

Proceedings of the NWWA/API Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water—Prevention, Detection and Restoration

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TABLE OF CONTENT

Conference Coordinating Committee.....	1
Acknowledgments.....	1
Abstract.....	11

SESSION I PREVENTION OF GROUND WATER CONTAMINATION

Industry Training and Education in Spill Prevention (...Detection and Response)	
--Fred E. Brostoff.....	1
Qualitative Risk Assessment Applications to Hazardous Waste Site Evaluations	
--M.P. Eichelberger, K.C. Bishop, and D.T. Mack.....	11
An Underground Tank Spill Prevention Program	
--Daniel F. Predpall, Warren Rogers, and Alan Lamont.....	17
A Regulator's Perspective on Prevention of Leaks from Underground Storage Systems	
--Marcel Moreau.....	33

SESSION II TRANSPORT AND FATE

A. MIGRATION OF PETROLEUM HYDROCARBONS AND ORGANIC CHEMICALS IN GROUND WATER

Subsurface Gasoline Migration Perpendicular to Ground Water Gradients: A Case Study	
--Donald K. Reichmuth.....	43
Migration, Entrapment and Treatment of Subsurface Oil Under Bank Inflow/Outflow Conditions Near a Major River	
--Kenneth A. Sylvester.....	53

DO 074388
CONFIDENTIAL

**B. MICROBIAL DEGRADATION AND PHYSICAL/CHEMICAL TRANSFORMATION
IN THE SUBSURFACE**

Biotransformation of Organic Micropollutants in the Subsurface	
--Edward J. Bouwer.....	66
Degradation of Petroleum Fractions from Oil Refinery Wastes: A Land Treatment Study	
--K.M. Bagawandoss, L.E. Streebin, J.M. Robertson, and P.T. Bowen.....	82
Influence of Chemical Species on Mobility of Subsurface Organic Arsenic Contamination	
--Dennis E. Reece, Alan D. Husak, Robert I. Chapin, Edwin A. Woolson, and Paul J. Mastradone.....	99
Determination of the Contaminant Source Strength from Mass Exchange Processes at the Petroleum/Ground Water Interface in Shallow Aquifer Systems	
--Hans-Olaf Pfannkuch.....	111

C. PRACTICAL APPLICATIONS OF GROUND WATER MODELS

Modeling the Migration and Biodegradation of Hydrocarbons Derived from a Wood-Creosoting Process Waste	
--R.C. Borden, M.D. Lee, J.T. Wilson, C.H. Ward, and P.B. Bedient.....	130
A Predictive Model for Pollution from Gasoline in Soils and Ground Water	
--Arthur Kuehr and M.Yavuz Corapcioglu.....	144

SESSION III

DETECTION

A. DETECTING AND DELINEATING UNDERGROUND SPILLS

Leak Detection and Verification for Underground Tanks and Surface Impoundments	
--Robert D. Morrison and John L. Irwin.....	159
Remote Detection of Volatile Organic Contaminants in Ground Water Via Shallow Soil Gas Sampling	
--Donn L. Marrin and Glenn M. Thompson.....	172
Use of the Electrical Resistivity Technique to Delineate a Hydrocarbon Spill in the Coastal Plain Deposits of New Jersey	
of the New Jersey Coastal Plain: A Case Study	
--Karl G. Andres and Robert Canace.....	188

DO 074389
CONFIDENTIAL

B. GROUND WATER MONITORING PROGRAM DESIGN AND IMPLEMENTATION

Ground Water Monitoring Well Network Redesign	
--Eric F. Wood and Dennis McLaughlin.....	198
RCRA Ground Water Monitoring Statistical	
Comparisons: A Better Version of the	
Student's t-Test	
--M.D. Miller and F.C. Kohout.....	210
Maximizing the Statistical Performance of	
Ground Water Monitoring Systems	
--Lauren Ross and Richard Elton.....	224

C. ANALYTICAL TECHNIQUES FOR CONTAMINANT IDENTIFICATION

Capillary and Packed-Column Gas Chromatography of	
Gasoline Hydrocarbons and EDB	
--Clifford J. Bruell and George E. Hoag.....	234
Migration Rates of Volatiles from Buried	
Hydrocarbon Sources Through Soil Media	
--Ramon E. Bisque.....	267

