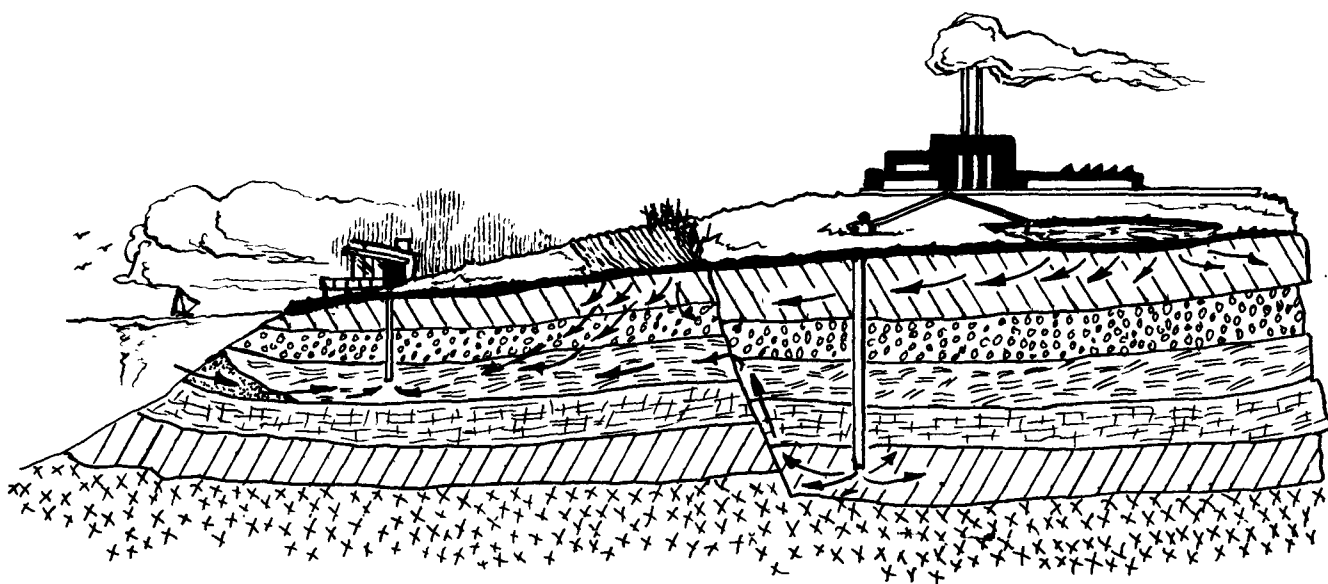




OFFICE OF WATER PROGRAMS

# **Subsurface Water Pollution A Selective Annotated Bibliography**

## **Part III Percolation from Surface Sources**



U.S. ENVIRONMENTAL PROTECTION AGENCY

SUBSURFACE WATER POLLUTION

A Selective

Annotated Bibliography

PART III

PERCOLATION FROM SURFACE SOURCES

Produced in cooperation with  
Water Resources Scientific Information Center  
Office of Water Resources Research  
U.S. DEPARTMENT OF THE INTERIOR

U.S. ENVIRONMENTAL PROTECTION AGENCY  
Office of Water Programs  
Division of Applied Technology  
Water Quality Protection Branch  
Fresh Water Pollution Section  
Washington, D.C. 20460

March 1972



## FOREWORD

Subsurface Water Pollution is a selective bibliography produced by the Fresh Water Pollution Section, Office of Water Programs, Environmental Protection Agency from the computerized data base of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior. This bibliography represents published research in water resources as abstracted and indexed in the semimonthly journal, Selected Water Resources Abstracts (SWRA). This bibliography represents a search of a 33,980-item data base, covering SWRA from October 1968 through December 1971, and is published in three parts. Part I covers pollution associated with subsurface waste injection, Part II covers pollution associated with saline water intrusion, and Part III covers pollution associated with percolation from surface sources.





# SUBSURFACE WATER POLLUTION

## A Selective Annotated Bibliography

### INTRODUCTION

Ground water in the United States has historically been a quantitatively minor water source whose chief role was in individual homes or small communities. Today, ground water accounts for nearly 20 percent of the Nation's requirements for water, and has been viewed by some as the answer to the Nation's water supply problems. The problems associated with ground water management and its use in satisfying the future's enormous needs for water storage and supply are extremely complex. Other than basic relationships describing flow due to differences in gravity head; predictive relationships for mixing, flow times, dispersion, and stratification are only poorly developed. The concept of irreversibility in ground water pollution is widely accepted. Once an aquifer has been contaminated, it is difficult or infeasible to flush or pump out the contaminants and restore the aquifer to its original quality. To assure the continuing availability of large volumes of water of acceptable quality, research and technology must combine efforts to fill the basic knowledge gaps in the earth sciences that allow understanding and prediction of the causes and effects of subsurface water pollution.

Sources of ground water pollution generally fall into one of three distinct categories: 1) subsurface waste injection, 2) intrusion of saline water into fresh water aquifers, and 3) percolation from surface sources. Accordingly, this bibliography is divided into the same three basic categories. Within each category, the bibliography references articles pertaining to technology for prevention and control of pollution, documented cases of pollution, litigation, and laws and regulations affecting subsurface disposal of wastes.

Because the various aspects of the problems of ground water pollution cover a wide spectrum of science and engineering, articles bearing on the subject are widely dispersed in the scientific and technical literature. It is hoped that this bibliography will serve as a handy reference for scientists, engineers, and managers concerned with protection of the subsurface environment.

Selections in this bibliography were made by Clinton W. Hall, Geologist, Fresh Water Pollution Section, Office of Water Programs, Environmental Protection Agency.

## ARRANGEMENT

### Significant Descriptor Index

This index (blue pages) is made up of a fraction of the descriptors and identifiers by which each paper in this bibliography has been indexed, and represents weighted terms (indicated by asterisks) that best describe the information content.

### Bibliography

Subsurface Water Pollution is divided into three sections: 1) pollution associated with the deliberate injection of wastes below the water table, 2) pollution associated with the intrusion of saline waters into fresh water aquifers, and 3) pollution associated with the percolation of wastes from surface sources. In each section, the bibliography contains references to technology dealing with the prevention or abatement of pollution, litigation pertaining to incidences of pollution, and laws and regulations pertaining to the construction and operation of subsurface waste disposal facilities. Abstracts in each section are listed in ascending order according to accession number.

### Comprehensive Index

This index (yellow pages) is subdivided into three sections, corresponding to the subdivisions of the bibliography, and represents all of the descriptors and identifiers by which each paper has been indexed. Through permutation, each word in a multiple-word descriptor or identifier is made to file in its normal alphabetic order, thus affording a multiple access to each abstract.

## USING THE INDEXES

Having thought of a few key words describing your subject matter of interest, scan the indexes for their presence. The number in the right margin locates the full record in the bibliography section, which is arranged in ascending accession number sequence.

#### AVAILABILITY OF COPIES

Neither the Environmental Protection Agency nor the Water Resources Scientific Information Center supplies copies of documents listed in this bibliography. Some of the documents are shown to be available from the National Technical Information Service, Springfield, Virginia 22151. PB numbers should be included with all orders. Other reports may be obtained from publishers or from local libraries on loan or in reproduction.

Copies of this bibliography can be purchased from the National Technical Information Service, Springfield, Virginia 22151 at \$3.00 each in paper copy or 95¢ in microfiche.



## CONTENTS

	Page
FOREWORD	i
INTRODUCTION	iii
ARRANGEMENT	iv
SIGNIFICANT DESCRIPTOR INDEX (blue pages)	1
BIBLIOGRAPHY	9
COMPREHENSIVE INDEX (yellow pages)	117

## SIGNIFICANT DESCRIPTOR INDEX





BOLISM, MOBILITY, PARTICULATE F/	*AGRICULTURAL DRAINAGE, LAKE META	W71-06443
POLLUTION SOURCES, *GROUNDWATER,	*AGRICULTURAL POLLUTANTS.:	W71-04121
ACE DRAINAGE, *DRAINAGE, *EUTRO/	*AGRICULTURAL CHEMICALS, FERTILIZ	W71-04121
NUTRIENTS, WATER MIXING, RUSSI/	*AGRICULTURAL WATERSHED, *SUBSURF	W70-04504
ABORATORY / *PATH OF POLLUTANTS,	*AGRICULTURAL DRAINAGE, DISSOLVED	W70-04504
NTS, *GROUNDWATER/ *SURFACTANTS,	*ALDRIN, *GROUNDWATER MOVEMENT, L	W70-01904
T/ *INFILTRATION, *POROUS MEDIA,	*ALKYBENZENE SULFONATES, *DETERGE	W70-01291
S, *CORES, FIELDS, P/ *NITRATES,	*ALLUVIUM, *LYSIMETERS, *RADIOISO	W69-02681
*NUTRIENTS, *SOILS, *LEACHING,	*AMMONIA, *WATER POLLUTION SOURCE	W70-04488
N, WASTE DISPOS/ *CONTAMINATION,	*AQUIFER CHARACTERISTICS, SOIL AN	W71-07887
E, *CALIFORNIA, WATER YIELD, IN/	*AQUIFERS, CONVECTION, *DISPERSIO	W69-00651
ADING, *WATER REUSE, *TERTIARY /	*ARTIFICIAL RECHARGE, *WATER REUS	W70-05466
LAIMED WATER, *MUNICIPAL WASTES,	*ARTIFICIAL RECHARGE, *WATER SPRE	W70-04712
FILTRATION, *PIT RECHARGE, *WAT/	*ARTIFICIAL RECHARGE, LEGAL ASPEC	W69-08620
ND-WATER, WATER POLLU/ *VIRUSES,	*ARTIFICIAL RECHARGE, *INDUCED IN	W71-12410
*WATER POLLUTION, *WOOD WASTES,	*BACTERIOPHAGE, PERCOLATION, GROU	W69-00225
, *WOOD WASTES, *BARK, *LIGNINS,	*BARK, *LIGNINS, *BIOCHEMICAL OXY	W68-01269
EWAGE DISPOSAL, ORGANIC LOADING,	*BIOCHEMICAL OXYGEN DEMAND, LEACH	W68-01269
TIFICIAL RECHARGE, *WATER REUSE,	*BIODEGRADATION, SOIL DISPOSAL FI	W68-01010
C BACTERIA, NITRATES, CHLORIDES,	*CALIFORNIA, WATER YIELD, INFILTR	W70-05466
ION SOURCES, PATH/ *FARM WASTES,	*CAPILLARY CONDUCTIVITY, SOIL MOI	W69-01076
AQUIFER, DISCHARG/ *FARM WASTES,	*CATTLE, *LEACHING, *WATER POLLUT	W70-00665
*GROUNDWATER POLLUTION,	*CATTLE, *GROUNDWATER, *NITRATE,	W71-03543
STE WATER DISPOSAL, *IRRIGATION,	*CENTRAL VALLEY(CALIF).:	W71-04548
WATER CHEMISTRY, *WATER QUALITY,	*CHEMICAL WASTES, SPRINKLER IRRIG	W69-07114
NT, PERCOLATION, *MODEL STUDIES,	*CLIMATES, *LAND USE, *OKLAHOMA,	W70-06102
NDU/ *WATER MANAGEMENT(APPLIED),	*COMPUTER PROGRAMS.: /G, MANAGEME	W71-09936
SEEPAGE, *POLLUTION, JUDICIAL D/	*CONJUNCTIVE USE, *STREAMFLOW, *I	W70-03102
SURFACE WATERS, SURFA/ *FLORIDA,	*CONNECTICUT, *OILY WATER, *UNDER	W70-07631
TION, *DISPERSION, WASTE DISPOS/	*CONSUMPTIVE USE, *GROUNDWATER, *	W70-00532
D FLOW, *DIFFUSION, *DISPERSION,	*CONTAMINATION, *AQUIFERS, CONVEC	W69-00651
*TRITIUM, *TRACERS, *LEACHING,	*CONVECTION, *GROUNDWATER MOVEMEN	W69-08921
MONIA, *WATER POLLUTION SOURCES,	*COPPER, *WASTE DUMPS, MINE WASTE	W71-11255
WATER POLLUTION/ *WATER QUALITY,	*CORES, FIELDS, PLANTS, ALFALFA,	W70-04488
BON POLLUTION.:	*CROP PRODUCTION, *FERTILIZERS, *	W71-12084
NGTON, *WATER POLLUTION SOURCES,	*DAMAGES(LEGAL ASPECTS), HYDROCAR	W68-00627
CTANTS, *ALKYBENZENE SULFONATES,	*DAMAGES, *WATER WELL, IMPAIRED W	W71-13645
-WATER ENVIRONMENT, ANIONIC SUR/	*DETERGENTS, *GROUNDWATER MOVEMEN	W70-01291
, *RETURN FLOW, *DRAINAGE WATER,	*DETERGENT BEHAVIOR(WATER), *SOIL	W70-01291
ON SOURCES, *PATH OF POLLUTANTS,	*DETERIORATION, *WATER POLLUTION	W71-06063
UNDWATER, WASTES, *UNIFORM FLOW,	*DIFFUSION, *SOIL WATER MOVEMENT,	W70-10058
LLUTANTS, *GROUNDWATER MOVEMENT,	*DIFFUSION, POROUS MATERIALS, *EN	W69-01238
ION, *GROUNDWA/ *SATURATED FLOW,	*DIFFUSION, *DISPERSION, *MATHEMA	W69-07554
DWATER MOVEMENT, *PATH OF POLLU/	*DIFFUSION, *DISPERSION, *CONVECT	W69-08921
DWATER MOVEMENT, */ *DISPERSION,	*DIFFUSION, *POROUS MEDIA, *GROUN	W69-03212
COMPUTER PROGRAMS, DIFFUSION, /	*DIFFUSION, *POROUS MEDIA, *GROUN	W69-03237
ISOTOPES, *GROUNDWATER MOVEMENT,	*DISPERISON, *NUMERICAL ANALYSIS,	W71-09611
T, *NUMER/ *SIMULATION ANALYSIS,	*DISPERSION, *ION EXCHANGE, DIFFU	W71-11356
WA/ *SATURATED FLOW, *DIFFUSION,	*DISPERSION, *GROUNDWATER MOVEMEN	W71-04559
MEDIA, *GROUNDWATER MOVEMENT, */	*DISPERSION, *CONVECTION, *GROUND	W69-08921
ROUNDWATER MOVEMENT, *DIFFUSION,	*DISPERSION, *DIFFUSION, *POROUS	W69-03237
GROUNDWATER, WASTES, *UNIFORM F/	*DISPERSION, *MATHEMATICAL MODELS	W69-07554
MINATION, *AQUIFERS, CONVECTION,	*DISPERSION, FLOW, POROUS MEDIA,	W69-01238
*IRRIGATION WATER, *RETURN FLOW,	*DISPERSION, WASTE DISPOSAL, THER	W69-00651
WATERSHED, *SUBSURFACE DRAINAGE,	*DRAINAGE WATER, *DETERIORATION,	W71-06063
W, *DIFFUSION, POROUS MATERIALS,	*DRAINAGE, *EUTROPHICATION, NITRO	W70-04504
*SUBSURFACE DRAINAGE, *DRAINAGE,	*ENGINEERING MECHANICS.: /ORM FLO	W69-01238
PHORUS, NUTRIENTS, ALGAE, NITRA/	*EUTROPHICATION, NITROGEN, PHOSPH	W70-04504
	*EUTROPHICATION, *NITROGEN, *PHOS	W71-06443

M WASTES, NUTRIENTS, DENITRIFICATION, \*NUCLEAR, \*RADIOECOLOGICAL, \*NITRATE, AQUIFER, DISCHARGE, \*GR/ \*PATH OF POLLUTANTS, DWATER, PRECIPITATION, / \*SOILS, \*FERTILIZERS, \*NITRATES, WATER/ \*WATER POLLUTION SOURCES, PATH/

ED FLOORS, AERATOR, SPREADING, / LEY.:

ARM WASTES, \*SOIL CONTAMINATION, ITATION, / \*SOILS, \*FARM WASTES, WATER QUALITY, \*CROP PRODUCTION, \*PIT RECHARGE, \*WATER TREATMENT,

NTROL, \*WATER POLLUTION SOURCES, NDWATER, \*SURFACE WATERS, SURFA/ OF POLLUTANTS/ \*WASTE DISPOSAL, LLUTANTS, \*LEACHING, \*LANDFILLS, ELLS, GROUNDWATER/ \*RHODE ISLAND, ES, JU/ \*NEW YORK, \*WATER WELLS, TIGATIONS, \*SOIL INVESTIGATIONS, HELATE EXTRACTION, ATOMIC ABSOR/ CLAMATION, INDUCED INFILTRATION, CLAMATION, INDUCED INFILTRATION, POROSITY, CLOSED CONDUIT FLOW, R, \*SEEPAGE, / \*WATER POLLUTION, USION, \*DISPERSION, \*CONVECTION, \*DISPERS/ \*PATH OF POLLUTANTS, NDFILL, SANITA/ \*WASTE DISPOSAL, OLLU/ \*DIFFUSION, \*POROUS MEDIA, \*PATHOGENIC BACTERIA, \*VIRUSES, SION, \*DIFFUSION, \*POROUS MEDIA, TABLE, \*SURFACE-GROUNDWATER RE/ RFA/ \*FLORIDA, \*CONSUMPTIVE USE, S, \*SOLID WAS/ \*WATER POLLUTION, / \*PATH OF POLLUTANTS, \*ALDRIN, BENZENE SULFONATES, \*DETERGENTS, ATION TECHNIQ/ \*WATER POLLUTION, ING, \*LANDFILLS, \*GARBAGE DUMPS, LEACHING, \*SALINE WATER SYSTEMS, CHING, \*LANDFILLS, \*PERCOLATION, ION SOURCES, \*INDUSTRIAL WASTES, H OF POLLUTANTS, \*RADIOISOTOPES, HASTIC PROCESSES, \*POROUS MEDIA, OIL WATER MOVEMENT, \*OILY WATER, WATER POLLUTION CONTR/ \*WYOMING, ON, \*WATER QUALITY, \*MONITORING, DISCHARGE/ \*FARM WASTES, \*CATTLE, I/ \*WATER QUALITY, \*RETURN FLOW, ASTES, \*WATER POLLUTION SOURCES, VALLEY(CALIF).:

IMULATION ANALYSIS, \*DISPERSION, POLLUTION EFFECTS.: DUMPS, \*SOLID WASTES, \*LEACHING, ES, OILY/ \*KENTUCKY, \*OIL WELLS, N FLOW, \*SALINE WATER INTRUSION, ATER / \*WATER POLLUTION SOURCES, UTION EFFECTS, \*SODIUM CHLORIDE, AVA(CZECHOSLOVAKIA).:

