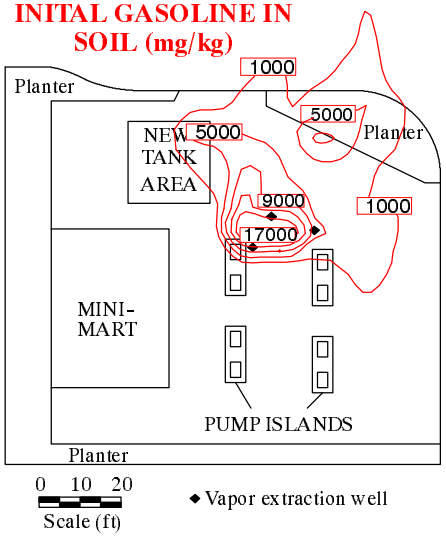
For additional reference material see:

Benson, D. A., D. Huntley, and P. C. Johnson, Modeling vapor extraction and general transport in the presence of NAPL mixtures and nonideal conditions. Ground Water, v. 31, no. 3, pp. 437-445, 1993.

Johnson, P. C., Stanley, C. C., Byers, D. L., Benson, D. A., and Acton, M. A., Soil venting at a California site: Field data reconciled with theory, *Hydrocarbon Contaminated Soils and Groundwater*, V. 1, Lewis Publishers, Chelsea, MI., 1992.

U.S. E.P.A., Review of mathematical modeling for evaluating soil vapor extraction systems, EPA/540/R-95/513, July 1995.

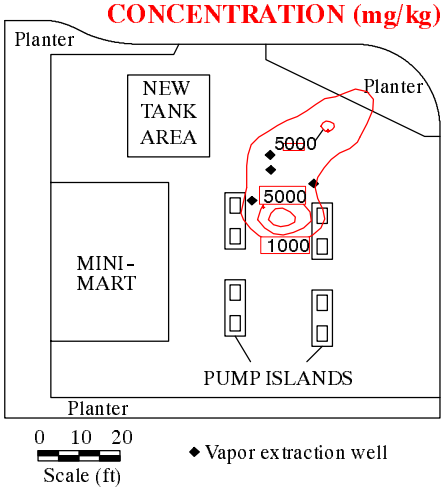
INITAL GASOLINE IN SOIL (mg/kg)



EXTRACT 25 CFM OF SOIL GAS FOR 900 DAYS

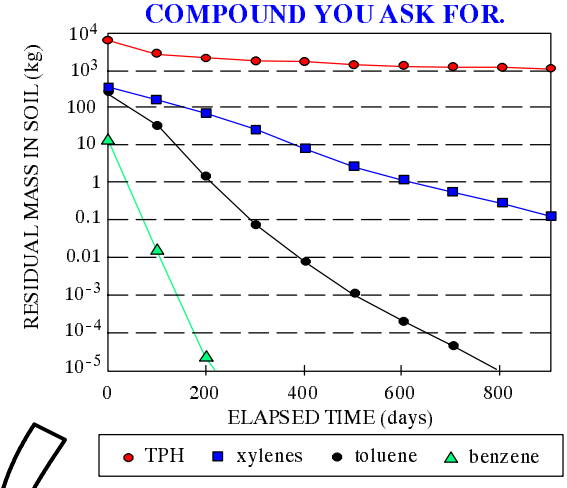
(Actual site data taken from Johnson et al [1992] and AGI [1988] and modeled with VENT2D. See U.S.E.P.A. [1995] for details.)

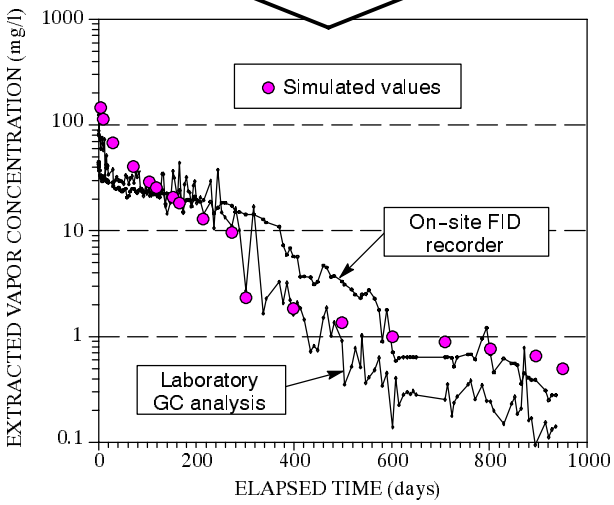
MODELED FINAL TPH CONCENTRATION (mg/kg)



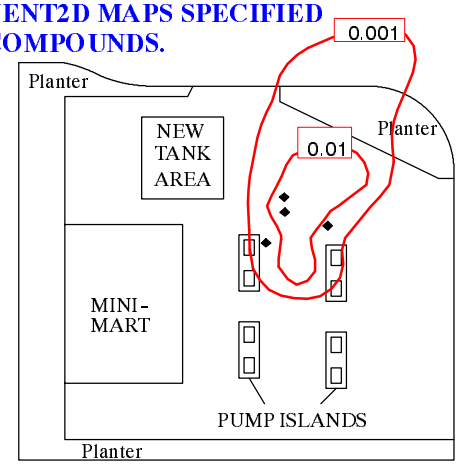
PREDICT THE VOC VAPOR CONCENTRATIONS

IS VENTING MORE EFFECTIVE FOR CERTAIN COMPOUNDS? VENT2D KEEPS TRACK OF ANY COMPOUND YOU ASK FOR.





WHERE WILL THE "HOT-SPOTS" BE? VENT2D MAPS SPECIFIED COMPOUNDS.



◆ Vapor extraction well

MODELED BENZENE IN SOIL (mg/kg) AT 275 DAYS

VENT2D FEATURES:

- Solves the advection/diffusion equation with 4-phase partitioning (vapor, dissolved, sorbed, NAPL)
- Compact and fast: simplified vapor transport solution runs in 640 Kbytes
- User-specified permeability, leakage and initial VOC concentration distributions (or homogeneous domains)
- 900 nodes × 50 compounds maximum size
- Utility programs translate SURFER grids to ASCII maps and vice-versa
- Spreadsheet included with 3 gasoline compositions

ADDITIONAL VENT3D FEATURES:

- Third-order vapor transport algorithm for sharp fronts at very high grid Peclet numbers
- User-specified dispersion/diffusion calculation for faster and/or more accurate modeling
- Adjustable dimensions allow huge grids
- New distributed variables on layers: moisture content, porosity, organic carbon content