SESSION IV RESTORATION

A. DESIGN AND OPERATION OF CONTAMINANT RECOVERY SYSTEMS

Is Physical Displacement of Residual	
Hydrocarbons a Realistic Possibility in	
Aquifer Restoration?	
--John L. Wilson and Stephen H. Conrad.....	274
Hydrocarbon Retrieval and Apparent Hydrocarbon	
Thickness: Interrelationships to Recharging/	
Discharging Aquifer Conditions	
--Paul M. Yanida.....	299
Recovery of Hydrocarbons from Limestone Aquifers	
and the Dangers of Pumping Ground Water During	
Recovery Operations	
--Joseph T. McNally.....	330
Recovery of Petroleum Product Within a Complex	
Hydrogeologic Environment	
--Matthew G. Dalton, Ronald Wilson, and C. Hugh Thompson....	344
Air Operated Pumping System for Recovery	
of Lighter-Than-Water Contaminants	
--Tony Godel.....	353

DO 074390
CONFIDENTIAL

Recovery of Subsurface Hydrocarbons at an
Asphalt Plant: Results of a Five-Year Monitoring
Program

- M.J. O'Connor, A.M. Wofford, and S.K. Ray.....359
Unique Technology Applied to the Cleanup of
Hydrocarbon Product from a Low Permeability
Formation in a Residential Neighborhood,
St. Paul, Minnesota
--Michael R. Burke and Dan C. Buzea.....377
Design of Hydrocarbon Recovery System,
Miami International Airport
--Charles I. Mansur and Jeffrey L. Fouse.....400

B. THE ROLE OF ENHANCED BIODEGRADATION IN RESTORATION

Accelerated Aquifer Restoration: In-Situ
Applied Techniques For Enhanced Free
Product Recovery/Adsorbed Hydrocarbon
Reduction Via Bioreclamation

- Paul M. Yaniga and James Muley.....421
Oxygen Transport in Contaminated Aquifers
with Hydrogen Peroxide
--R.A. Brown, R.D. Norris, and R.L. Raymond.....441
Aquifer Restoration Via Accelerated In Situ
Biodegradation of Organic Contaminants
--Paul M. Yaniga and William Smith.....451

C. CONTROL OF SUBSURFACE HYDROCARBON VAPORS

Induced Soil Venting for Recovery/Restoration
of Gasoline Hydrocarbons in the Vadose Zone

- Michael C. Marley and George E. Hoag.....473
Abatement of Hydrocarbon Vapors in Buildings
--Lloyd E. Dunlap.....504
Practical Experience in the Management of
Hydrocarbon Vapors in the Subsurface
--M.J. O'Connor, J.G. Agar, and R.D. King.....519

DO 074391
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16. ABSTRACT Many hazardous substances and mixtures are immiscible with and more dense than water. When spillages or releases into waterbodies occur, the hazardous materials will disperse in a pattern controlled by physical properties of the material, flow and dispersion effects, and topography of the waterbody bed. Mapping (i.e., location and thickness determination) of the spilled substance is essential for prompt and economical removal to protect birlta and ensure minimal contamination of water. Analysis of the reflection patterns of acoustic waves (i.e., 200 kHz) beamed into the water from a boat is shown in this and in previous work to serve as an excellent mapping technique. To properly plot pollutant pool location and depth, the coordinates of the boat position must also be determined. As the acoustic pulse passes through the water, pollutant, and sediment, reflected waves are generated at each interface (water/pollutant; pollutant/sediment). Depth (thickness) is computed from acoustical parameters and from the times between the transmission of the pulse and the detection of the reflected pulses (echoes). The depth and precision of detection is ultimately limited by the attenuation and dispersion of the echoes. By placing the transmitter/detector element at known depths below the boat, detection depth is almost unlimited and the detectable thickness of the pollutant can be as small as 1 cm. When the project to map pollutants was initiated, no suitable commercial devices were available. A very effective, portable, battery-operated prototype system was constructed. The reflection data (intensity vs time) were displayed on an on-board dual-trace oscilloscope that had time-delay features. Subsequently, a suitable commercial system was test marketed and has been successfully used in the field to locate crevices in a waterbody. Readout is on chart paper. The instrument is operated from a boat, which follows a scanning pattern at speeds up to 8 km/hr (5 mph) for gross evaluation and at much slower speeds for accurate measurements. Once a pool is located, the position can be confirmed by recording the readings from a conductivity meter as the sensor is lowered into (or raised from) the water body. Actual samples of the pollutant can be acquired by standard techniques.		
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