\*EUTROPHICATION, FERTILIZERS, FAR \*FALLOUT, \*LEACHING, \*PATH OF POL \*FARM WASTES, \*CATTLE, \*GROUNDWAT \*FARM WASTES, \*WATER POLLUTION SO \*FARM WASTES, \*FERTILIZERS, GROUN \*FARM WASTES, \*SOIL CONTAMINATION \*FARM WASTES, \*CATTLE, \*LEACHING, \*FEEDLOT, PLATTE RIVER VALLEY.: \*FEEDLOTS, OXIDATION DITCH, SLOTT \*FEEDLOTS, SOUTH PLATTE RIVER VAL \*FERTILIZERS, \*NITRATES, WATER PO \*FERTILIZERS, GROUNDWATER, PRECIP \*FERTILIZERS, \*WATER POLLUTION SO \*FILTRATION, ALLUVIA CHANNELS, SUR \*FINITE DIFFERENCE METHOD.: \*FISHKILL, STORM RUNOFF, ODOR, SU \*FLORIDA, \*CONSUMPTIVE USE, \*GROU \*GARBAGE DUMPS, \*LANDFILLS, \*PATH \*GARBAGE DUMPS, \*GROUNDWATER MOVE \*GASOLINE, \*PERCOLATING WATER, \*W \*GASOLINE, \*WATER POLLUTION SOURC \*GEOLOGIC INVESTIGATIONS, \*ILLINO \*GROUND WATER, \*TRACE ELEMENTS, C \*GROUND WATER RECHARGE, IRRIGATIO \*GROUND WATER RECHARGE, IRRIGATIO \*GROUND WATER MOVEMENT, CAPILLARY \*GROUNDWATER RECHARGE, GROUNDWATE \*GROUNDWATER MOVEMENT, SOLUTES, W \*GROUNDWATER MOVEMENT, \*DIFFUSION \*GROUNDWATER, \*WATER QUALITY, \*LA \*GROUNDWATER MOVEMENT, \*PATH OF P \*GROUNDWATER MOVEMENT, MUNICIPAL \*GROUNDWATER MOVEMENT, \*WATER POL \*GROUNDWATER, \*PIEZOMETRY, \*WATER \*GROUNDWATER, \*SURFACE WATERS, SU \*GROUNDWATER, \*SEEPAGE, \*LANDFILL \*GROUNDWATER MOVEMENT, LABORATORY \*GROUNDWATER MOVEMENT, \*WATER POL \*GROUNDWATER, \*OIL WASTES, \*SEPAR \*GROUNDWATER MOVEMENT, KARST, INF \*GROUNDWATER MOVEMENT, DRAINAGE S \*GROUNDWATER MOVEMENT, MODEL STUD \*GROUNDWATER MOVEMENT, \*RECHARGE, \*GROUNDWATER MOVEMENT, \*DISPERSIO \*GROUNDWATER MOVEMENT, \*STATISTIC \*GROUNDWATER RECHARGE, MODEL STUD \*GROUNDWATER, \*WATER POLLUTION, \* \*GROUNDWATER, NITRATE, NITRITES, \*GROUNDWATER, \*NITRATE, AQUIFER, \*GROUNDWATER, \*SATURATED SOILS, \* \*GROUNDWATER, \*AGRICULTURAL CHEMI \*GROUNDWATER POLLUTION, \*CENTRAL \*GROUNDWATER MOVEMENT, \*NUMERICAL \*GROUNDWATER POLLUTION, LANDFILL \*GROUNDWATER, HYDROGEOLOGY, WATER \*GROUNDWATER, \*SEEPAGE, DRILL HOL \*HAWAII, IRRIGATION WATER, WATER \*HERBICIDES, \*NEW MEXICO, \*SOIL W \*HIGHWAY ICING, \*SNOW REMOVAL, \*M \*HYDRAULICS LABORATORY OF BRATISL

W71-10372  
W71-04882  
W71-03543  
W71-04121  
W71-03542  
W71-02036  
W70-00665  
W71-03543  
W71-03542  
W71-02036  
W71-02036  
W71-03542  
W71-12084  
W71-12410  
W71-09611  
W71-09154  
W70-00532  
W70-06572  
W71-01204  
W70-08025  
W69-06117  
W70-06322  
W69-03197  
W69-05328  
W69-05327  
W69-00979  
W68-00058  
W69-08921  
W69-07554  
W69-03178  
W69-03212  
W69-08621  
W69-03237  
W70-07766  
W70-00532  
W70-06011  
W70-01904  
W70-01291  
W71-01930  
W71-01204  
W71-01932  
W70-09548  
W71-00194  
W71-11356  
W71-11776  
W71-10325  
W71-10446  
W71-12122  
W71-03543  
W71-08073  
W71-04121  
W71-04548  
W71-04559  
W71-07194  
W71-07194  
W71-08055  
W71-08044  
W71-06514  
W70-09844  
W71-01930

NDFILL, *INFILTRATION, *WATER Q/	*HYDRAULIC POTENTIAL, CANADA.:	W70-07766
*LANDFILLS, *PATH OF POLLUTANTS,	*HYDROGEOLOGY, *SOLID WASTES, *LA	W70-09637
NT/ *LANDFILLS, *WASTE DISPOSAL,	*HYDROGEOLOGY, *ILLINOIS, MUNICIP	W70-06572
TIONS, *GEOLOGIC INVESTIGATIONS,	*HYDROGEOLOGY, WATER POLLUTION CO	W70-07193
TH OF POLLUTANTS, *HYDROGEOLOGY,	*ILLINOIS, HYDROLOGIC DATA, GEOLO	W70-06322
ER POLLUTION CONTROL, *POLLUTIO/	*ILLINOIS, MUNICIPAL WASTES, LEAC	W70-06572
JUDICIAL DECISIONS, OIL WASTES/	*ILLINOIS, *WATER POLLUTION, *WAT	W70-02896
	*ILLINOIS, *SALINE WATER, *WELLS,	W69-06118
	*INDIA.:	W71-08073
ALLUVIAL / *PATH OF POLLUTANTS,	*INDUCED INFILTRATION, COLIFORMS,	W71-02909
RGE, *WAT/ *ARTIFICIAL RECHARGE,	*INDUCED INFILTRATION, *PIT RECHA	W71-12410
, *CONJUNCTIVE USE, *STREAMFLOW,	*INDUCED INFILTRATION, *NEW YORK,	W70-03102
MOVEM/ *WATER POLLUTION SOURCES,	*INDUSTRIAL WASTES, *GROUNDWATER	W71-00194
OLOGY, *SOLID WASTES, *LANDFILL,	*INFILTRATION, *WATER QUALITY POL	W70-09637
*MONITORING, / *SEWAGE DISPOSAL,	*INFILTRATION, *WATER SPREADING,	W71-01205
*MONITORING, WATER POLLUTION SO/	*INFILTRATION, *WATER SPREADING,	W71-01324
UNDWATER BASINS, WATER SUPPLY, /	*INFILTRATION, *PONDS, *SOIL, GRO	W69-07838
LUVIUM, *LYSIMETERS, *RADIOISOT/	*INFILTRATION, *POROUS MEDIA, *AL	W69-02681
BACT/ *POLLUTANTS, GROUNDWATER,	*INFILTRATION, COLIFORMS, ENTERIC	W69-01076
RRIGAT/ WATER POLLUTION SOURCES,	*ION EXCHANGE, *WATER QUALITY, *I	W71-09936
OUNDWATER MOVEMENT, *DISPERSION,	*ION EXCHANGE, DIFFUSION, MIXING,	W71-11356
, *ION EXCHANGE, *WATER QUALITY,	*IRRIGATION EFFICIENCY, SIMULATIO	W71-09936
IC-QUALITY MODEL.:	*IRRIGATION RETURN FLOW, HYDROLOG	W71-09936
*DRAINAGE WATER, *DETERIORATION/	*IRRIGATION WATER, *RETURN FLOW,	W71-06063
*GROUNDWATER, *SATURATED SOILS,	*IRRIGATION EFFECTS, LEACHING, WA	W71-08073
RELATIONSHIPS, D/ *RETURN FLOW,	*IRRIGATION, *SURFACE-GROUNDWATER	W69-00248
N, HYDRO/ *WASTE WATER DISPOSAL,	*IRRIGATION, *SPRINKLER IRRIGATIO	W69-07375
RINKLER / *WASTE WATER DISPOSAL,	*IRRIGATION, *CHEMICAL WASTES, SP	W69-07114
*OIL WASTES, *REMEDIES, WATER /	*KANSAS, *SALINE WATER INTRUSION,	W71-13521
ER, *SEEPAGE, DRILL HOLES, OILY/	*KENTUCKY, *OIL WELLS; *GROUNDWAT	W71-08055
NNETONKA(MINN), SOIL MINERALS, /	*KILLING, ANIMAL MANURES, LAKE MI	W70-04193
HORUS, ALFALFA-BROMEGRASS, SPRI/	*LAKE EUTROPHICATION, *SOIL PHOSP	W69-09721
YSTEMS, EUTROPHICATION, OLIGOTR/	*LAKES, STREAMS, FISH, LAND, ECOS	W70-04193
STRY, *WATER QUALITY, *CLIMATES,	*LAND USE, *OKLAHOMA, SALINITY, S	W70-06102
	*LANDFILL HYDROLOGY.:	W71-08907
Q/ *HYDROGEOLOGY, *SOLID WASTES,	*LANDFILL, *INFILTRATION, *WATER	W70-09637
L, *GROUNDWATER, *WATER QUALITY,	*LANDFILL, SANITARY FILL, WASTE D	W69-03178
ROGEOLOGY, WATER POLLUTION CONT/	*LANDFILLS, *WASTE DISPOSAL, *HYD	W70-07193
LLUTION, *GROUNDWATER, *SEEPAGE,	*LANDFILLS, *SOLID WASTES, WATER	W70-06011
*WASTE DISPOSAL, *GARBAGE DUMPS,	*LANDFILLS, *PATH OF POLLUTANTS,	W70-06572
IL MOISTURE, EVAPOTRANSPIRATION,	*LANDFILLS, DRAINAGE, SANITARY EN	W68-00058
WATER MOVEMENT, MODE/ *LEACHING,	*LANDFILLS, *PERCOLATION, *GROUND	W70-09548
*PATH OF POLLUTANTS, *LEACHING,	*LANDFILLS, *GARBAGE DUMPS, *GROU	W71-01204
STE DUMPS, *SOLID WASTES, *LEAC/	*LANDFILLS, *WATER POLLUTION, *WA	W71-07194
WATER MOVEMENT, CAPILLARY FLOW,	*LAVA, BASALTS, WATER POLLUTION S	W69-00979
DRAINAGE, SANITARY ENGINEERING,	*LEACHING, WATER POLLUTION SOURCE	W68-00058
ER, WATER POLLUTION, ABSORPTION,	*LEACHING, *PERCOLATION.:/UNDWAT	W70-04688
ES, PATH/ *FARM WASTES, *CATTLE,	*LEACHING, *WATER POLLUTION SOURC	W70-00665
ON, *WASTE DUMPS, *SOLID WASTES,	*LEACHING, *GROUNDWATER, HYDROGEO	W71-07194
NUCLEA/ *RADIOECOLOGY, *FALLOUT,	*LEACHING, *PATH OF POLLUTANTS, *	W71-04882
CS, SOIL AN/ *NUTRIENTS, *SOILS,	*LEACHING, *AQUIFER CHARACTERISTI	W71-07887
ON, *GROUNDWATER MOVEMENT, MODE/	*LEACHING, *LANDFILLS, *PERCOLATI	W70-09548
NE WATER-FRESH-WATER INTERFACES,	*LEACHING, *SALINE WATER SYSTEMS,	W71-01932
UMPS, *GRO/ *PATH OF POLLUTANTS,	*LEACHING, *LANDFILLS, *GARBAGE D	W71-01204
*OILY WATE/ *PATH OF POLLUTANTS,	*LEACHING, *SOIL WATER MOVEMENT,	W71-10325
MINE WASTE/ *TRITIUM, *TRACERS,	*LEACHING, *COPPER, *WASTE DUMPS,	W71-11255
LVANIA, *OILY WATER, *PIPELINES,	*LEAKAGE, JUDICIAL DECISIONS, OIL	W70-07632
*WELL REGULATIONS, *WATER WELLS,	*LEGISLATION, CONSTRUCTION, PUMPS	W71-04742
POLLUTION, *WOOD WASTES, *BARK,	*LIGNINS, *BIOCHEMICAL OXYGEN DEM	W68-01269
*SHALLOW WELLS, WATER WELLS, WA/	*LOUISIANA, *PERCOLATING WATERS,	W68-00627

ATION, *POROUS MEDIA, *ALLUVIUM,	*LYSIMETERS, *RADIOISOTOPES, RADI	W69-02681
STES, *OIL, LEGISLATION, STATE /	*MAINE, *WATER POLLUTION, *OIL WA	W69-05370
, *HIGHWAY ICING, *SNOW REMOVAL,	*MAINE, DEICERS, ROADS, CHEMCONTR	W70-09844
LEMENT, *DIFFUSION, *DISPERSION,	*MATHEMATICAL MODELS, MODEL STUDI	W69-07554
ILTRATION, RECH/ *WATER QUALITY,	*MATHEMATICAL MODELS, INDUCED INF	W69-02611
FEEDLOTS, RESIDUAL ACCUMULATIO/	*METHEMOGLOBIN, NITRATE MOVEMENT,	W71-10372
POLLUTANTS, *SALINE WATER INTRU/	*MICHIGAN, *OIL WASTES, *PATH OF	W70-08026
WATERS, *WATER POLLUTION CONTRO/	*MISSOURI, *PERMITS, *SUBSURFACE	W71-10157
ANNING, MANAGEMENT, PERCOLATION,	*MODEL STUDIES, *COMPUTER PROGRAM	W71-09936
EMENT, LEACH/ *UNSATURATED FLOW,	*MOISTURE ROUTING, LANDFILL MANAG	W68-00058
IDENTIFICATION, *WATER QUALITY,	*MONITORING, *GROUNDWATER, NITRAT	W71-12122
*INFILTRATION, *WATER SPREADING,	*MONITORING, WATER POLLUTION SOUR	W71-01205
*INFILTRATION, *WATER SPREADING,	*MONITORING, WATER POLLUTION SOUR	W71-01324
S, *WATER WELLS, *REMEDIES, IND/	*MONTANA, *WATER POLLUTION SOURCE	W71-11692
	*MULTIPHASE FLOW.:	W71-11776
NT, *UNITED ST/ *WASTE DISPOSAL,	*MUNICIPAL WASTES, *WASTE TREATME	W71-08907
*WATER REUSE, *RECLAIMED WATER,	*MUNICIPAL WASTES, *ARTIFICIAL RE	W69-08620
POLLUTION SOURCES, *HERBICIDES,	*NEW MEXICO, *SOIL WATER MOVEMENT	W71-06514
E, *WATER POLLUTION SOURCES, JU/	*NEW YORK, *WATER WELLS, *GASOLIN	W69-06117
REAMFLOW, *INDUCED INFILTRATION,	*NEW YORK, HYDROGRAPHS, HYDROGRAP	W70-03102
M WASTES, *CATTLE, *GROUNDWATER,	*NITRATE, AQUIFER, DISCHARGE, AQU	W71-03543
PRECIPITATION, SEDIM/ *NITROGEN,	*NITRATES, GROUNDWATER, AMMONIA,	W71-06435
ES, LEACHING, FARM WASTES, GROU/	*NITRATES, *WATER POLLUTION SOURC	W71-08218
ATH OF POLLUTANTS, *RETURN FLOW,	*NITRATES, MATHEMATICAL MODELS, C	W71-04548
, *SUBSURFACE DRAINAGE, DRAINAG/	*NITRATES, *NITROGEN, *RIO GRANDE	W70-08662
OIL CONTAMINATION, *FERTILIZERS,	*NITRATES, WATER POLLUTION, NITRO	W71-02036
TION SOURCES, *CORES, FIELDS, P/	*NITRATES, *AMMONIA, *WATER POLLU	W70-04488
PUBLIC HEALTH, *SOIL LEACHING, /	*NITRIFICATION, *SOIL NITROGEN, *	W69-09721
IDENTIFICATION, *WATER QUALITY, /	*NITROGEN COMPOUNDS, *POLLUTION I	W71-12122
CE DRAINAGE, DRAINAG/ *NITRATES,	*NITROGEN, *RIO GRANDE, *SUBSURFA	W70-08662
, ALGAE, NITRA/ *EUTROPHICATION,	*NITROGEN, *PHOSPHORUS, NUTRIENTS	W71-06443
, AMMONIA, PRECIPITATION, SEDIM/	*NITROGEN, *NITRATES, GROUNDWATER	W71-06435
	*NUCLEAR CANAL EXCAVATION.:	W71-04882
*VENEZUELA,	*NUCLEAR ENGINEERING, NUCLEAR EXP	W71-04882
*LEACHING, *PATH OF POLLUTANTS,	*NUISANCE.:	W70-08025
	*NUMERICAL ANALYSIS, MIXING, COMP	W71-04559
SPERSION, *GROUNDWATER MOVEMENT,	*NUMERICAL ANALYSIS, COMPUTER PRO	W71-09611
GRAMS, DIFFUSION, / *DISPERISON,	*NUTRIENTS, *SOILS, *LEACHING, *A	W71-07887
AQUIFER CHARACTERISTICS, SOIL AN/	*OGALLALA AQUIFER, HIGH PLAINS(TE	W71-12122
XAS), PARKER COUNTY(TEXAS), HOL/	*OIL SPILLS.:	W71-10325
	*OIL WASTES, *REMEDIES, WATER POL	W71-13521
KANSAS, *SALINE WATER INTRUSION,	*OIL WASTES, *REMEDIES, WATER POL	W71-11724
OHOMA, *WATER POLLUTION SOURCES,	*OIL WASTES, *PATH OF POLLUTANTS,	W70-08026
*SALINE WATER INTRU/ *MICHIGAN,	*OIL WASTES, *SEPARATION TECHNIQU	W71-01930
*WATER POLLUTION, *GROUNDWATER,	*OIL WASTES, *OIL, LEGISLATION, S	W69-05370
TATE / *MAINE, *WATER POLLUTION,	*OIL WELLS, *WATER WELLS, GROUNDW	W71-03230
LVANIA, *SALINE WATER INTRUSION,	*OIL WELLS, *GROUNDWATER, *SEEPAG	W71-08055
E, DRILL HOLES, OILY/ *KENTUCKY,	*OIL, LEGISLATION, STATE GOVERNME	W69-05370
, *WATER POLLUTION, *OIL WASTES,	*OILY WATER, *UNDERSEEPAGE, *POLL	W70-07631
UTION, JUDICIAL D/ *CONNECTICUT,	*OILY WATER, *PIPELINES, *LEAKAGE	W70-07632
, JUDICIAL DECIS/ *PENNSYLVANIA,	*OILY WATER, *GROUNDWATER RECHARG	W71-10325
*LEACHING, *SOIL WATER MOVEMENT,	*OKLAHOMA, *WATER POLLUTION SOURC	W71-11724
ES, *OIL WASTES, *REMEDIES, WAT/	*OKLAHOMA, SALINITY, STREAMFLOW,	W70-06102
R QUALITY, *CLIMATES, *LAND USE,	*ON-SITE INVESTIGATIONS, *SOIL IN	W70-06322
VESTI/ *WATER POLLUTION EFFECTS,	*OXIDATION LAGOONS, *TERTIARY TRE	W71-07118
ATMENT, *SLUDGE DIGESTION, ANAE/	*PATH OF POLLUTANTS, *RETURN FLOW	W71-04548
, *NITRAT/ *SIMULATION ANALYSIS,	*PATH OF POLLUTANTS, *NUCLEAR ENG	W71-04882
DIOECOLOGY, *FALLOUT, *LEACHING,	*PATH OF POLLUTANTS, *FARM WASTES	W71-04121
, *WATER POLLUTION SOURCES, *GR/	*PATH OF POLLUTANTS, MATHEMATICAL	W71-11776
R MOVEMENT, *STATISTICAL MODELS,	*PATH OF POLLUTANTS, *LEACHING, *	W71-10325
SOIL WATER MOVEMENT, *OILY WATE/		

ES, *GROUNDWATER MOVEMENT, *DIS/	*PATH OF POLLUTANTS, *RADIOISOTOP	W71-11356
LANDFILLS, *GARBAGE DUMPS, *GRO/	*PATH OF POLLUTANTS, *LEACHING, *	W71-01204
R INTRU/ *MICHIGAN, *OIL WASTES,	*PATH OF POLLUTANTS, *SALINE WATE	W70-08026
ILTRATION, COLIFORMS, ALLUVIAL /	*PATH OF POLLUTANTS, *INDUCED INF	W71-02909
*SOIL/ *WATER POLLUTION SOURCES,	*PATH OF POLLUTANTS, *DIFFUSION,	W70-10058
OUNDWATER MOVEMENT, LABORATORY /	*PATH OF POLLUTANTS, *ALDRIN, *GR	W70-01904
SAL, *GARBAGE DUMPS, *LANDFILLS,	*PATH OF POLLUTANTS, *HYDROGEOLOG	W70-06572
US MEDIA, *GROUNDWATER MOVEMENT,	*PATH OF POLLUTANTS, INJECTION WE	W69-03212
MOVEMENT, *DIFFUSION, *DISPERS/	*PATH OF POLLUTANTS, *GROUNDWATER	W69-07554
GROUNDWATER MOVEM/ *WATER REUSE,	*PATHOGENIC BACTERIA, *VIRUSES, *	W69-08621
LINES, *LEAKAGE, JUDICIAL DECIS/	*PENNSYLVANIA, *OILY WATER, *PIPE	W70-07632
USION, *OIL WELLS, *WATER WELLS/	*PENNSYLVANIA, *SALINE WATER INTR	W71-03230
*SALINE WATER INTRUSION, *WATER/	*PENNSYLVANIA, *WATER POLLUTION,	W71-01028
NT, MODE/ *LEACHING, *LANDFILLS,	*PERCOLATION, *GROUNDWATER MOVEME	W70-09548
DWATE/ *RHODE ISLAND, *GASOLINE,	*PERCOLATING WATER, *WELLS, GROUND	W70-08025
AND, *SEEPAGE, *WATER POLLUTION,	*PERCOLATING WATER, RIPARIAN RIGH	W71-01043
ION, *SEEPAGE, *SUBSURFACE WATE/	*PERCOLATING WATER, *WATER POLLUT	W70-08050
ION, *SEEPAGE, *SUBSURFACE WATE/	*PERCOLATING WATER, *WATER POLLUT	W70-08049
OLLUTION, ABSORPTION, *LEACHING,	*PERCOLATION.: /UNDWATER, WATER P	W70-04688
HT/ *REMEDIES, *WATER POLLUTION,	*PERCOLATING WATER, *RELATIVE RIG	W70-00521
LS, WATER WELLS, WA/ *LOUISIANA,	*PERCOLATING WATERS, *SHALLOW WEL	W68-00627
ONDU/ PERCOLATION, GROUND WATER,	*PERMEABILITY, POROSITY, CLOSED C	W69-00979
TER POLLUTION CONTROL/ *MISSOURI,	*PERMITS, *SUBSURFACE WATERS, *WA	W71-10157
TRA/ *EUTROPHICATION, *NITROGEN,	*PHOSPHORUS, NUTRIENTS, ALGAE, NI	W71-06443
CE-GROUNDWATER RE/ *GROUNDWATER,	*PIEZOMETRY, *WATER TABLE, *SURFA	W70-07766
CIS/ *PENNSYLVANIA, *OILY WATER,	*PIPELINES, *LEAKAGE, JUDICIAL DE	W70-07632
RECHARGE, *INDUCED INFILTRATION,	*PIT RECHARGE, *WATER TREATMENT,	W71-12410
RATION, COLIFORMS, ENTERIC BACT/	*POLLUTANTS, GROUNDWATER, *INFILT	W69-01076
CUT, *OILY WATER, *UNDERSEEPAGE,	*POLLUTION, JUDICIAL DECISIONS, O	W70-07631
UTION, *WATER POLLUTION CONTROL,	*POLLUTION ABATEMENT, STATE GOVER	W70-02896
QUALITY, / *NITROGEN COMPOUNDS,	*POLLUTION IDENTIFICATION, *WATER	W71-12122
, WATER SUPPLY, / *INFILTRATION,	*PONDS, *SOIL, GROUNDWATER BASINS	W69-07838
ENT, */ *DISPERSION, *DIFFUSION,	*POROUS MEDIA, *GROUNDWATER MOVEM	W69-03237
ENT, *PATH OF POLLU/ *DIFFUSION,	*POROUS MEDIA, *GROUNDWATER MOVEM	W69-03212
TERS, *RADIOISOT/ *INFILTRATION,	*POROUS MEDIA, *ALLUVIUM, *LYSIME	W69-02681
ENT, *ST/ *STOCHASTIC PROCESSES,	*POROUS MEDIA, *GROUNDWATER MOVEM	W71-11776
, *WATER WELLS, *LEGISLATION, C/	*PUBLIC HEALTH, *WELL REGULATIONS	W71-04742
*NITRIFICATION, *SOIL NITROGEN,	*PUBLIC HEALTH, *SOIL LEACHING, G	W69-09721
DIFFUSION, *SOIL WATER MOVEMENT,	*RADIOACTIVE WASTES, EQUATIONS, G	W70-10058
G, *PATH OF POLLUTANTS, *NUCLEA/	*RADIOECOLOGY, *FALLOUT, *LEACHTN	W71-04882
MENT, *DIS/ *PATH OF POLLUTANTS,	*RADIOISOTOPES, *GROUNDWATER MOVE	W71-11356
S MEDIA, *ALLUVIUM, *LYSIMETERS,	*RADIOISOTOPES, RADIOACTIVE WASTE	W69-02681
L WASTES, *GROUNDWATER MOVEMENT,	*RECHARGE, *SURFACE-GROUNDWATER R	W71-00194
ES, *ARTIFICIAL R/ *WATER RFUSE,	*RECLAIMED WATER, *MUNICIPAL WAST	W69-08620
R POLLUTION, *PERCOLATING WATER,	*RELATIVE RIGHTS, WATER LAW, GROU	W70-00521
COLATING WATER, *RELATIVE RIGHT/	*REMEDIES, *WATER POLLUTION, *PER	W70-00521
POLLUTION SOURCES, *WATER WELLS,	*REMEDIES, INDUSTRIAL WASTES, WAT	W71-11692
POLLUTION SOURCES, *OIL WASTES,	*REMEDIES, WATER POLLUTION, WATER	W71-11724
NE WATER INTRUSION, *OIL WASTES,	*REMEDIES, WATER POLLUTION, JUDIC	W71-13521
URCES, *WATER POLLUTION EFFECTS,	*RETURN FLOW, *SALINE WATER INTRU	W71-08044
ETERIORATION/ *IRRIGATION WATER,	*RETURN FLOW, *DRAINAGE WATER, *D	W71-06063
N ANALYSIS, *PATH OF POLLUTANTS,	*RETURN FLOW, *NITRATES, MATHEMAT	W71-04548
RATED SOILS, *I/ *WATER QUALITY,	*RETURN FLOW, *GROUNDWATER, *SATU	W71-08073
CE-GROUNDWATER RELATIONSHIPS, D/	*RETURN FLOW, *IRRIGATION, *SURFA	W69-00248
WASTE TREATMENT, *UNITED STATES,	*REVIEWS, METHODOLOGY, SANITARY E	W71-08907
OLLUTION, *PERCOLATING WATER, R/	*RHODE ISLAND, *SEEPAGE, *WATER P	W71-01043
ATING WATER, *WELLS, GROUNDWATE/	*RHODE ISLAND, *GASOLINE, *PERCOL	W70-08025
, DRAINAG/ *NITRATES, *NITROGEN,	*RIO GRANDE, *SUBSURFACE DRAINAGE	W70-08662
STRY, DARCY'S LAW, PERMEABILITY,	*RIVER FLOW.: /PTION, WATER CHEMI	W69-02611
	*RUHR VALLEY.:	W71-12410

TES, \*REMEDIES, WATER / \*KANSAS,  
 FRESH-WATER INTERFACES, \*LEACHING,  
 OIL WASTES, \*PATH OF POLLUTANTS,  
 LS, \*WATER WELLS/ \*PENNSYLVANIA,  
 CES, \*LEACHING, \*SALINE WATER S/  
 \*PENNSYLVANIA, \*WATER POLLUTION,  
 POLLUTION EFFECTS, \*RETURN FLOW,  
 ECISIONS, OIL WASTES/ \*ILLINOIS,  
 SPORT.:

\*WATER POLLUTION, \*GROUNDWATER,  
 GROUNDWATER RECHARGE, GROUNDWATER,  
 TUCKY, \*OIL WELLS, \*GROUNDWATER,  
 OLATING WATER, R/ \*RHODE ISLAND,  
 OLATING WATER, \*WATER POLLUTION,  
 OLATING WATER, \*WATER POLLUTION,  
 TION, \*GROUNDWATER, \*OIL WASTES,  
 \*WATER SPREADING, \*MONITORING, /  
 \*LOUISIANA, \*PERCOLATING WATERS,  
 , \*GROUNDWATER MOVEMENT, \*NUMER/  
 LLUTANTS, \*RETURN FLOW, \*NITRAT/  
 ON LAGOONS, \*TERTIARY TREATMENT,  
 SODIUM CHLORIDE, \*HIGHWAY ICING,  
 \*SNO/ \*WATER POLLUTION EFFECTS,  
 , \*NITRATES, WATE/ \*FARM WASTES,  
 FFECTS, \*ON-SITE INVESTIGATIONS,  
 \*SOIL NITROGEN, \*PUBLIC HEALTH,  
 RECHARGE, GROUNDWATER, \*SEEPAGE,  
 SOIL LEACHING, / \*NITRIFICATION,  
 ASS, SPRI/ \*LAKE EUTROPHICATION,  
 ATER TREATMENT, WATER POLLUTION,  
 ATER TREATMENT, WATER POLLUTION,  
 \*PATH OF POLLUTANTS, \*DIFFUSION,  
 URCES, \*HERBICIDES, \*NEW MEXICO,  
 \*PATH OF POLLUTANTS, \*LEACHING,  
 SUR/ \*DETERGENT BEHAVIOR(WATER),  
 SUPPLY, / \*INFILTRATION, \*PONDS,  
 S, GROUNDWATER, PRECIPITATION, /  
 CTERISTICS, SOIL AN/ \*NUTRIENTS,  
 POLLUTION SOURCES, \*URBANIZATION,  
 \*WATER POLLUTION, \*WASTE DUMPS,  
 RATION, \*WATER Q/ \*HYDROGEOLOGY,  
 OUNDWATER, \*SEEPAGE, \*LANDFILLS,  
 STE WATER DISPOSAL, \*IRRIGATION,  
 US MEDIA, \*GROUNDWATER MOVEMENT,  
 DIA, \*GROUNDWATER MOVEMENT, \*ST/  
 MENT(APPLIED), \*CONJUNCTIVE USE,  
 \*EUTRO/ \*AGRICULTURAL WATERSHED,  
 ION CONTRO/ \*MISSOURI, \*PERMITS,  
 TER, \*WATER POLLUTION, \*SEEPAGE,  
 TER, \*WATER POLLUTION, \*SEEPAGE,  
 ITRATES, \*NITROGEN, \*RIO GRANDE,

ES, MINERALIZATION, NITROGEN SO/  
 \*CONSUMPTIVE USE, \*GROUNDWATER,  
 ATER, \*PIEZOMETRY, \*WATER TABLE,  
 INDUCED INFILTRATION, RECHARGE,  
 S, D/ \*RETURN FLOW, \*IRRIGATION,

\*SALINE WATER INTRUSION, \*OIL WAS  
 \*SALINE WATER SYSTEMS, \*GROUNDWAT  
 \*SALINE WATER INTRUSION, WATER PO  
 \*SALINE WATER INTRUSION, \*OIL WEL  
 \*SALINE WATER-FRESH-WATER INTERFA  
 \*SALINE WATER INTRUSION, \*WATER W  
 \*SALINE WATER INTRUSION, \*HAWAII,  
 \*SALINE WATER, \*WELLS, JUDICIAL D  
 \*SALT WATER IRRIGATION, SALT TRAN  
 \*SATURATED SOILS, \*IRRIGATION EFF  
 \*SATURATED FLOW, \*DIFFUSION, \*DIS  
 \*SEEPAGE CONTROL.:

\*SEEPAGE, \*LANDFILLS, \*SOLID WAST  
 \*SEEPAGE, \*SOIL MOISTURE, EVAPOTR  
 \*SEEPAGE, DRILL HOLES, OILY WATER  
 \*SEEPAGE, \*WATER POLLUTION, \*PERC  
 \*SEEPAGE, \*SUBSURFACE WATERS, PRI  
 \*SEEPAGE, \*SUBSURFACE WATERS, GRO  
 \*SEPARATION TECHNIQUES, INFILTRAT  
 \*SEWAGE DISPOSAL, \*INFILTRATION,  
 \*SHALLOW WELLS, WATER WELLS, WATE  
 \*SIMULATION ANALYSIS, \*DISPERSION  
 \*SIMULATION ANALYSIS, \*PATH OF PO  
 \*SLUDGE DIGESTION, ANAEROBIC DIGE  
 \*SNOW REMOVAL, \*MAINE, DEICERS, R  
 \*SODIUM CHLORIDE, \*HIGHWAY ICING,  
 \*SOIL CONTAMINATION, \*FERTILIZERS  
 \*SOIL INVESTIGATIONS, \*GEOLOGIC I  
 \*SOIL LEACHING, GROUNDWATER, SOIL  
 \*SOIL MOISTURE, EVAPOTRANSPIRATIO  
 \*SOIL NITROGEN, \*PUBLIC HEALTH, \*  
 \*SOIL PHOSPHORUS, ALFALFA-BROMEGR  
 \*SOIL WASTE TREATMENT, SOIL PERCO  
 \*SOIL WASTE TREATMENT, SOIL PERCO  
 \*SOIL WATER MOVEMENT, \*RADIOACTIV  
 \*SOIL WATER MOVEMENT, GROUNDWATER  
 \*SOIL WATER MOVEMENT, \*OILY WATER  
 \*SOIL-WATER ENVIRONMENT, ANIONIC  
 \*SOIL, GROUNDWATER BASINS, WATER  
 \*SOILS, \*FARM WASTES, \*FERTILIZER  
 \*SOILS, \*LEACHING, \*AQUIFER CHARA  
 \*SOLID WASTES, \*WASTE DISPOSAL, S  
 \*SOLID WASTES, \*LEACHING, \*GROUND  
 \*SOLID WASTES, \*LANDFILL, \*INFILT  
 \*SOLID WASTES, WATER POLLUTION SO  
 \*SPRINKLER IRRIGATION, HYDROGEOLO  
 \*STATISTICAL MODELS, \*PATH OF POL  
 \*STOCHASTIC PROCESSES, \*POROUS ME  
 \*STREAMFLOW, \*INDUCED INFILTRATIO  
 \*SUBSURFACE DRAINAGE, \*DRAINAGE,  
 \*SUBSURFACE WATERS, \*WATER POLLUT  
 \*SUBSURFACE WATERS, GROUNDWATER,  
 \*SUBSURFACE WATERS, PRIOR APPROPR  
 \*SUBSURFACE DRAINAGE, DRAINAGE WA  
 \*SUPERNATANT RE-CYCLE.:

\*SURFACE WATERS, GEOLOGICAL SOURC  
 \*SURFACE WATERS, SURFACE RUNOFF,  
 \*SURFACE-GROUNDWATER RELATIONSHIP  
 \*SURFACE-GROUNDWATER RELATIONSHIP  
 \*SURFACE-GROUNDWATER RELATIONSHIP

W71-13521  
 W71-01932  
 W70-08026  
 W71-03230  
 W71-01932  
 W71-01028  
 W71-08044  
 W69-06118  
 W71-06063  
 W71-08073  
 W69-08921  
 W70-06011  
 W70-06011  
 W68-00058  
 W71-08055  
 W71-01043  
 W70-08049  
 W70-08050  
 W71-01930  
 W71-01205  
 W68-00627  
 W71-04559  
 W71-04548  
 W71-07118  
 W70-09844  
 W70-09844  
 W71-02036  
 W70-06322  
 W69-09721  
 W68-00058  
 W69-09721  
 W69-09721  
 W69-05327  
 W69-05328  
 W70-10058  
 W71-06514  
 W71-10325  
 W70-01291  
 W69-07838  
 W71-03542  
 W71-07887  
 W71-05094  
 W71-07194  
 W70-09637  
 W70-06011  
 W69-07375  
 W71-11776  
 W71-11776  
 W70-03102  
 W70-04504  
 W71-10157  
 W70-08050  
 W70-08049  
 W70-08662  
 W71-07118  
 W71-06435  
 W70-00532  
 W70-07766  
 W69-02611  
 W69-00248

GROUNDWATER MOVEMENT, \*RECHARGE,  
ATES, \*DETERGENTS, \*GROUNDWATER/  
N(NY).:

\*WATER SPREADING, \*WATER REUSE,  
STION, ANAEROBIC \*OXIDATION LAGOONS,  
, LEACH BED, SPOKE/ DRAIN FIELDS,  
ON, ATOMIC ABSOR/ \*GROUND WATER,  
STE DUMPS, MINE WASTE/ \*TRITIUM,  
LEM, LEYDEN, THE HAGUE, MINERAL/  
OPPER, \*WASTE DUMPS, MINE WASTE/  
AL D/ \*CONNECTICUT, \*OILY WATER,  
ROUS MEDIA, GROUNDWATER, WASTES,  
ICIPAL WASTES, \*WASTE TREATMENT,  
ING, LANDFILL MANAGEMENT, LEACH/

MO), WILSON CREEK(MO), SPRINGFI/  
STE D/ \*WATER POLLUTION SOURCES,  
TION.:

TION, GROUND-WATER, WATER POLLU/  
UTION, ABSORPTION, \*LEACHING, \*/  
TER REUSE, \*PATHOGENIC BACTERIA,  
RCES, \*DAMAGES, \*WATER WELL, IM/  
S, \*URBANIZATION, \*SOLID WASTES,  
S, \*WASTE TREATMENT, \*UNITED ST/  
\*LANDFILLS, \*PATH OF POLLUTANTS/  
ATER POLLUTION CONT/ \*LANDFILLS,  
ATER QUALITY, \*LANDFILL, SANITA/  
C/ \*LANDFILLS, \*WATER POLLUTION,  
M, \*TRACERS, \*LEACHING, \*COPPER,  
STE DISPOSAL, \*MUNICIPAL WASTES,  
N, \*SPRINKLER IRRIGATION, HYDRO/  
STE TREATMENT, SOIL PERCOLATION,  
STE TREATMENT, SOIL PERCOLATION,  
R TREATMENT, W/ SEWAGE EFFLUENT,  
N, \*CHEMICAL WASTES, SPRINKLER /  
R TREATMENT, W/ SEWAGE EFFLUENT,  
\*CLIMATES, \*LAND USE, \*OKLAHOM/  
UNCTIVE USE, \*STREAMFLOW, \*INDU/  
FACE-GROUNDWATER RELATIONSHIPS,  
IO/ \*ILLINOIS, \*WATER POLLUTION,  
SEEPAGE, \*LANDFILLS, \*SOLID WAS/  
FARM WASTES, \*CATTLE, \*LEACHING,  
FIELDS, P/ \*NITRATES, \*AMMONIA,  
N CONTROL, \*POLLUTIO/ \*ILLINOIS,  
TERGENTS, \*GROUNDWATER MOVEMENT,  
E INVESTIGATIONS, \*SOIL INVESTI/  
TER, \*RELATIVE RISK/ \*REMEDIES,  
IL, LEGISLATION, STATE / \*MAINE,  
US MEDIA, \*GROUNDWATER MOVEMENT,  
W YORK, \*WATER WELLS, \*GASOLINE,  
CHARGE, GROUNDWATER, \*SEEPAGE, /  
BARK, \*LIGNINS, \*BIOCHEMICAL OX/  
FACTS, \*WATER POLLUTION CONTROL,  
IDES, \*NEW MEXICO, \*SOIL WATER /  
POLLUTION CONTROL, \*WATER POLLU/  
POLLU/ \*WATER POLLUTION EFFECTS,  
FLOW/ \*WATER POLLUTION SOURCES,  
POLLUTION EFFECTS, \*RETURN FLOW/

\*SURFACE-GROUNDWATER RELATIONSHIP  
\*SURFACTANTS, \*ALKYBENZENE SULFON  
\*SUSQUEHANNA RIVER BASIN, (N Y).:  
\*SUSQUEHANNA RIVER(NY), BINGHAMTO  
\*TANNINS, SUGARS.:.  
\*TERTIARY TREATMENT, INFILTRATION  
\*TERTIARY TREATMENT, \*SLUDGE DIGE  
\*TEST HOLES, ANNUAL PRECIPITATION  
\*TRACE ELEMENTS, CHELATE EXTRACTI  
\*TRACERS, \*LEACHING, \*COPPER, \*WA  
\*TRANSFORMATIONS, AMSTERDAM, HAAR  
\*TRITIUM, \*TRACERS, \*LEACHING, \*C  
\*UNDERSEEPAGE, \*POLLUTION, JUDICI  
\*UNIFORM FLOW, \*DIFFUSION, POROUS  
\*UNITED STATES, \*REVIEWS, METHODO  
\*UNSATURATED FLOW, \*MOISTURE ROUT  
\*URBAN HYDROLOGY.:.  
\*URBAN STORM RUNOFF, JAMES RIVER(  
\*URBANIZATION, \*SOLID WASTES, \*WA  
\*VENEZUELA, \*NUCLEAR CANAL EXCAVA  
\*VIRUSES, \*BACTERIOPHAGE, PERCOLA  
\*VIRUSES, GROUNDWATER, WATER POLL  
\*VIRUSES, \*GROUNDWATER MOVEMENT,  
\*WASHINGTON, \*WATER POLLUTION SOU  
\*WASTE DISPOSAL, SURFACE WASTERS,  
\*WASTE DISPOSAL, \*MUNICIPAL WASTE  
\*WASTE DISPOSAL, \*GARBAGE DUMPS,  
\*WASTE DISPOSAL, \*HYDROGEOLOGY, W  
\*WASTE DISPOSAL, \*GROUNDWATER, \*W  
\*WASTE DUMPS, \*SOLID WASTES, \*LEA  
\*WASTE DUMPS, MINE WASTES, MINING  
\*WASTE TREATMENT, \*UNITED STATES,  
\*WASTE WATER DISPOSAL, \*IRRIGATIO  
\*WASTE WATER RECLAMATION, INDUCED  
\*WASTE WATER RECLAMATION, INDUCED  
\*WASTE WATER DISPOSAL, WASTE WATE  
\*WASTE WATER DISPOSAL, \*IRRIGATIO  
\*WASTE WATER DISPOSAL, WASTE WATE  
\*WATER CHEMISTRY, \*WATER QUALITY,  
\*WATER MANAGEMENT(APPLIED), \*CONJ  
\*WATER POLLUTION SOURCES, INFILTR  
\*WATER POLLUTION CONTROL, \*POLLUT  
\*WATER POLLUTION, \*GROUNDWATER, \*  
\*WATER POLLUTION SOURCES, PATH OF  
\*WATER POLLUTION SOURCES, \*CORES,  
\*WATER POLLUTION, \*WATER POLLUTIO  
\*WATER POLLUTION, INFILTRATION, A  
\*WATER POLLUTION EFFECTS, \*ON-SIT  
\*WATER POLLUTION, \*PERCOLATING WA  
\*WATER POLLUTION, \*OIL WASTES, \*O  
\*WATER POLLUTION, PATH OF POLLUTA  
\*WATER POLLUTION SOURCES, JUDICIA  
\*WATER POLLUTION, \*GROUNDWATER RE  
\*WATER POLLUTION, \*WOOD WASTES, \*  
\*WATER POLLUTION SOURCES, \*FISHKI  
\*WATER POLLUTION SOURCES, \*HERBIC  
\*WATER POLLUTION EFFECTS, \*WATER  
\*WATER POLLUTION CONTROL, \*WATER  
\*WATER POLLUTION EFFECTS, \*RETURN  
\*WATER POLLUTION SOURCES, \*WATER

W71-00194  
W70-01291  
W70-03102  
W71-02909  
W68-01269  
W70-04712  
W71-07118  
W69-01076  
W69-03197  
W71-11255  
W69-07838  
W71-11255  
W70-07631  
W69-01238  
W71-08907  
W68-00058  
W71-05094  
W71-09154  
W71-05094  
W71-04882  
W69-00225  
W70-04688  
W69-08621  
W71-13645  
W71-05094  
W71-08907  
W70-06572  
W70-07193  
W69-03178  
W71-07194  
W71-11255  
W71-08907  
W69-07375  
W69-05328  
W69-05327  
W69-05328  
W69-07114  
W69-05327  
W70-06102  
W70-03102  
W70-07766  
W70-02896  
W70-06011  
W70-00665  
W70-04488  
W70-02896  
W70-01291  
W70-06322  
W70-00521  
W69-05370  
W69-03237  
W69-06117  
W68-00058  
W68-01269  
W71-09154  
W71-06514  
W71-09154  
W71-09154  
W71-08044  
W71-08044

*DRAINAGE WATER, *DETERIORATION,	*WATER POLLUTION EFFECTS, WATER Q	W71-06063
ZATION, *SOLID WASTES, *WASTE D/	*WATER POLLUTION SOURCES, *URBANI	W71-05094
G, FARM WASTES, GROU/ *NITRATES,	*WATER POLLUTION SOURCES, LEACHIN	W71-08218
ATH OF POLLUTANTS, *FARM WASTES,	*WATER POLLUTION SOURCES, *GROUND	W71-04121
SOLID WASTES, *LEAC/ *LANDFILLS,	*WATER POLLUTION, *WASTE DUMPS, *	W71-07194
N CONTR/ *WYOMING, *GROUNDWATER,	*WATER POLLUTION, *WATER POLLUTIO	W71-10446
STES, *REMEDIES, WAT/ *OKLAHOMA,	*WATER POLLUTION SOURCES, *OIL WA	W71-11724
*GROUNDWATER, *WATER POLLUTION,	*WATER POLLUTION CONTROL, POLLUTI	W71-10446
WELLS, *REMEDIES, IND/ *MONTANA,	*WATER POLLUTION SOURCES, *WATER	W71-11692
I, *PERMITS, *SUBSURFACE WATERS,	*WATER POLLUTION CONTROL, WATER P	W71-10157
S, *WATER WELL, IM/ *WASHINGTON,	*WATER POLLUTION SOURCES, *DAMAGE	W71-13645
*CROP PRODUCTION, *FERTILIZERS,	*WATER POLLUTION SOURCES, NITROGE	W71-12084
F POLLUTANTS, *DIFFUSION, *SOIL/	*WATER POLLUTION SOURCES, *PATH O	W70-10058
URFACE WATE/ *PERCOLATING WATER,	*WATER POLLUTION, *SEEPAGE, *SURS	W70-08050
URFACE WATE/ *PERCOLATING WATER,	*WATER POLLUTION, *SEEPAGE, *SURS	W70-08049
RIAL WASTES, *GROUNDWATER MOVEM/	*WATER POLLUTION SOURCES, *INDUST	W71-00194
OIL WASTES, *SEPARATION TECHNIQ/	*WATER POLLUTION, *GROUNDWATER, *	W71-01930
CHLORIDE, *HIGHWAY ICING, *SNO/	*WATER POLLUTION EFFECTS, *SODIUM	W70-09844
TER, R/ *RHODE ISLAND, *SEEPAGE,	*WATER POLLUTION, *PERCOLATING WA	W71-01043
NTRUSION, *WATER/ *PENNSYLVANIA,	*WATER POLLUTION, *SALINE WATER I	W71-01028
ASTES, *LANDFILL, *INFILTRATION,	*WATER QUALITY POLLUTION, RECHARG	W70-09637
UNDS, *POLLUTION IDENTIFICATION,	*WATER QUALITY, *MONITORING, *GRO	W71-12122
*FERTILIZERS, *WATER POLLUTION/	*WATER QUALITY, *CROP PRODUCTION,	W71-12084
OLLUTION SOURCES, *ION EXCHANGE,	*WATER QUALITY, *IRRIGATION EFFIC	W71-09936
OUNDWATER, *SATURATED SOILS, *I/	*WATER QUALITY, *RETURN FLOW, *GR	W71-08073
ELS, INDUCED INFILTRATION, RECH/	*WATER QUALITY, *MATHEMATICAL MOD	W69-02611
*WASTE DISPOSAL, *GROUNDWATER,	*WATER QUALITY, *LANDFILL, SANITA	W69-03178
USE, *OKLAHOM/ *WATER CHEMISTRY,	*WATER QUALITY, *CLIMATES, *LAND	W70-06102
YIELD, IN/ *ARTIFICIAL RECHARGE,	*WATER REUSE, *CALIFORNIA, WATER	W70-05466
CIAL RECHARGE, *WATER SPREADING,	*WATER REUSE, *TERTIARY TREATMENT	W70-04712
A, *VIRUSES, *GROUNDWATER MOVEM/	*WATER REUSE, *PATHOGENIC BACTERI	W69-08621
MUNICIPAL WASTES, *ARTIFICIAL R/	*WATER REUSE, *RECLAIMED WATER, *	W69-08620
TERTIARY / *ARTIFICIAL RECHARGE,	*WATER SPREADING, *WATER REUSE, *	W70-04712
TER POLLUTION SO/ *INFILTRATION,	*WATER SPREADING, *MONITORING, WA	W71-01324
*SEWAGE DISPOSAL, *INFILTRATION,	*WATER SPREADING, *MONITORING, WA	W71-01205
R RE/ *GROUNDWATER, *PIEZOMETRY,	*WATER TABLE, *SURFACE-GROUNDWATE	W70-07766
ED INFILTRATION, *PIT RECHARGE,	*WATER TREATMENT, *FILTATION, ALL	W71-12410
NTANA, *WATER POLLUTION SOURCES,	*WATER WELLS, *REMEDIES, INDUSTRI	W71-11692
TER POLLUTION SOURCES, *DAMAGES,	*WATER WELL, IMPAIRED WATER QUALI	W71-13645
LUTION, *SALINE WATER INTRUSION,	*WATER WELLS, OIL INDUSTRY, PUBLI	W71-01028
INE WATER INTRUSION, *OIL WELLS,	*WATER WELLS, GROUNDWATER, SALINE	W71-03230
UBLIC HEALTH, *WELL REGULATIONS,	*WATER WELLS, *LEGISLATION, CONST	W71-04742
OLLUTION SOURCES, JU/ *NEW YORK,	*WATER WELLS, *GASOLINE, *WATER P	W69-06117
OBSERVATION WELLS, WATER LEVELS,	*WATER WELLS, WATER SUPPLY, AQUIF	W69-02611
*LEGISLATION, C/ *PUBLIC HEALTH,	*WELL REGULATIONS, *WATER WELLS,	W71-04742
, *GASOLINE, *PERCOLATING WATER,	*WELLS, GROUNDWATER, OILY WATER,	W70-08025
ASTES/ *ILLINOIS, *SALINE WATER,	*WELLS, JUDICIAL DECISIONS, OIL W	W69-06118
IOCHEMICAL OX/ *WATER POLLUTION,	*WOOD WASTES, *BARK, *LIGNINS, *B	W68-01269
LLUTION, *WATER POLLUTION CONTR/	*WYOMING, *GROUNDWATER, *WATER PO	W71-10446



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WATER MOVEMENT IN AN UNSATURATED SANITARY LANDFILL,

DREXEL INST. OF TECHNOLOGY, PHILADELPHIA, CORNELL UNIV., ITHACA, NY.

IRWIN REMSON, A. ALEXANDER FUNGARDLI, AND ALONZO W. LAWRENCE.

ASCE PROC, JOUR SANIT AND ENG, VOL 94, NO SA2, PAPER 5904, PP 307-317, APR 1968. 11 P, 1 FIG, 4 TAB, 14 REF.

DESCRIPTORS:

\*WATER POLLUTION, \*GROUNDWATER RECHARGE, GROUNDWATER, \*SEEPAGE, \*SOIL MOISTURE, EVAPOTRANSPIRATION, \*LANDFILLS, DRAINAGE, SANITARY ENGINEERING, \*LEACHING, WATER POLLUTION SOURCES, SOLID WASTES, WASTES, GARBAGE DUMPS, WASTE DUMPS, WASTE STORAGE, SOIL PROPERTIES, MOISTURE CONTENT, POLLUTANTS, SOIL WATER MOVEMENT.

IDENTIFIERS:

\*UNSATURATED FLOW, \*MOISTURE ROUTING, LANDFILL MANAGEMENT. LEACHATE, INFILTRATION CAPACITY, GROUNDWATER CONTAMINATION.

ABSTRACT:

CONTAMINATION OF GROUNDWATER FROM LEACHING OF SANITARY LANDFILLS WILL BECOME MORE COMMON AS USE OF THIS WASTE-DISPOSAL METHOD SPREADS. AN UNDERSTANDING OF THE MOISTURE REGIMEN OF THE LANDFILL IS BASIC TO A KNOWLEDGE OF THE CHARACTER AND QUANTITY OF THE WATER-BORNE CONTAMINANTS IT GENERATES. MOISTURE-ROUTING METHODS ARE EXTENDED TO PROVIDE AN APPROXIMATE METHOD FOR PREDICTING VERTICAL MOVEMENT OF MOISTURE THROUGH A HYPOTHETICAL LANDFILL. THE METHOD IS BASED ON CLIMATOLOGICAL TECHNIQUES OF SOIL-MOISTURE ROUTING AND INCORPORATES THE HYDRAULIC CHARACTERISTICS OF THE UNSATURATED PERMEABLE MATERIALS MAKING UP THE FILL AND OVERLYING SOIL COVER. USING THE METHOD, PREDICTIONS WERE MADE OF THE EFFECT OF EMPLACEMENT SEASON AND INITIAL CONDITIONS ON THE MOVEMENT OF MOISTURE. RESULTS SHOW THAT THE TIME THAT ELAPSES BEFORE THE FIRST LEACHATE APPEARS DEPENDS ON THE SEASON OF EMPLACEMENT AND THE INITIAL MOISTURE CONTENT. VARIOUS OBJECTIVES IN LANDFILL-MANAGEMENT MAY BE OBTAINED BY VARYING THE TIME OF EMPLACEMENT, INITIAL MOISTURE CONTENT, SOIL COVER, AND OTHER FACTORS. TABLES SHOW MOISTURE ROUTING THROUGH THE SOIL AND COMPACTED REFUSE AND COMPUTATION OF MONTHLY GROUNDWATER RECHARGE.

FIELD 05A

ACCESSION NO. W68-00058

MONROE '66' OIL COMPANY V HIGHTOWER (LEGAL DAMAGE FROM SHALLOW WELL POLLUTION BY HYDROCARBONS).

180 SO 2D 8-11 (CT APP LA 1965).

DESCRIPTORS:

\*LOUISIANA, \*PERCOLATING WATERS, \*SHALLOW WELLS, WATER WELLS, WATER POLLUTION, DAMAGE, JUDICIAL DECISIONS, GROUND WATER, PATH OF POLLUTANTS, SUBSURFACE FLOW, GASOLINE, WATER LAW, WELLS, GROUND WATER MOVEMENT.

IDENTIFIERS:

\*DAMAGES(LEGAL ASPECTS), HYDROCARBON POLLUTION.

ABSTRACT:

THIS WAS AN ACTION ON OPEN ACCOUNT FOR GOODS SOLD AND DELIVERED BY PLAINTIFF TO DEFENDANT. THE CORRECTNESS OF PLAINTIFF'S CLAIM WAS ADMITTED. DEFENDANT RECONVENED FOR DAMAGES ALLEGEDLY CAUSED BY PLAINTIFF'S NEGLIGENCE IN INSTALLING UNDERGROUND GASOLINE STORAGE TANKS AND CONNECTING LINES TO GAS PUMPS. DEFENDANT OWNED A CAFE WHICH WAS SUPPLIED WITH WATER FROM A SHALLOW WELL 70 FEET AWAY. PLAINTIFF INSTALLED PUMPS AND STORAGE TANKS IN FRONT OF CAFE. WITHIN A YEAR DEFENDANT'S WELL BECAME POLLUTED BY HYDROCARBONS, AND IT WAS FOUND THAT THE TANK CONNECTIONS WERE LEAKING. AS A RESULT OF THIS POLLUTION OF THE CAFE'S SOLE WATER SUPPLY, THE HEALTH DEPARTMENT ORDERED DEFENDANT TO CLOSE THE CAFE BUSINESS. THE CASE DEALS PRIMARILY WITH THE PROPER MEASURE OF DAMAGES DUE THE DEFENDANT. THE COURT HELD THAT DEFENDANT WAS ENTITLED TO THE COST OF A NEW WELL PLUS \$100 FOR THE EXPENSE AND INCONVENIENCE OF HAULING WATER.

FIELD 05B

ACCESSION NO. W68-00627

INFILTRATION AND PERCOLATION STUDIES OF SULFIDES AND SEWAGE CARBONACEOUS MATTER,  
HAWAII UNIV, HONOLULU.

JAMES S. KUMAGAI.

WATER RESOUR RES CENTER, UNIV HAWAII TECHN REP 7, JUNE 1967. 58 P, 14 FIG, 25  
TAB, 26 REF, APPEND.

DESCRIPTORS:

SEWAGE DISPOSAL, ORGANIC LOADING, \*BIODEGRADATION, SOIL DISPOSAL  
FIELDS, CESSPOOLS, SEPTIC TANKS, SULFATES, SULFIDES, PERCOLATING WATER,  
INFILTRATION, GROUNDWATER MOVEMENT.

ABSTRACT:

THE LABORATORY STUDY OF INFILTRATION AND PERCOLATION OF SULFIDES AND  
SEWAGE CARBONACEOUS MATTER WAS CONDUCTED IN 2 PHASES: PHASE 1 UTILIZED  
SIMULATED CESSPOOL LYSIMETERS AND PHASE 2 CONSIDERED THE GENERATION OF  
SULFIDES AND THE INFILTRATION AND PERCOLATION OF SULFIDES THROUGH SOIL  
AND SAND COLUMNS. PHASE 1 RESULTS DICTATED A NEED FOR FURTHER STUDY  
OWING TO FREE PERCOLATION OF CERTAIN ODOROUS COMPOUNDS AND EXCELLENT  
COD REMOVALS UNDER PRESUMABLY ANAEROBIC CONDITIONS CONTRARY TO FINDING  
IN SIMILAR STUDIES. IN PHASE 2 SOIL COLUMN WAS MORE EFFECTIVE FOR  
SULFIDE REMOVAL THAN THE SAND COLUMN WHICH ALLOWED CONTINUOUS  
BREAKTHROUGH OF AN ODOROUS PERCOLATE. PROGRESSIVE MOVEMENT OF A BLACK  
PRECIPITATE THROUGH THE SANDBED INDICATED THAT FILTERING ACTION OF SAND  
WAS NOT AS EFFECTIVE AS SOIL COLUMN. UNDER ACID CONDITIONS, SULFIDE  
BREAKTHROUGH WAS CLEARLY DEMONSTRATED IN BOTH SAND AND SOIL COLUMNS.  
FLOW RATE SIGNIFICANTLY IMPROVED IN BOTH COLUMNS AFTER PERCOLATION OF  
ACIDIFIED FLUIDS. ALL COLUMNS EXHIBITED CHARACTERISTIC NONLINEAR  
RELATIONSHIP BETWEEN FILTRATION AND PERCOLATION RATES AND THE HYDRAULIC  
GRADIENT.

FIELD 02G, 05G

ACCESSION NO. W68-01010

WATER QUALITY DEGRADATION BY WOOD BARK POLLUTANTS,

MAINE UNIV., WATER RESOURCES CENTER, ORONO, MAINE.

OTIS J. SPROUL, AND CLIFFORD A. SHARPE.

MAINE UNIV., WATER RES CENTER PUB NO 5, 53 P, JUNE 1968. 19 FIG, 6 TAB, 10 REF.

DESCRIPTORS:

\*WATER POLLUTION, \*WOOD WASTES, \*BARK, \*LIGNINS, \*BIOCHEMICAL OXYGEN DEMAND, LEACHING, RUNOFF, GROUNDWATER, CELLULOSE, HYDROGEN ION CONCENTRATION, TOXICITY.

IDENTIFIERS:

\*TANNINS, SUGARS.

ABSTRACT:

THE LEACHING OF WOOD BARK WAS STUDIED IN THE LABORATORY TO DETERMINE ITS EFFECT UPON WATER QUALITY. SIGNIFICANT WATER QUALITY DEGRADATION RESULTS FROM MATERIALS LEACHED FROM WOODBARK STOCKPILES ON LAND OR IN WATERCOURSES. THIS DEGRADATION IS FROM ORGANIC AND INORGANIC MATERIALS WHICH CAUSE BOD, COLOR, ODOR, COD, ALKALINITY, AND ACIDITY AND INCREASE THE SOLIDS IN THE WATER. SOFTWOOD BARK LEACHINGS FROM SIMULATED 'DRY' LAND STOCKPILES HAD COLOR OF UP TO 1000 UNITS, BOD UP TO 1200 MG/L AND A THRESHOLD ODOR NUMBER OF 500 AT THE END OF 55 DAYS. HARDWOOD BARK LEACHINGS UNDER SIMILAR CONDITIONS WERE DEGRADED TO A LESSER EXTENT EXCEPT FOR A HIGHER COLOR. STORAGE UNDER HIGHER TEMPERATURES GENERALLY DECREASED THE EXTENT OF WATER CONTAMINATION. BENTHAL BARK DEPOSITS CREATED OXYGEN DEMANDS OF ABOUT 0.6 TO 0.8 POUNDS PER DAY PER TON OF DRY BARK. BOD VALUES WITHIN THE BARK BENTHAL DEPOSIT REACHED 17,700 MG/L. COLOR OF THE OVERLYING WATER REACHED AS HIGH AS 6,000 UNITS FOR THE SOFTWOOD BARK. HARDWOOD BARKS GAVE COLORS AS HIGH AS 1,000 UNITS. WHEN STOCKPILED ON LAND WOODBARK SHOULD BE PLACED OVER IMPERVIOUS MATERIAL AND SURROUNDED BY IMPERVIOUS BERMS SO THAT RAINWATER MOVING THROUGH THE PILE CANNOT CARRY THE POLLUTIONAL MATERIALS INTO WATERCOURSES. (KNAPP-USGS)

FIELD 05C

ACCESSION NO. W68-01269

MIGRATION OF BACTERIOPHAGE T4 IN PERCOLATING WATER THROUGH SELECTED OAHU SOILS,  
HAWAII UNIV., HONOLULU.

RICHARD M. TANIMOTO, REGINALD H. F. YOUNG, AND NATHAN C. BURBANK, JR.

OWRR PROJECT NO. A-001-HI, WATER RESOURCES RESEARCH CTR, TECH RPT NO 20, JUN  
1968. 45 P, 9 FIG, 4 TAB, 64 REF.

DESCRIPTORS:

\*VIRUSES, \*BACTERIOPHAGE, PERCOLATION, GROUND-WATER, WATER POLLUTION.

ABSTRACT:

TESTS TO DETERMINE THE ABILITY OF THREE OAHU SOILS TO REMOVE THE  
COLIPHAGE T4BR11 MUTANT VIRUS FROM WATER PERCOLATING THROUGH LOW HUMIC  
LATOSOLS (WAHIAWA AND LAHAINA SOILS) PROVED THE SOILS ABILITY TO RETAIN  
THE VIRUS BUT ONLY AT DEPTHS GREATER THAN 2 1/2 INCHES. ABSORPTION WAS  
100% WHEN THE CONCENTRATION APPLIED WAS  $2.5 \times 10^6$  TO THE 6 POWER VIRUS  
PER ML OF FEED SOLUTION. BREAKTHROUGH AT LESSER THICKNESSES OF SOIL  
OCCURRED SLOWLY AT FIRST THEN INCREASED RAPIDLY WITH TIME. TANTALUS  
TUFF, A CINDERY PUMICE SUBSTRATUM WAS INEFFECTIVE IN RETAINING VIRUSES  
EVEN AT SOIL THICKNESSES OF AS GREAT AS 15 INCHES. (BURBACK-HAWAII)

FIELD 05G

ACCESSION NO. W69-00225

PREDICTING RETURN FLOWS FROM IRRIGATION,

BUREAU OF RECLAMATION, U S DEPARTMENT OF THE INTERIOR, DENVER, COLORADO,  
OFFICE OF ATMOSPHERIC WATER RESOURCES.

PATRICK A. HURLEY.

ASCE PROC, J IRRIG AND DRAINAGE DIV, VOL 94, NO IR1, PAP 5838, PP 41-48, MAR  
1968. 8 P, 3 FIG, 3 TAB, 3 REF.

DESCRIPTORS:

\*RETURN FLOW, \*IRRIGATION, \*SURFACE-GROUNDWATER RELATIONSHIPS, DRAINAGE  
EFFECTS, DRAINS, DEEP PERCOLATION, EVAPOTRANSPIRATION.

IDENTIFIERS:

TRANSIENT STORAGE, GRAPHICAL SOLUTIONS.

ABSTRACT:

AN ANALYTICAL METHOD FOR COMPUTING RETURN FLOW OR DRAINAGE FROM  
IRRIGATION APPLICATIONS IS PRESENTED AND DISCUSSED. COMPUTATIONS  
CONSIDER AQUIFER PROPERTIES, DRAIN SPECING, AND DEEP PERCOLATION. A  
GRAPH FOR DETERMINING THE FRACTIONAL PART OF PERCOLATION REMAINING IN  
TRANSIENT STORAGE IS INCLUDED. BY USING THE GRAPH AND SIMPLE DIGITAL  
PROCEDURES, REALISTIC ESTIMATES OF IRRIGATION RETURN FLOW CAN BE  
DETERMINED. THE METHOD WAS USED TO DETERMINE MONTHLY QUANTITIES FOR 13  
YR OF RETURN FLOWS IN THE MESILLA VALLEY, NEW MEXICO-TEXAS. (AUTHOR)

FIELD 058, 048

ACCESSION NO. W69-00248



THE EFFECTS OF TEMPERATURE AND DENSITY GRADIENTS UPON THE MOVEMENT OF  
CONTAMINANTS IN SATURATED AQUIFERS,

ALABAMA UNIV., UNIVERSITY.

HAROLD R. HENRY.

UNIV ALABAMA RPT, 1967. 14 P, 4 FIG, 26 REF. OWRR PROJECT B-004-ALA.

DESCRIPTORS:

\*CONTAMINATION, \*AQUIFERS, CONVECTION, \*DISPERSION, WASTE DISPOSAL,  
THERMAL PROPERTIES, MODEL TESTS, SATURATION ZONES, SEEPAGE, NUMERICAL  
METHOD, LABORATORY TESTS, PERMEABILITY, POROSITY, POROUS MATERIALS,  
BIBLIOGRAPHIES, DARCYS LAW.

IDENTIFIERS:

TEMPERATURE PROFILES, THERMAL DIFFUSION.

ABSTRACT:

EXPERIMENTAL AND ANALYTICAL STUDIES WERE MADE ON A SIMPLIFIED GEOMETRIC  
MODEL. A HORIZONTAL, LATERAL TEMPERATURE GRADIENT WAS IMPOSED UPON A  
HORIZONTAL CHANNEL OF SQUARE CROSS SECTION CONTAINING SAND SATURATED  
WITH WATER. VELOCITIES WERE MEASURED BY TRACING DYE PATTERNS ALONG THE  
GLASS WALLS AND TOP OF THE CHANNEL. TEMPERATURES WERE MEASURED BY  
NETWORKS OF COPPER-CONSTANTAN THERMOCOUPLE JUNCTIONS SPACED THROUGHOUT  
THE CHANNEL. EXPERIMENTAL TEMPERATURES AND VELOCITIES INDICATED THE  
PRESENCE OF A CONVECTION CURRENT WHICH INCREASED IN STRENGTH AS THE  
TEMPERATURE GRADIENT INCREASED. BY DEFINING A STREAM FUNCTION  $\Psi$  AND  
BY APPROPRIATE NORMALIZATION OF THE VARIABLES, THE GOVERNING EQUATIONS  
WERE REDUCED TO AN EXPRESSION WHICH IS PARAMETER FREE EXCEPT FOR A  
VALUE,  $M$ , WHICH IS A MODIFICATION OF THE RAYLEIGH NUMBER. FINITE  
DIFFERENCE SOLUTIONS ARE OBTAINED FOR SEVERAL VALUES OF  $M$  AND FOR  
SEVERAL BOUNDARY CONDITIONS. THE EFFECTIVE VALUE OF THERMAL DIFFUSIVITY  
IS FOUND TO BE ABOUT 50 TIMES LARGER THAN THE USUAL VALUE BECAUSE OF  
THE DISPERSION WHICH OCCURS WHEN FLUID MOVES THROUGH THE TORTUOUS  
CHANNELS WITHIN THE POROUS BED.

FIELD 058

ACCESSION NO. W69-00651

TRAVEL OF ABS AND AMMONIA NITROGEN WITH PERCOLATING WATER THROUGH SATURATED  
OAHU SOILS,

HAWAII UNIV., HONOLULU.

REGINALD H. F. YOUNG, L. STEPHEN LAU, AND NATHAN C. BURBANK.

WATER RESOUR RES CENTER, TECHN REP 1, JAN 1967. 54 P, 13 FIG, 7 TAB, 32 REF,  
4 APPEND. OWRR PROJECT A-001-HI.

DESCRIPTORS:

PERCOLATING WATER, INFILTRATION, DETERGENTS, POLLUTANTS, NITROGEN  
COMPOUNDS, SOIL CONTAMINATION, CESSPOOLS, SEWAGE DISPOSAL, GROUNDWATER  
MOVEMENT, ABSORPTION, ADSORPTION.

ABSTRACT:

A LABORATORY STUDY WAS UNDERTAKEN TO DETERMINE THE ABILITY OF 4 OAHU  
SOILS, LOLEKAA, LAHAINA, MANANA, AND WAHIAWA, TO REMOVE AMMONIA, ABS,  
AND COLIFORMS FROM WATER PERCOLATING CONTINUOUSLY THROUGH SATURATED  
SOILS. SOILS UTILIZED WERE CHOSEN ON THE BASIS OF THEIR WIDE OCCURRENCE  
ON THE ISLAND AREAS WHERE PERCOLATING WATER MAY ENTER DIRECTLY AND IN  
QUANTITY INTO THE GROUND WATER BODY THAT PRINCIPALLY PROVIDES THE  
ISLAND'S DOMESTIC WATER SUPPLY. ALL 4 SOILS HAD A HIGH CLAY CONTENT AND  
LOW PH. LABORATORY TESTS WERE CONDUCTED WITH 10-ML BURETTES AND SUBJECT  
TO CONTINUOUS SATURATED FLOW. EACH CONTAMINANT WAS APPLIED IN SOLUTION  
1 AT A TIME TO A FRESH SOIL SAMPLE. TAP WATER WAS USED FOR ABS AND  
AMMONIA NITROGEN WHILE SEWAGE WAS USED TO STUDY COLIFORM REMOVAL. THE  
RESULTS OF COLIFORM REMOVAL FROM PERCOLATING LIQUIDS WERE NOT  
CONCLUSIVE BECAUSE OF SMALL SOIL SAMPLES AND LOADING PROCEDURES.  
PRELIMINARY TESTS VERIFIED SOME GENERAL PRINCIPLES DEVELOPED ELSEWHERE  
FOR EFFECTIVE COLIFORM REMOVAL BY GROUND DISPOSAL OF SEWAGE. THE FINAL  
CLARIFIER EFFLUENT FROM A TRICKLING FILTER WAS PASSED CONTINUOUSLY  
THROUGH A 30 IN. COLUMN OF WAHIAWA SOIL AND AN INITIAL COLIFORM  
REDUCTION OF ABOUT 90 % WAS EFFECTED.

FIELD 05B

ACCESSION NO. W69-00652

EFFECTS OF SOLUBLE ORGANICS ON FLOW THROUGH THIN CRACKS OF BASALTIC LAVA,  
HAWAII UNIV., MANOA.

KENNETH ISHIZAKI, NATHAN C. BURBANK, JR., AND STEPHEN LAU.

TECH REP 16, WATER RESOUR RES CENTER, AUG 1967. 56 P, 38 FIG, 9 TAB, 42 REF,  
2 APPEND. OWRR PROJECT A-001-HI.

DESCRIPTORS:

PERCOLATION, GROUND WATER, \*PERMEABILITY, POROSITY, CLOSED CONDUIT  
FLOW, \*GROUND WATER MOVEMENT, CAPILLARY FLOW, \*LAVA, BASALTS, WATER  
POLLUTION SOURCES, MICROORGANISMS, FERROBACILLUS, FLOW RESISTANCE,  
RETENTION, HAWAII.

IDENTIFIERS:

HAGAN-POISEUILLE FLOW, CLOGGING.

ABSTRACT:

MOST OF OAHU'S DOMESTIC WATER SUPPLY IS FROM GROUND WATER OCCURRING IN  
PERMEABLE MATERIALS OF VOLCANIC ROCK. MOVEMENT OF GROUND WATER IS  
INTRINSICALLY THROUGH THIN CRACKS IN BASALTIC LAVAS. THIS PROJECT  
STUDIED PASSAGE OF AN ORGANIC-RICH LIQUID THROUGH CRACKS IN BASALT.  
PERMEABILITY OF BLUE ROCK PORTIONS OF A BASALT WAS DETERMINED AS  $2.6 \times 10^{-10}$  TO THE MINUS 4 POWER GAL/DAY/SQ FT OF WATER, CLASSING THE ROCK AS  
IMPERVIOUS. A RANGE OF 7.7 TO 10.4% IN POROSITY VALUES WAS OBTAINED  
FROM THE BLUE ROCK PORTIONS; THE CLINKER PORTION YIELDED A VALUE OF  
50%. THE GREATEST RETARDATION IN FLOW OF NONBIODEGRADABLE LIQUIDS  
THROUGH THIN CRACKS OCCURRED IN THE INITIAL HOURS FOLLOWED BY A  
SYSTEMATIC REDUCTION OF FLOW TO 7/8 TO 1/100 OF THE INITIAL FLOW RATE.  
FLOW OF ORGANIC-RICH LIQUIDS THROUGH SUCH CRACKS, SIMILAR TO  
NONBIODEGRADABLE LIQUIDS, EXHIBITS A DECREASE IN FLOW INITIALLY AND  
CONTINUES THIS TREND FOR AS LONG AS 220 HR. TERMINAL FLOW VELOCITY OF  
TAP WATER IS MUCH GREATER THAN THAT OF SEWAGE WHICH APPEARS TO PROCEED  
TO A NO-FLOW CONDITION. THE CLOGGING PHENOMENON WAS DEPENDENT UPON  
MICROBIAL ACTIVITY AND FOOD SUPPLY IN SEWAGE. THE PRODUCTS ARE  
PRIMARILY POLYSACCHARIDES AND SLIMES ALONG WITH FERROUS SULFIDE,  
COMMONLY FOUND IN SEPTIC SEWAGE IN CONTACT WITH SOIL OR ROCK.

FIELD 05B, 02F

ACCESSION NO. W69-00979

MIGRATION OF POLLUTANTS IN A GLACIAL OUTWASH ENVIRONMENT,

WASHINGTON STATE UNIV., PULLMAN.

JAMES W. CROSBY, III, DONALD L. JOHNSTONE, CHARLES H. DRAKE, AND ROBERT L. FENTON.

WATER RESOURCES RESEARCH, VOL 4, NO 5, PP 1095-1114, OCTOBER 1968. 17 FIG, 1 TAB, 17 REF.

DESCRIPTORS:

\*POLLUTANTS, GROUNDWATER, \*INFILTRATION, COLIFORMS, ENTERIC BACTERIA, NITRATES, CHLORIDES, \*CAPILLARY CONDUCTIVITY, SOIL MOISTURE.

IDENTIFIERS:

DRAIN FIELDS, \*TEST HOLES, ANNUAL PRECIPITATION, LEACH BED, SPOKANE RIVER VALLEY.

ABSTRACT:

A TEST DRILLING PROGRAM WAS CONDUCTED IN A DRAIN FIELD AREA OF THE SPOKANE VALLEY, WASHINGTON TO STUDY THE MOVEMENT OF POLLUTANTS IN GLACIAL OUTWASH DEPOSITS WHEN THEY ARE SUBJECTED TO EXTREME POLLUTANT LOADS. CONTRARY TO WHAT MIGHT BE EXPECTED, VERY DRY SOILS WERE FOUND AT DEPTHS BENEATH THE DRAIN FIELD, AND IT IS CONCLUDED THAT MOST OF THE WATERS ARE BEING DISPERSED Laterally BY CAPILLARY MECHANISMS. MUCH OF THE SYSTEMIC WATER MAY ULTIMATELY BE RETURNED TO THE ATMOSPHERE BY EVAPOTRANSPIRATION. MOISTURE CONDITIONS IN THE DRAIN FIELD SYSTEM STRONGLY INDICATE THAT GROUND-WATER RECHARGE THROUGH INCIDENT PRECIPITATION IN THIS PART OF THE VALLEY WOULD BE HIGHLY IMPROBABLE. CHEMICAL POLLUTANTS ARE FOUND TO TRAVEL WITH MOISTURE FRONTS, BUT FINE MATERIALS ARE DETERMINED TO BE VERY EFFECTIVE IN FILTERING BACTERIA WITHIN A RELATIVELY FEW FEET OF THE LEACH BED. (SENECA-RUTGERS)

FIELD 05B

ACCESSION NO. W69-01076

BAND DIFFUSION WITH VARIABLE PARAMETERS ALONG FLOW,

SYRACUSE UNIVERSITY, NEW YORK.

WEN-HSIUNG LI.

J ENG MECH DIV, AMER SOC CIV ENG, PROC PAP 4106, VOL 90, NO EM5, PP 343-361,  
OCT 1964. 19 P, 8 FIG, 14 REF, APPEND.

DESCRIPTORS:

\*DISPERSION, FLOW, POROUS MEDIA, GROUNDWATER, WASTES, \*UNIFORM FLOW,  
\*DIFFUSION, POROUS MATERIALS, \*ENGINEERING MECHANICS.

ABSTRACT:

THE DIFFUSION EQUATION WITH VARIABLE PARAMETERS ALONG THE FLOW CAN BE  
SOLVED WHEN THE DIFFUSED QUANTITY IS CONFINED TO A NARROW BAND.  
SOLUTIONS ARE OBTAINED FOR DIFFUSION FROM A LINE SOURCE AND A POINT  
SOURCE IN NONUNIFORM FLOWS. THE DISPERSION OF A CONTAMINANT IN  
NONUNIFORM FLOWS THROUGH POROUS MEDIA IS STUDIED. IT IS FOUND THAT THE  
DISPERSION ACROSS THE STREAMLINES CAN BE ESTIMATED BY USING THE  
SOLUTIONS OF DIFFUSION FROM A LINE SOURCE AND A POINT SOURCE IN A  
UNIFORM FLOW. (S. MAYER-FWPCA)

FIELD 02F, 05B

ACCESSION NO. W69-01238

EFFECT OF RIVER WATER QUALITY ON AN ADJACENT AQUIFER,

CINCINNATI UNIV., OHIO.

HERBERT C. PREUL, AND L. V. POPAT.

SYSTEMS APPROACH TO WATER QUALITY IN THE GREAT LAKES, PROC 3RD ANNU SYMP  
WATER RESOURCES RES, PP 73-96, OHIO STATE UNIV, SEPT 1967. 24 P, 11 FIG, 5  
TAB, 8 REF.

DESCRIPTORS:

\*WATER QUALITY, \*MATHEMATICAL MODELS, INDUCED INFILTRATION, RECHARGE,  
\*SURFACE-GROUNDWATER RELATIONSHIPS, OBSERVATION WELLS, WATER LEVELS,  
\*WATER WELLS, WATER SUPPLY, AQUIFERS, ION EXCHANGE, POLLUTANTS,  
POLLUTANT IDENTIFICATION, ADSORPTION, WATER CHEMISTRY, DARCY'S LAW,  
PERMEABILITY, \*RIVER FLOW.

IDENTIFIERS:

GREAT MIAMI RIVER, S.W. OHIO WATER COMPANY, NETWORK ANALYSIS.

ABSTRACT:

PREDICTIVE MATHEMATICAL MODELS USED TO DETERMINE THE QUANTITY AND  
QUALITY OF RECHARGE FROM THE GREAT MIAMI RIVER TO COLLECTOR WELLS WERE  
PRESENTED. THE QUANTITY MODEL, BASED ON A SIMPLIFIED NODE-NETWORK  
MODEL, REPRESENTING GROUND BASIN DYNAMICS BASED ON DARCY'S LAW, WAS A  
LINEAR DIFFERENCE-DIFFERENTIAL MODEL USING ONE-HALF YEAR AS THE  
INCREMENT OF TIME. THE CONCENTRATION OF POLLUTANTS WAS DETERMINED AS  
THE SUM OF CONCENTRATIONS INTRODUCED BY THE CONVECTIVE FLUX BETWEEN THE  
RIVER AND WELL. CALCULATED POLLUTANT CONCENTRATIONS WERE TABLED, AND  
COMPARED WITH MEASURED CONCENTRATIONS. IT WAS CONCLUDED THAT A HIGH  
PERCENTAGE OF THE WATER RECHARGING THE TWO COLLECTOR WELLS ORIGINATES  
FROM THE RIVER, AND THAT THE POLLUTANT INHIBITORY CAPABILITIES OF THE  
AQUIFER, IN THE FORM OF ADSORPTION AND ION EXCHANGE, WERE NEARLY  
EXHAUSTED. (GYSI-CORNELL)

FIELD 04B, 05B

ACCESSION NO. W69-02611

MODEL EXPERIMENTS ON FLUID FLOW IN THE TRANSITION ZONE FROM UNSATURATED TO SATURATED SOIL,

BUNDESANSTALT FUER GEWASSERKUNDE, COBLENZ, (WEST GERMANY).

F. SCHWILLE, W. LIPPOK, AND D. WEISFLOG.

PROC OF SYMP, INT AT ENERGY AGENCY, VIENNA, AND EUROPE NUCL ENERGY AGENCY, PP 151-160, 1967. 10 P, 10 FIG, DISCUSS.

DESCRIPTORS:

\*INFILTRATION, \*POROUS MEDIA, \*ALLUVIUM, \*LYSIMETERS, \*RADIOISOTOPES, RADIOACTIVE WASTE DISPOSAL, GROUNDWATER MOVEMENT, PERCOLATION, SEEPAGE, UNSATURATED FLOW, MODEL STUDIES, SATURATED SOILS.

IDENTIFIERS:

HOMOGENEOUS MEDIA, UNSATURATED SOIL.

ABSTRACT:

LYSIMETER STUDIES OF THE INFILTRATION OF WATER INTO SOIL WERE MADE IN A STUDY OF THE SAFETY FACTORS OF RADIONUCLIDE-PRODUCING PLANTS LOCATED ON RIVER ALLUVIUM IN GERMANY. MORE THAN FOUR-FIFTHS OF THE DRINKING WATER IN GERMANY IS GROUNDWATER OR BANK-FILTERED RIVER WATER. THE MOST IMPORTANT AQUIFERS IN THE FEDERAL REPUBLIC OF GERMANY ARE FLUVIATILE AND FLUVIOGLACIAL PLEISTOCENE SAND AND GRAVEL DEPOSITS, SITUATED IN THE VALLEYS OF THE LARGE RIVERS. THE GROUND-WATER LEVEL IS GENERALLY FROM 3 TO 15 M BELOW GROUND SURFACE. DEPENDING ON THE PERMEABILITY OF THE SUBSTRATA, ABOUT 100 TO 300 MM OF PRECIPITATION WATER PROBABLY INFILTRATES. THESE ALLUVIAL PLAINS ARE POSSIBLE LOCATIONS FOR RADIONUCLIDE-PRODUCING PLANTS. HOWEVER, IT IS HARD TO FIND ANY LOCALITY WHERE SUCH PLANTS WOULD NOT HAVE A MARKED EFFECT ON THE WATER SUPPLY SYSTEM. TO PROTECT GROUNDWATER AGAINST RADIONUCLIDE CONTAMINATION, A DETAILED KNOWLEDGE IS FIRST NECESSARY OF THE MIGRATION MECHANISMS OF RADIONUCLIDE-CONTAINING SOLUTIONS BOTH INTO THE UNSATURATED ZONE AND THE SATURATED ZONE. INFILTRATION IN THE UNSATURATED ZONE AND SPREADING IN THE SATURATED ZONE WERE ANALYZED WITH SAND MODELS. LARGE GLASS LYSIMETERS, EXPERIMENTAL TROUGHS WITH GLASS WALLS AND SMALL DIAMETER COPPER AND GLASS SEGMENT-TUBES WERE USED AS MODELS. THE LIQUID FRONTS WERE TRACED MAINLY WITH ULTRA-VIOLET LIGHT. THE RESULT SHOWS THAT IT IS NOT YET POSSIBLE TO TREAT THE FLOW OF LIQUID ANALYTICALLY IN EVERY CASE, EVEN IN HOMOGENEOUS MEDIA. (KNAPP-USGS)

FIELD 02G, 05B

ACCESSION NO. W69-02681

INVESTIGATION OF THE INFLUENCE OF WASTE DISPOSAL PRACTICES ON GROUNDWATER QUALITIES,

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF CIVIL ENGINEERING.

JOHN R. ANDERSON, AND JAMES N. DORNBUSH.

TECHNICAL COMPLETION REPORT, WATER RESOURCES INSTITUTE, NOVEMBER, 1968, WASHINGTON, D. C., 41 P, 5 TAB, 11 FIG, 13 REF. DWRR PROJECT A-003-SDAK.

DESCRIPTORS:

\*WASTE DISPOSAL, \*GROUNDWATER, \*WATER QUALITY, \*LANDFILL, SANITARY FILL, WASTE DILUTION, WATER POLLUTION CONTROL, LEACHING, WATER QUALITY CONTROL, DOMESTIC WASTES, INFILTRATION, AQUIFORS, SANITARY ENGINEERING.

IDENTIFIERS:

BROOKINGS(SOUTH DAKOTA).

ABSTRACT:

AN EVALUATION OF THE EFFECTS OF ITS LANDFILL ON THE GROUNDWATER QUALITY WAS INITIATED BY THE CITY OF BROOKINGS, S. D. IN 1960, AND INCORPORATED IN A COMPREHENSIVE STUDY BY THIS PROJECT IN 1964. THE INITIAL PHASE OF THE PROJECT CONCLUDED THAT THE MOST USEFUL PARAMETERS FOR DETECTING CONTAMINATION WERE CHLORIDES, SODIUM AND SPECIFIC CONDUCTANCE WITH THE NEXT PHASE, CONCLUDING THAT SEASONAL RAINFALL INTENSIFIED LEACHING. INCREASED IONIC CONCENTRATIONS DURING RAINY PERIODS IMPLIED THAT EFFECTS OF LEACHING OVERRODE THOSE ATTRIBUTED TO DILUTION. IT APPEARED THAT AS THE WATER MOVED DOWNSTREAM FROM THE LANDFILL THE QUALITY IMPROVED AND WAS SUITABLE AS A DOMESTIC WATER SUPPLY AND FOR IRRIGATIONAL PURPOSES BEFORE IT LEFT THE LANDFILL AREA. IN AS MUCH AS IT WAS FOUND THAT A POND SEEMED TO IMPROVE THE QUALITY OF THE DEGRADED GROUNDWATER, A TRENCH WAS CONSTRUCTED TO INTERCEPT THE GROUNDWATER AS IT MOVED FROM THE FILL AREA. IT WAS SHOWN THAT CHEMICAL CONSTITUENTS THAT WERE LEACHED FROM THE REFUSE WERE MODIFIED BY THE TRENCH AND WATER QUALITY EXHIBITED AN IMPROVEMENT. THE TRENCH ALSO MODIFIED THE CONCENTRATIONS OF ORGANIC MATERIALS AND THE THRESHOLD ODOR LEVELS. GENERAL RECOMMENDED PRACTICES WERE MADE FOR DISPOSING OF REFUSE INTO ABANDONED GRAVEL PITS LOCATED IN A REGION OF HIGH WATER TABLE.

FIELD 058

ACCESSION NO. W69-03178



TRACE AND TRACER ELEMENTS IN GROUND WATER,

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY.

GORDON R. DUTT.

ARIZONA WATER RESOURCES RESEARCH CENTER, RESEARCH PROJECT TECHNICAL  
COMPLETION REPORT, AUGUST 1968. 11 P, 1 TAB, 2 REF. OWRR PROJECT  
B-001-ARIZ, B-002-ARIZ, AND B-004-ARIZ.

DESCRIPTORS:

\*GROUND WATER, \*TRACE ELEMENTS, CHELATE EXTRACTION, ATOMIC ABSORPTION  
ANALYSES, CARBONATE, BICARBONATE, FLUORIDE, NITRATE, SULFATE, SILICATE,  
GROUND WATER RECHARGE, HYDROCHEMICAL FACIES, SEWAGE EFFLUENT, C.O.D.,  
B.O.D., WASTE WATERS, HYDRAULIC LOADING, INFILTRATION, TUCSON BASIN,  
PROCESS-RESPONSE MODEL, INSTRUMENTATION, HYDROCHEMICAL DATA.

ABSTRACT:

OVER 680 WELLS ARE SAMPLED AND ANALYZED FOR CONDUCTIVITY, PH, CA(++),  
MG(++), NA(+), CL(-), SO4(=), CO3(=), F(-), NO3(-), K(+), SR(++), AND  
THE TRACE ELEMENTS, FE, MN, CU, ZN, CR(+6), NI, PB, CO, AND CD. A NEW  
METHOD WAS DEVELOPED FOR THE SIMULTANEOUS CHELATE EXTRACTION AND ATOMIC  
ABSORPTION ANALYSIS OF THE LAST NINE ELEMENTS IN WATER AND SEWAGE  
SAMPLES. THE SURFACE AND SUBSURFACE MOVEMENT OF THE NINE TRACE ELEMENTS  
WERE STUDIED ON GRASSED PLOTS WITH EFFLUENT FROM A DOMESTIC SEWAGE  
EFFLUENT TREATMENT FACILITY. ANALYSIS OF RECHARGED WATER WAS THE SAME  
AS ABOVE PLUS C.O.D. AND B.O.D. DETERMINATIONS. A CONCEPTUAL  
PROCESS-RESPONSE MODEL OF THE TUCSON BASIN WAS DEVELOPED TO RELATE  
GROUND WATER CHEMICAL COMPOSITION TO THE SOIL, SUBSOIL AND GEOLOGIC  
FORMATIONS OF THE RECHARGE AND GROUND WATER FLOW PATTERN OF THE BASIN.  
A CALCITE-WATER CHEMICAL EQUILIBRIUM MODEL WAS USED TO DETERMINE THE  
PRECIPITATION OR DISSOLUTION OF CALCITE IN THE BASIN AQUIFERS.

FIELD 02F, 05A

ACCESSION NO. W69-03197

CONVECTIVE SALT DIFFUSION IN A RADIAL SUBSURFACE STREAM IN RELATION TO THE  
PROTECTION OF SUBSURFACE WATERS FROM CONTAMINATED DISCHARGES,

F. M. BOCHEVER, AND A. YE. DRADOVSKAYA.

TRANSL FROM DOKLADY VODGEO, NO. 13, PP 159-180, 1966. SOVIET HYDROL: SELEC  
PAP, ISSUE NO 4, PP 416-431, 1967. 16 P, 5 FIG, 1 TAB, 17 REF.

DESCRIPTORS:

\*DIFFUSION, \*POROUS MEDIA, \*GROUNDWATER MOVEMENT, \*PATH OF POLLUTANTS,  
INJECTION WELLS, WASTE DISPOSAL, SUBSURFACE WATERS.

IDENTIFIERS:

USSR, RADIAL DIFFUSION EQUATIONS.

ABSTRACT:

METHODS ARE GIVEN FOR CALCULATION OF RADIAL SOLUTE DIFFUSION ALLOWING  
FOR SORPTION IN POROUS MEDIA. EXAMPLES OF SUCH DIFFUSION ARE FOUND NEAR  
SUBSURFACE WASTE INJECTION WELLS. SOLUTIONS ARE DEVELOPED FOR VARYING  
AND UNVARYING CONCENTRATIONS OF INJECTED FLUIDS. (KNAPP-USGS)

FIELD 05B, 02F

ACCESSION NO. W69-03212

NUMERICAL SOLUTIONS FOR DISPERSION IN POROUS MEDIUMS,

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. HYDRODYNAMICS LAB.

URI Y. SHAMIR, AND DONALD R. F. HARLEMAN.

WATER RESOURCES RES, VOL 3, NO 2, PP 557-581, 1967. 25 P, 14 FIG, 2 TAB, 19 REF.

DESCRIPTORS:

\*DISPERSION, \*DIFFUSION, \*POROUS MEDIA, \*GROUNDWATER MOVEMENT, \*WATER POLLUTION, PATH OF POLLUTANTS, DIGITAL COMPUTERS, COMPUTER PROGRAMS.

IDENTIFIERS:

NUMERICAL METHODS.

ABSTRACT:

A NUMERICAL METHOD IS PRESENTED FOR THE SOLUTION OF PROBLEMS OF DISPERSION IN STEADY 3-DIMENSIONAL POTENTIAL FLOW FIELDS IN POROUS MEDIUMS, IN WHICH THE MISCIBLE FLUIDS HAVE THE SAME DENSITY AND VISCOSITY. THE METHOD IS DEVELOPED AND TESTED FOR 2-DIMENSIONAL PROBLEMS, AND THE EXTENSION TO 3 DIMENSIONS IS PRESENTED. EMPHASIS IS PUT ON THE EFFICIENCY OF THE NUMERICAL SCHEME AND ON ITS GENERALITY. IT IS SHOWN TO BE INDEPENDENT OF THE GEOMETRY OF THE FLOW FIELD. THE COMPUTER PROGRAM FOR CARRYING OUT THE COMPUTATIONS AS DESCRIBED IS TESTED WITH SIMPLE PROBLEMS, FOR WHICH EXACT OR APPROXIMATE ANALYTICAL SOLUTIONS EXIST. IT IS ALSO USED TO OBTAIN SOLUTIONS TO A FEW PROBLEMS FOR WHICH NO OTHER SOLUTION IS KNOWN. (KNAPP-USGS)

FIELD 05B, 02F

ACCESSION NO. W69-03237

PUTTING WASTE WATER TO BENEFICIAL USE - THE FLUSHING MEADOWS PROJECT,  
AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.  
HERMAN BOUWER.

PROC 12TH ANNUAL ARIZONA WATERSHED SYMPOSIUM, PHOENIX, ARIZONA, 18 SEPTEMBER  
1968, PP 25-30. 6 P, 3 FIG, 1 TAB, 6 REF.

DESCRIPTORS:

SEWAGE EFFLUENT, \*WASTE WATER DISPOSAL, WASTE WATER TREATMENT, WATER  
POLLUTION, \*SOIL WASTE TREATMENT, SOIL PERCOLATION, \*WASTE WATER  
RECLAMATION, INDUCED INFILTRATION, \*GROUND WATER RECHARGE, IRRIGATION,  
DENITRIFICATION, ECONOMICS.

IDENTIFIERS:

SURFACE SPREADING, RECHARGE BASINS, EXPERIMENTAL RECHARGE PROJECT,  
FLUSHING MEADOWS PROJECT, PHOENIX(ARIZONA).

ABSTRACT:

IN CENTRAL ARIZONA, DECREASING WATER SUPPLIES AND INCREASING POPULATION  
MAKE REUSE OF MUNICIPAL WASTE WATER MANDATORY. AN EXPERIMENTAL PROJECT  
WEST OF PHOENIX HAS SHOWN THAT THE HYDROGEOLOGY OF THE SALT RIVER BED  
IS UNIQUELY SUITED FOR RECLAIMING WATER FROM SEWAGE EFFLUENT BY SURFACE  
SPREADING FOR GROUND WATER RECHARGE. THE PROJECT CONTAINS SIX RECHARGE  
BASINS 20 X 700 FT EACH. FOUR BASINS ARE IN BERMUDAGRASS, ONE BASIN IS  
COVERED WITH A GRAVEL LAYER, AND ANOTHER IS IN BARE SOIL. THE GRASS  
BASINS HAD THE HIGHEST INFILTRATION RATES, THE GRAVEL BASIN THE LOWEST.  
INCLUDING DRYUP PERIODS, AN ANNUAL RECHARGE RATE OF ABOUT 300 FT SHOULD  
BE ATTAINABLE. WITH SHORT INUNDATION PERIODS (2 DAYS) ALL NITROGEN IN  
THE SEWAGE EFFLUENT WAS CONVERTED TO NITRATE IN THE RECLAIMED WATER.  
WITH LONG INUNDATION PERIODS (10 DAYS) 90% REMOVAL OF THE NITROGEN WAS  
OBTAINED, PROBABLY BECAUSE OF DENITRIFICATION. THE USUAL REDUCTIONS IN  
BOD, COLIFORMS, AND PHOSPHORUS WERE OBSERVED. HORIZONTAL AND VERTICAL  
HYDRAULIC CONDUCTIVITY OF THE AQUIFER WERE EVALUATED BY ELECTRIC  
ANALOG, USING WATER LEVEL DATA FROM TWO OBSERVATION WELLS. PLANS FOR A  
LARGE-SCALE RECHARGE PROJECT CONSISTING OF STRIPS OF RECHARGE BASINS ON  
EACH SIDE OF THE RIVER BED AND WELLS IN THE CENTER OF THE RIVER BED  
WERE DEVELOPED.

FIELD 05D, 03F, 04B

ACCESSION NO. W69-05327

RETURNING WASTES TO THE LAND, A NEW ROLE FOR AGRICULTURE,

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.

HERMAN BOUWER.

JOUR SOIL AND WATER CONSERVATION, VOL 23, NO 5, PP 164-169, 1968. 5 P, 2 FIG,  
1 TAB, 22 REF.

DESCRIPTORS:

SEWAGE EFFLUENT, \*WASTE WATER DISPOSAL, WASTE WATER TREATMENT, WATER  
POLLUTION, \*SOIL WASTE TREATMENT, SOIL PERCOLATION, \*WASTE WATER  
RECLAMATION, INDUCED INFILTRATION, \*GROUND WATER RECHARGE, IRRIGATION,  
DENITRIFICATION, ECONOMICS.

IDENTIFIERS:

SURFACE SPREADING, RECHARGE BASINS, EXPERIMENTAL RECHARGE PROJECT,  
FLUSHING MEADOWS PROJECT, PHOENIX(ARIZONA).

ABSTRACT:

LAND DISPOSAL OF TREATED SEWAGE OR OTHER LIQUID WASTE REDUCES POLLUTION  
LOADS ON STREAMS AND LAKES. AFTER INFILTRATION AND PERCOLATION THROUGH  
THE SOIL, BIODEGRADABLE MATERIAL, MICROORGANISMS, PHOSPHORUS, NITROGEN,  
HEAVY METALS, FLUORIDES, AND OTHER SUBSTANCES ARE EFFECTIVELY REMOVED.  
THUS, THE WASTE WATER THAT HAS PERCOLATED TO THE WATER TABLE AND THEN  
MOVED AS GROUND WATER FOR SOME DISTANCE CAN BE COLLECTED AS RECLAIMED  
WATER SUITABLE FOR REUSE. UNDER FAVORABLE HYDROGEOLOGIC CONDITIONS, THE  
COST OF WASTE WATER RENOVATION BY SURFACE SPREADING FOR GROUND WATER  
RECHARGE IS A FRACTION OF THAT OF COMPARABLE TERTIARY IN-PLANT  
TREATMENT. SEVERAL TYPES OF LAND DISPOSAL OF GROUND WATER RECHARGE  
SYSTEMS ARE DISCUSSED AND DESIGN AND OPERATING CRITERIA ARE PRESENTED.  
FOR THE EXPERIMENTAL RECHARGE PROJECT NEAR PHOENIX, ARIZONA, SEQUENCES  
OF LONG INUNDATION PERIODS (10 DAYS) YIELDED MUCH LOWER NITRATE LEVELS  
IN THE RECLAIMED WATER THAN SEQUENCES OF SHORT INUNDATION PERIODS (2  
DAYS). THIS IS ATTRIBUTED TO DENITRIFICATION. IN VIEW OF THE INCREASING  
AMOUNTS OF WASTE WATER AND THE URGENT NEED FOR POLLUTION CONTROL OF  
SURFACE WATERS, AGRICULTURE'S ROLE IN THE FUTURE WILL NOT ONLY BE TO  
PROVIDE FOOD AND FIBER, BUT ALSO TO SERVE AS A MEDIUM FOR RECEIVING AND  
RENOVATING TREATED SEWAGE AND OTHER WASTES.

FIELD 05D, 03F, 04B

ACCESSION NO. W69-05328

DUMPING OF OIL.

ME REV STAT ANN TIT 17, SEC 2794 (1965).

DESCRIPTORS:

\*MAINE, \*WATER POLLUTION, \*OIL WASTES, \*OIL, LEGISLATION, STATE GOVERNMENTS, POLLUTION ABATEMENT, CHEMICAL WASTES, WATER POLLUTION SOURCES, INDUSTRIAL WASTES, RIVERS, STREAMS, LAKES, PONDS, TIDAL WATERS, WELLS, GROUNDWATER, SURFACE WATERS, SEEPAGE, PERCOLATION.

ABSTRACT:

THE INTENTIONAL PLACEMENT OR DIRECT DEPOSIT OF OIL, PETROLEUM BASE PRODUCTS OR MATERIALS CONTAINING SIGNIFICANT QUANTITIES OF SUCH OIL INTO OR ON THE BANKS OF ANY RIVER, STREAM, PERMANENT OR TEMPORARY LAKE, POND, OR TIDAL WATERS OR ON THE ICE THEREOF WHERE SUCH MATERIALS MAY FIND ITS WAY INTO SAID WATERCOURSE OF TIDAL WATERS IS PROHIBITED. ALSO PROHIBITED IS THE DEPOSIT OF SUCH MATERIALS INTO PITS, WELLS OR ON GROUND SURFACES IN SUCH A MANNER THAT OIL WILL PERCOLATE, SEEP, OR OTHERWISE FIND ACCESS INTO GROUNDWATERS OR INTO WELLS USED FOR THE PRODUCTION OF WATER. (LOGAN-FLA)

FIELD 05G, 06E

ACCESSION NO. W69-05370

PHILLIPS V SUN OIL CO (GASOLINE POLLUTION OF WATER WELL).

307 NY 328, 121 NE 2D 249-251 (1954).

DESCRIPTORS:

\*NEW YORK, \*WATER WELLS, \*GASOLINE, \*WATER POLLUTION SOURCES, JUDICIAL DECISIONS, FUELS, WELLS, WATER POLLUTION, SEEPAGE, GROUNDWATER, PERCOLATING WATER, WELL REGULATIONS, PERCOLATION, SUBSURFACE DRAINAGE, SHALLOW WELLS, SUBSURFACE WATERS, LEGAL ASPECTS.

IDENTIFIERS:

TRESPASS, INJUNCTIONS(PROHIBITORY), NUISANCE.

ABSTRACT:

PLAINTIFF OWNED LAND ADJACENT TO DEFENDANT'S UNDERGROUND GASOLINE STORAGE TANKS. GASOLINE TRAVELED UNDERGROUND TO PLAINTIFF'S LAND AND SEEPED INTO HIS WATER WELL, CONTAMINATING HIS WATER SUPPLY. PLAINTIFF BROUGHT THIS ACTION IN TRESPASS TO RECOVER DAMAGES. THE COURT HELD THAT TRESPASS IS AN INTENTIONAL HARM. THE TRESPASSER NEED NOT INTEND OR EXPECT THE CONSEQUENCE OF HIS ACTION IN ORDER TO BE HELD LIABLE THEREFOR, BUT HE MUST INTEND THE ACT WHICH PRODUCES THE UNLAWFUL INTRUSION. EVEN THOUGH THE POLLUTANT HAD DELIBERATELY BEEN PUT INTO THE LAND, DEFENDANT IS NOT LIABLE FOR A NEIGHBOR'S DAMAGE THEREFROM UNLESS HE HAD GOOD REASON TO KNOW THAT THERE WOULD BE SEEPAGE TO THE NEIGHBOR'S LAND. SINCE DEFENDANT DID NOT KNOW OF THE LEAKING GASOLINE, HE WAS NOT LIABLE FOR DAMAGES RESULTING THEREFROM. INJUNCTIVE RELIEF MAY HAVE BEEN AVAILABLE TO PREVENT FUTURE HARM TO THE WATER SUPPLY. (HELWIG-FLA)

FIELD 05G, 06E

ACCESSION NO. W69-06117

PHOENIX V GRAHAM (SALT WATER POLLUTION OF WELLS).

349 ILL APP 326, 110 NE 2D 669-673 (1953).

DESCRIPTORS:

\*ILLINOIS, \*SALINE WATER, \*WELLS, JUDICIAL DECISIONS, OIL WASTES, WATER QUALITY, SALINITY, PERCOLATING WATER, WELL SPACING, SHALLOW WELLS, GROUNDWATER, WATER SOURCES, DRAINAGE, RIPARIAN RIGHTS, ARTESIAN WELLS, DITCHES, DRAINAGE EFFECTS, SEEPAGE, WASTE STORAGE, LEGAL ASPECTS.

ABSTRACT:

PLAINTIFF WAS LESSOR OF CERTAIN OIL PRODUCING LAND UPON WHICH DEFENDANT LESSEE HAD WELLS. SALT WATER PUMPED FROM THE WELLS AND NEGLIGENTLY DISCHARGED BY DEFENDANT POLLUTED PLAINTIFF'S WATER WELLS. DEFENDANT AND HIS PREDECESSOR HAD DUG PITS TO STORE THE SALT WATER, AND THE WELLS BECAME UNUSABLE SOON AFTER ENLARGING ONE OF THE STORAGE PITS. WHILE THERE IS A CONFLICT AMONG THE JURISDICTIONS REGARDING LIABILITY FROM SALT WATER DAMAGE, THE COURT HELD THAT ADJOINING LANDOWNERS AND OTHER DOWNSTREAM OWNERS HAVE A RIGHT TO RECEIVE WATER IN ITS NATURAL STATE. HOWEVER, LESSORS HAVE NO ACTION FOR SALT DAMAGE TO THEIR OWN LAND FROM SOURCES ON THE LAND UNLESS SUCH DAMAGE IS CAUSED BY LESSEE'S NEGLIGENCE. THE LESSEE WELL OPERATOR IS REQUIRED TO USE THE CARE OF AN ORDINARY PRUDENT OPERATOR; HE HAS THE RIGHT TO USE THAT PART OF THE LEASED LAND FOR SALT WATER DISPOSAL AS IS REASONABLY NECESSARY. THERE WAS SUFFICIENT EVIDENCE IN THIS CASE TO SHOW NEGLIGENCE ON THE PART OF THE LESSEE, HOWEVER, THE COURT REMANDED ON THE ISSUE OF DAMAGES. PLAINTIFF FAILED TO DEMONSTRATE PERMANENT DAMAGE TO HIS WATER SUPPLY OR TO SHOW LACK OF ANOTHER WATER SOURCE. (HELWIG-FLA)

FIELD 05G, 06E

ACCESSION NO. W69-06118



SPRAY IRRIGATION OF ORGANIC CHEMICAL WASTES,

COMMERCIAL SOLVENTS CORR., TERRE HAUTE, IND.

RICHARD A. WOODLEY.

PROC OF 23RD IND WASTE CONF, MAY 7-9, 1968, PURDUE UNIV, PART 1, PP 251-261, 1969. 11 P, 1 FIG, 3 TAB.

DESCRIPTORS:

\*WASTE WATER DISPOSAL, \*IRRIGATION, \*CHEMICAL WASTES, SPRINKLER IRRIGATION, INFILTRATION, GROUNDWATER, WATER LEVELS, WATER QUALITY, BIOCHEMICAL OXYGEN DEMAND, SUSPENDED LOAD.

IDENTIFIERS:

ORGANIC CHEMICAL WASTES.

ABSTRACT:

AT THE TERRE HAUTE, INDIANA PLANT OF COMMERCIAL SOLVENTS CORPORATION, A SPRAY IRRIGATION SYSTEM HAS BEEN SUCCESSFULLY UTILIZED SINCE AUGUST 1965 FOR TREATMENT OF HIGH STRENGTH, LOW VOLUME WASTE FROM AEROBIC INDUSTRIAL FERMENTATION PROCESSES. WASTES VARYING IN BOD UP TO 64,700 MG/L, SUSPENDED SOLIDS UP TO 99,700 MG/L, AND FLOWS UP TO 160,000 GPD HAVE BEEN ROUTINELY SPRAYED ON 100 ONE-ACRE PLOTS WITHOUT CAUSING ANY ENVIRONMENTAL NUISANCES OR ANY COMMUNITY PROBLEMS WHATSOEVER. THE LAND APPLICATION SYSTEM HAS BEEN MANAGED SO THAT TOTAL TREATMENT OF ALL APPLIED WASTES HAS BEEN ACHIEVED. LAND AND SYSTEM MANAGEMENT HAS CONSISTED OF SPRAY PLOT SELECTION, APPLICATION TIME CONTROL, ELIMINATION OF SURFACE RUNOFF, AND CONTROL OF SURFACE PONDING. CONTINUOUS WINTERTIME OPERATION HAS BEEN ACHIEVED BY PRE-PLANNING FOR MINUS ZERO C OPERATIONS AND THE INSTALLATION OF RAPID DRAINING SPRAY HEADERS AND LATERALS. EQUIPMENT SUBJECT TO 24 HR CONTAMINANT OF LIQUID IS PROTECTED BY VARIOUS TYPES OF ELECTRICAL HEATERS.

FIELD 05D, 03C, 05G

ACCESSION NO. W69-07114

HYDROGEOLOGIC CONSIDERATIONS IN LIQUID WASTE DISPOSAL,

WISCONSIN UNIV., MADISON. DEPT. OF GEOLOGY.

S. M. BORN, AND D. A. STEPHENSON.

J SOIL AND WATER CONSERV, VOL 24, NO 2, PP 52-55, MAR-APR 1969. 4 P, 2 FIG, 7 REF.

DESCRIPTORS:

\*WASTE WATER DISPOSAL, \*IRRIGATION, \*SPRINKLER IRRIGATION, HYDROGEOLOGY, SOILS, POROSITY, PERMEABILITY, GROUNDWATER MOVEMENT, SOIL WATER MOVEMENT, INFILTRATION, PERCOLATION, ADSORPTION, FILTRATION.

IDENTIFIERS:

SPRAY DISPOSAL.

ABSTRACT:

THE GEOHYDROLOGY OF LIQUID WASTE DISPOSAL BY IRRIGATION IS REVIEWED. KNOWLEDGE OF GEOLOGIC CONDITIONS IS NECESSARY FOR SPRAY IRRIGATION DISPOSAL OF WASTES. THE THICKNESS, NATURE, AND DISTRIBUTION OF UNCONSOLIDATED SURFACE DEPOSITS DETERMINE INFILTRATION, ADSORPTION STORAGE, AND DOWNWARD MOVEMENT OF WASTE WATER. INFILTRMETER TESTS MAY BE USED IN SITU, OR LABORATORY EXAMINATION OF SAMPLES CAN YIELD QUICKER LESS ACCURATE INFORMATION. THE CONDITION OF BEDROCK DETERMINES RATE OF WATER MOVEMENT AND EFFECTIVENESS OF FILTRATION. FLOW SYSTEMS MUST BE STUDIED TO LEARN WHERE WASTES WILL TRAVEL. (KNAPP-USGS)

FIELD 05E, 03F

ACCESSION NO. W69-07375

WASTE WATER RECHARGE AND DISPERSION IN POROUS MEDIA,

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.

JOHN AUSTIN HOOPEES, AND DONALD R. F. HARLEMAN.

MASS INST TECH HYDRODYNAMICS LAB REP NO 75, JUNE 1965. 166 P, 40 FIG, 3 TAB,  
120 REF. PHS GRANT NO WP-347.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*GROUNDWATER MOVEMENT, \*DIFFUSION, \*DISPERSION,  
\*MATHEMATICAL MODELS, MODEL STUDIES, HYDRAULIC MODELS, TRACERS,  
INJECTION WELLS, ARTIFICIAL RECHARGE, CONVECTION, MIXING, FLOW, POROUS  
MEDIA.

IDENTIFIERS:

DISPOSAL WELLS.

ABSTRACT:

THE EFFECTS OF DISPERSION AND DIFFUSION OF WASTEWATER SOLUTES IN  
AQUIFERS NEAR THE INJECTION WELLS ARE INCORPORATED IN A MASS  
CONSERVATION EQUATION. SOLUTIONS ARE DERIVED TO PREDICT THE TRACER  
DISTRIBUTIONS RESULTING FROM VARIOUS RECHARGE AND DISPOSAL OPERATIONS.  
FOR UNIFORM FLOW, THE LONGITUDINAL AND LATERAL DISPERSION COEFFICIENTS  
ARE RELATED TO THE SEEPAGE VELOCITY, PARTICLE SIZE, AND MEDIA  
STRUCTURE. THESE COEFFICIENTS ARE DETERMINED FROM EXPERIMENTAL  
MEASUREMENTS OF THE DISTRIBUTION OF A DILUTE SALT TRACER IN FLOW  
THROUGH A SAND COLUMN. CONVECTION AND DISPERSION DETERMINE THE TRACER  
DISTRIBUTION NEAR THE WELL. AT LARGER DISTANCES FROM THE WELL,  
MOLECULAR DIFFUSION AND CONVECTION ALONE ARE IMPORTANT. WITH A PAIR OF  
WELLS, ONE RECHARGING TRACER FLUID AND THE OTHER PUMPING THE MIXTURE OF  
TRACER AND NATIVE GROUNDWATER, THE SOLUTION FOR THE TRACER DISTRIBUTION  
INDICATES THAT LATERAL DISPERSION HAS A NEGLIGIBLE INFLUENCE ON THE  
TRACER DISTRIBUTION, EXCEPT VERY NEAR THE LINE JOINING THE TWO WELLS.  
MOLECULAR DIFFUSION IS ALSO SHOWN TO BE INSIGNIFICANT, EXCEPT FOR SMALL  
FLOW RATES AND LARGE WELL-SPACINGS. LONGITUDINAL DISPERSION DETERMINES  
THE SHAPE OF THE TRACER DISTRIBUTION WITHIN THE MEDIA, WHEREAS  
CONVECTION DOMINATES THE TRACER DISTRIBUTION AT THE PUMPING WELL,  
EXCEPT FOR SHORT TIMES. (KNAPP-USGS)

FIELD 05B

ACCESSION NO. W69-07554

TRANSFORMATIONS IN INFILTRATION PONDS AND IN THE SOIL LAYERS IMMEDIATELY UNDERNEATH,

RESEARCH INSTITUTE FOR PUBLIC HEALTH ENGINEERING TNO, THE HAGUE  
(NETHERLANDS). WATER, SOIL, AND AIR DIV.

J. K. BAARS.

PROC RUDOLFS RES CONF, RUTGERS UNIV, NEW BRUNSWICK, NJ. PRINCIPLES AND APPLICATIONS IN AQUATIC MICROBIOLOGY, HEUKELEKIAN, H AND DONDERO, NORMAN C (EDS), JOHN WILEY AND SONS, INC, NEW YORK, PP 344-365, 1964. 8 FIG, 2 TAB, 9 REF, DISC.

DESCRIPTORS:

\*INFILTRATION, \*PONDS, \*SOIL, GROUNDWATER BASINS, WATER SUPPLY, MUD, BENTHOS, HYDROGEN, BACTERIA, AEROBIC BACTERIA, METABOLISM, CANALS, SANDS, CHLORINATION, MICROORGANISMS, CHEMICAL ANALYSIS, TEMPERATURE, NITRATES, PLANTS, AMMONIA, HARDNESS(WATER), ACIDITY, OXYGEN, ALGAE, SELF-PURIFICATION, BACTERIOPHAGE, RESERVOIRS, SPORES, NITRITES, IRON, ORGANIC MATTER, SUBSOIL, VELOCITY, OXIDATION, DENITRIFICATION, SULFATES, REDUCTION(CHEMICAL), FERMENTATION, METHANE, HYDROGENATION, CHEMICAL OXYGEN DEMAND, BIOCHEMICAL OXYGEN DEMAND, POTASSIUM COMPOUNDS, CARBON DIOXIDE, PROTOZOA, SEWAGE, SLUDGE, E COLI.

IDENTIFIERS:

\*TRANSFORMATIONS, AMSTERDAM, HAARLEM, LEYDEN, THE HAGUE, MINERALIZATION, CLAY LENSES, RHINE RIVER, AMSTERDAM RHINE, POLDERS, COMPOSITION, PSEUDOMONAS, MYCOBACTERIUM, BACILLUS SUBTILIS, BACILLUS MYCOIDES, BACILLUS MESPENTERICUS, DIATOMEA, CLADOPHORA, FLAGELLATA, CILIATES, RANUNCULUS CIRCINATUS, POTAMOGETON PUSILLUS.

ABSTRACT:

WATER FROM STORAGE PONDS, FILTERED THROUGH BOTTOM MUD AND A BODY OF SAND, WAS MEASURED FOR CHLORIDE, FORMS OF NITROGEN, OXYGEN, ORGANIC MATTER, ALGAE, AND BACTERIAL CONTENT. TO STUDY BENTHOS, WATER WAS ANALYZED FROM WELLS CONSTRUCTED AT DISTANCES FROM A POND IN THE DIRECTION OF FLOW. NOT ONLY DISSOLVED ORGANIC MATTER, AS DETERMINED BY THE POTASSIUM PERMANGANATE METHOD, IS MINERALIZED, BUT MUCH MORE OXIDANT (FREE OXYGEN PLUS NITRATE OXYGEN) IS USED, APPARENTLY IN THE BENTHOS. THE HIGH OXIDANT CONSUMPTION INDICATES THAT THE REDUCTION OF ORGANIC MATTER IS INTENSE. ORGANIC SUBSTANCES, DETECTABLE BY TASTE, ARE NOT COMPLETELY ELIMINATED. WHEN THERE IS A CONSTANT SUPPLY OF NEW OXIDANT, DEAD BIOLOGICAL MATERIALS MAY BE MINERALIZED AEROBICALLY. IF THIS SUPPLY IS TERMINATED, ANAEROBIC TRANSFORMATIONS MAY DOMINATE. PROBABLY BACTERIA ARE STRONGLY ADSORBED TO THE SAND GRAINS IN CONCENTRATIONS RESULTING IN INTENSE STRUGGLE FOR LIFE AND DECREASE RAPIDLY WITH INCREASING DISTANCE FROM THE POND. SAMPLES FROM THE BOTTOM OF THE PONDS DOWNWARD SHOWED PRONOUNCED DECREASE IN BACTERIA AT 0.5-METER DEPTH. A SMALL AMOUNT OF SILT IN THE WATER MAY CAUSE CLOGGING OF THE SOIL. THE INTERMITTENT INFILTRATION SYSTEM AFFORDS THE SAME PERMEABILITY OF THE SAND EACH YEAR WITH THE CONSEQUENT USE OF AVAILABLE PURIFYING ACTORS. (JONES-WIS)

FIELD 05D

ACCESSION NO. W69-07838

GROUNDWATER RECHARGE WITH TREATED MUNICIPAL EFFLUENT,

TEXAS TECHNOLOGICAL COLL. LUBBOCK. WATER RESOURCES CENTER; AND TEXAS  
TECHNOLOGICAL COLL., LUBBOCK. DEPT. OF ENGINEERING.

DAN M. WELLS.

SYMP ON MUNIC SEWAGE EFFLUENT FOR IRRIG, JULY 30, 1968, LOUISIANA POLYTECH  
INST, RUSTON, P 61-73, 1968. 13 P, 1 TAB, 46 REF. OWRR PROJ NO A-009-LA.

DESCRIPTORS:

\*WATER REUSE, \*RECLAIMED WATER, \*MUNICIPAL WASTES, \*ARTIFICIAL  
RECHARGE, LEGAL ASPECTS, AESTHETICS, AQUIFERS, SOIL WATER MOVEMENT,  
GROUNDWATER MOVEMENT, INFILTRATION, WATER CHEMISTRY, WATER QUALITY,  
SOIL CONTAMINATION.

IDENTIFIERS:

WASTE WATER RECHARGE.

ABSTRACT:

MUNICIPAL EFFLUENT HAS ALWAYS BEEN USED FOR GROUNDWATER RECHARGE.  
PRACTICALLY ALL OF THE RECHARGE IN THE PAST HAS BEEN UNINTENTIONAL,  
RESULTING FROM THE NATURAL OPERATION OF THE HYDROLOGIC CYCLE, AND IT  
DOES NOT APPEAR THAT THIS PATTERN WILL BE APPRECIABLY CHANGED IN THE  
FUTURE. IT DOES APPEAR, HOWEVER, THAT THE DELIBERATE USE OF TREATED  
EFFLUENT FOR GROUNDWATER RECHARGE WILL INCREASE IN THE FUTURE,  
PARTICULARLY IN ARID AND SEMI-ARID AREAS OF THE COUNTRY THAT ARE  
RAPIDLY DEPLETING THEIR GROUNDWATER RESOURCES. ALTHOUGH THE  
TECHNOLOGICAL CAPABILITY FOR TREATING MUNICIPAL EFFLUENT FOR ANY TYPE  
OF REUSE INCLUDING THE RECHARGE OF POTABLE GROUNDWATER SUPPLIES HAS  
EXISTED FOR MANY YEARS, MANY PSYCHOLOGICAL PROBLEMS REMAIN TO BE SOLVED  
TO WIN PUBLIC ACCEPTANCE FOR ITS WIDESPREAD USE. PHYSICAL PROBLEMS  
INCLUDE CLOGGING OF SOILS OF AQUIFERS, CHEMICAL PRECIPITATION, AND  
ALGAL OR BACTERIAL GROWTH. THE LEGAL PROBLEMS INCLUDE LIABILITY FOR  
DAMAGES TO AQUIFERS, OWNERSHIP OF RECHARGED WATER, AND OWNERSHIP OF  
EFFLUENT WATER. (KNAPP-USGS)

FIELD 05D, 05F

ACCESSION NO. W69-08620

THE MOVEMENT OF DISEASE PRODUCING ORGANISMS THROUGH SOILS,

CALIFORNIA UNIV., DAVIS, DEPT. OF CIVIL ENGINEERING.

R. B. KRONE.

SYMP ON MUNIC SEWAGE EFFLUENT FOR IRRIG, JULY 30, 1968, LOUISIANA POLYTECH  
INST, RUSTON, P 75-104, 1968. 30 P, 2 FIG, 55 REF.

DESCRIPTORS:

\*WATER REUSE, \*PATHOGENIC BACTERIA, \*VIRUSES, \*GROUNDWATER MOVEMENT,  
MUNICIPAL WASTES, IRRIGATION WATER, ARTIFICIAL RECHARGE, FILTRATION,  
SORPTION, INFILTRATION, PERCOLATION, SOIL DISPOSAL FIELDS, SOIL  
CONTAMINATION, SOIL PHYSICAL PROPERTIES.

IDENTIFIERS:

MUNICIPAL WASTE RECHARGE.

ABSTRACT:

THE MOVEMENT OF PATHOGENIC ORGANISMS THROUGH SOILS RECHARGED WITH  
CONTAMINATED WATER IS DISCUSSED. PATHOGENS HAVE A WIDE VARIETY OF  
PHYSICAL AND BIOLOGICAL CHARACTERISTICS, INCLUDING WIDE RANGES OF SIZE,  
SHAPE, SURFACE PROPERTIES, AND DIE-AWAY RATES. THE PROCESSES OF  
FILTRATION BY SOIL INCLUDE STRAINING AT THE SOIL SURFACE, STRAINING AT  
INTERGRAIN CONTACTS, SEDIMENTATION, AND SORPTION BY SOIL PARTICLES.  
STRAINING OF PATHOGENS AT THE SOIL SURFACE AND SORPTION OF VIRUSES NEAR  
THE SOIL SURFACE IS DESIRABLE BECAUSE IT LIMITS TRAVEL OF PATHOGENS  
MOST, AND IT IS SUBJECT TO WIDE VARIATIONS IN TEMPERATURE AND MOISTURE,  
AND IT WILL ASSURE AEROBIC CONDITIONS. A SOIL CONTAINING CLAY SHOULD  
THEREFORE BE USED FOR IRRIGATION WITH TREATED SEWAGE. WIDE EXPERIENCE  
IN IRRIGATION WITH TREATED SEWAGE INDICATES THAT IT IS SAFE PROVIDED  
THAT AT LEAST PRIMARY TREATMENT IS USED, AND PROVIDED THAT THE CROPS  
ARE NOT CONSUMED DIRECTLY BY HUMANS. SECONDARY TREATMENT AND  
CHLORINATION IS RECOMMENDED FOR AESTHETIC REASONS. (KNAPP-USGS)

FIELD 05D, 03F

ACCESSION NO. W69-08621

THE EFFECTS OF TEMPERATURE AND DENSITY GRADIENTS UPON THE MOVEMENT OF  
CONTAMINANTS IN SATURATED AQUIFERS,

ALABAMA UNIV., UNIVERSITY. DEPT. OF ENGINEERING MECHANICS.

HAROLD R. HENRY.

SYMP ON GEOCHEM, PRECIPITATION, EVAPORATION, SOIL-MOISTURE, HYDROM, PROC GEN  
ASSEMBLY OF BERN (SEPT-OCT 1967), INT ASS SCI HYDROL, PUB NO 78, P 54-65,  
1968. 12 P, 4 FIG, 26 REF.

DESCRIPTORS:

\*SATURATED FLOW, \*DIFFUSION, \*DISPERSION, \*CONVECTION, \*GROUNDWATER  
MOVEMENT, SOLUTES, WASTES, PATH OF POLLUTANTS, MATHEMATICAL MODELS,  
CURRENTS(WATER), MASS TRANSFER, AQUIFERS.

IDENTIFIERS:

THERMAL GRADIENTS.

ABSTRACT:

THE EFFECTS OF GRADIENTS IN TEMPERATURE AND DENSITY ON THE MOVEMENT OF  
CONTAMINANTS IN GROUNDWATER WERE STUDIED BY IMPOSING A HORIZONTAL  
LATERAL TEMPERATURE GRADIENT ON A TUBE OF SQUARE CROSS SECTION  
CONTAINING WATER-SATURATED SAND. A CONVECTION CURRENT INCREASED IN  
STRENGTH AS THE TEMPERATURE GRADIENT INCREASED. THE EFFECTIVE VALUE OF  
THERMAL DIFFUSIVITY WAS ABOUT 50 TIMES LARGER THAN THE EXPECTED VALUE  
BECAUSE OF DISPERSION CAUSED BY THE MOVEMENT OF WATER THROUGH  
TORTUOUSLY INTERCONNECTED INTERSTICES OF THE SAND. (KNAPP-USGS)

FIELD 02F, 05B

ACCESSION NO. W69-08921

EFFECT OF VARIOUS FACTORS ON MOVEMENT OF NITRATE NITROGEN IN SOIL PROFILES AND  
ON TRANSFORMATIONS OF SOIL NITROGEN,

WISCONSIN UNIV., MADISON.

R. J. OLSEN.

UNIV OF WISCONSIN, WATER RESOURCES CENTER, REPORT 1969. 79 P. OWRR B-004-WIS.

DESCRIPTORS:

\*NITRIFICATION, \*SOIL NITROGEN, \*PUBLIC HEALTH, \*SOIL LEACHING,  
GROUNDWATER, SOIL PROFILES, WATER TABLE, SURFACE RUNOFF, FARM WASTES,  
AEROBIC CONDITIONS, INCUBATION.

IDENTIFIERS:

\*LAKE EUTROPHICATION, \*SOIL PHOSPHORUS, ALFALFA-BROMEGRASS, SPRING  
THAWS, FERTILIZER-NITROGEN.

ABSTRACT:

THERE IS INCREASING EVIDENCE THAT AGRICULTURE IS CONTRIBUTING TO THE INCREASE IN NITRATE-NITROGEN IN STREAMS, LAKES, AND DOMESTIC WATER SUPPLIES. HIGH AMOUNTS OF NITRATE-NITROGEN IN WATER ARE A HEALTH HAZARD AND CONTRIBUTE TO LAKE EUTROPHICATION. METHODS BY WHICH NITROGEN MAY ENTER THE WATER FROM AGRICULTURAL SOURCES INCLUDE THE LEACHING OF NITRATE-NITROGEN THROUGH THE SOIL PROFILE TO THE WATER TABLE AND SURFACE RUNOFF, ESPECIALLY DURING SPRING THAWS FROM MANURE APPLIED TO FROZEN SOIL DURING THE WINTER. THE DATA OBTAINED FROM FIELD EXPERIMENTS INDICATE THAT POLLUTION OF GROUNDWATER WITH NITRATE-NITROGEN CAN BE LIMITED BY AVOIDING EXCESSIVE RATES OF FERTILIZER NITROGEN; PROVIDING A CROP COVER ON THE SOIL DURING THE GROWING SEASON; USE OF HAY CROPS, SUCH AS ALFALFA-BROMEGRASS, IN ROTATION WITH CORN OR OTHER CROPS RECEIVING FERTILIZER NITROGEN; AND NOT PERMITTING UNPROTECTED MANURE TO ACCUMULATE DURING THE TIME OF YEAR WHEN LEACHING CAN OCCUR. RECOVERY OF FERTILIZER NITROGEN BY THREE SUCCESSIVE CORN CROPS AND AS SOIL INORGANIC NITROGEN FOLLOWING THE LAST CROP RANGED FROM 72 TO 88 PERCENT. THE AVERAGE CONCENTRATION OF NITRATE-NITROGEN IN THE SOIL SOLUTION AT THE LOWEST PROFILE DEPTH SAMPLED RANGED FROM 14 PPM FOR VIRGIN SOILS TO 21 PPM FOR MANURE CONTAMINATED SOILS AND TO 33 PPM FOR CULTIVATED SOILS. RATE OF NITRIFICATION WAS DIRECTLY RELATED TO THE RATE OF MANURE APPLICATION, PRESENCE OF AEROBIC CONDITIONS, PERIOD OF INCUBATION, AND SOIL PHOSPHORUS. THE AVERAGE RECOVERY OF NITROGEN BY CHEMICAL ANALYSIS OF THE SOIL RECEIVING THE HIGHER MANURE RATES AFTER 37 WEEKS OF INCUBATION RANGED FROM 24% FOR ANAEROBIC CONDITIONS TO 73 TO 80 PERCENT FOR THE AEROBIC CONDITIONS. THESE DATA SUGGEST THAT WHERE ANIMAL MANURE IS NOT TO BE USED AS A FERTILIZER, LAGOONING OF THE MANURE UNDER ANAEROBIC CONDITIONS MAY BE AN EFFECTIVE METHOD OF DISPOSAL WITH A MINIMUM RISK OF WATER POLLUTION. (OLSEN-UNIV OF WIS)

FIELD 05B, 05C

ACCESSION NO. W69-09721



LIABILITY OF LANDOWNERS FOR POLLUTION OF PERCOLATING WATERS,

ROBERT E. SHARP.

MARQ L REV, VOL 39, NO 2, P 119-134, FALL 1955. 16 P, 97 REF.

DESCRIPTORS:

\*REMEDIES, \*WATER POLLUTION, \*PERCOLATING WATER, \*RELATIVE RIGHTS, WATER LAW, GROUND WATER, SUBSURFACE WATER, PERCOLATION, SUBSURFACE RUNOFF, SUBSURFACE STREAMS, DEEP PERCOLATION, GROUND WATER MOVEMENT, INFILTRATION, PATH OF POLLUTANTS, SEEPAGE, PENETRATION, INDUSTRIAL WASTES, SEWAGE, WASTE WATER(POLLUTION), LEGAL ASPECTS.

IDENTIFIERS:

TRESPASS, NEGLIGENCE, NUISANCE, STRICT LIABILITY.

ABSTRACT:

THE PROBLEMS ASSOCIATED WITH POLLUTION OF PERCOLATING WATERS HAS INCREASED WITH THE RAPID EXPANSION OF RESIDENTIAL AND INDUSTRIAL COMPLEXES INTO AREAS WHICH SEE A HIGH DEGREE OF PERCOLATED WATER USE. THE REMEDIES AVAILABLE TO THE LANDOWNER WHO FINDS HIS WATER SUPPLY POLLUTED FALL INTO FOUR BASIC AREAS: TRESPASS, NEGLIGENCE, NUISANCE, AND STRICT LIABILITY. SOME JURISDICTIONS DO NOT HOLD TO / RIGHT TO UNDEFILED WATERS, BASING THEIR OPINIONS ON THE CONCEPT OF DAMNUM ABSQUE INJURIA WHICH MEANS A LOSS WITHOUT INJURY. OTHER JURISDICTIONS HOLD THAT THERE IS AN UNLIMITED RIGHT TO USE PERCOLATING WATER, AND CONTAMINATION OF SUCH WATER SO AS TO RENDER IT UNFIT FOR USE WHEN IT COMES ONTO A NEIGHBOR'S LAND IS A VIOLATION OF THE NEIGHBOR'S RIGHTS FOR WHICH AN ACTION CAN BE MAINTAINED. ONCE THE RIGHT TO REASONABLE PURITY OF PERCOLATING WATERS IS POSTULATED, THE ONLY REMAINING PROBLEM CONCERNS THE GROUNDS ON WHICH THE SUIT SHOULD BE BROUGHT. TRESPASS IS DIFFICULT TO RELY ON, AND NEGLIGENCE GIVES RISE TO SUSTAINING THE BURDEN OF PROOF. NUISANCE HAS CERTAIN ADVANTAGES AS IT IS ONLY NECESSARY TO SHOW THAT THE WELL HAS BEEN POLLUTED AND THAT DEFENDANT HAS MAINTAINED A NUISANCE THAT HAS CAUSED POLLUTION. STRICT LIABILITY MAKES THE PROOF OF A NUISANCE ALMOST A MATTER OF FACT.  
(MOULDER-FLORIDA)

FIELD 05G, 06E

ACCESSION NO. W70-00521

WATER LAW AND ADMINISTRATION--THE FLORIDA EXPERIENCE: CHAPTER 5 CONSUMPTIVE USE OF WATER: COMMON LAW RULES,

FLORIDA UNIV., GAINESVILLE. WATER RESOURCES RESEARCH CENTER.

F. MALONEY, S. PLAGER, AND F. BALDWIN.

UNIV OF FLORIDA PRESS, GAINESVILLE, CH 5, P 140-171, 1968. 6 FIG, 1 TABLE.

DESCRIPTORS:

\*FLORIDA, \*CONSUMPTIVE USE, \*GROUNDWATER, \*SURFACE WATERS, SURFACE RUNOFF, RIPARIAN RIGHTS, COMPETING USES, DOMESTIC WATER, LEGAL ASPECTS, MUNICIPAL WATER, REASONABLE USE, REMEDIES, WATER UTILIZATION, PERCOLATING WATER, AQUIFERS, HYDROGEOLOGY, GROUNDWATER BASINS, HYDROLOGIC CYCLE, OVERDRAFT, WELLS, SURFACE-GROUNDWATER RELATIONSHIPS, DAMAGES, WATER SUPPLY, SALINE WATER INTRUSION, UNDERGROUND STREAMS.

ABSTRACT:

GROUNDWATER FROM LIMESTONE AQUIFERS IS FLORIDA'S PRINCIPAL SOURCE OF WATER FOR CONSUMPTIVE USE. THE BASIC PROBLEMS OF GROUNDWATER MANAGEMENT ARE: (A) INTERFERENCE BETWEEN WELLS; (B) OVERDRAFT OF THE WATERBEARING BED OR AQUIFER; AND (C) CONTAMINATION. SALT-WATER INTRUSION IS PROBABLY FLORIDA'S GREATEST GROUNDWATER CONTAMINATION PROBLEM. GROUNDWATER HAS BEEN TRADITIONALLY CLASSIFIED INTO EITHER UNDERGROUND STREAMS OR PERCOLATING WATERS. THE SIGNIFICANCE OF THE DISTINCTIONS, HOWEVER, HAS BEEN REDUCED SINCE MOST JURISDICTIONS, INCLUDING FLORIDA, NOW BEGIN WITH THE PRESUMPTION THAT GROUNDWATER IS PERCOLATING. HOWEVER, LEGAL RIGHTS CONTINUE TO HINGE UPON WHETHER THE PROBLEMS OF PROOF AS TO THE EXISTENCE OF AN UNDERGROUND STREAM CAN BE OVERCOME. GENERALLY, THE RIGHTS GOVERNING SURFACE WATERCOURSES APPLY TO UNDERGROUND STREAMS, WHILE THE RIGHTS REGARDING PERCOLATING WATERS VARY ACCORDING TO WHETHER THE COMMON LAW OR REASONABLE USE RULE IS FOLLOWED. MANY COURTS HOLD THAT AS LONG AS THE USE IS BENEFICIAL AND REASONABLE, THE LANDOWNER MAY USE PERCOLATING WATER ON OVERLYING LAND EVEN IF SUCH USE INJURES ADJOINING OWNERS. FLORIDA, HOWEVER, SEEMINGLY APPLIES SURFACE WATER RIPARIAN DOCTRINE TO PERCOLATING WATERS. INJUNCTION IS USUALLY THE PREFERRED REMEDY RESPECTING GROUNDWATER INTERFERENCE. GENERAL RIPARIAN DOCTRINES ARE APPLICABLE TO SPRINGS AND DEFINED SURFACE WATERBODIES. WITH THE INCREASING USE OF SURFACE WATERS AS A SOURCE OF SUPPLY, THE TREND IS TO REFINE THE ABSOLUTE OWNERSHIP APPLICABLE TO SUCH WATERS. (SEE W70-00527). (WHEELER-FLORIDA)

FIELD 06E, 04B, 05G

ACCESSION NO. W70-00532

NITROGEN CONTAMINATION OF GROUNDWATER BY BARNYARD LEACHATES,

GUELPH UNIV. (ONTARIO). DEPT. OF SOIL SCIENCE.

R. W. GILLHAM, AND L. R. WEBBER.

J WATER POLLUT CONTR FEDERATION, VOL 41, NO 10, P 1752-1762, OCT 1969. 11 P,  
10 FIG, 2 TAB, 13 REF.

DESCRIPTORS:

\*FARM WASTES, \*CATTLE, \*LEACHING, \*WATER POLLUTION SOURCES, PATH OF  
POLLUTANTS, WATER POLLUTION EFFECTS, NUTRIENTS, GROUNDWATER MOVEMENT,  
NITROGEN, WASTE WATER(POLLUTION).

IDENTIFIERS:

CATTLE WASTES, FEEDLOT WASTES.

ABSTRACT:

A ZONE OF NITROGEN-CONTAMINATED GROUNDWATER ASSOCIATED WITH A BARNYARD  
WAS STUDIED TO DETERMINE THE QUANTITY OF INORGANIC NITROGEN REACHING  
THE GROUNDWATER FROM THE BARNYARD. FROM PIEZOMETRIC POTENTIAL AND  
HYDRAULIC CONDUCTIVITY MEASUREMENTS, QUANTITATIVE FLOW NETS WERE DRAWN  
PERMITTING GROUNDWATER DISCHARGE CALCULATIONS. AN INCREASE FROM 2 TO 15  
MG/L INORGANIC NITROGEN OCCURRED IN THE GROUNDWATER AS IT PASSED  
BENEATH THE BARNYARD. THIS RESULTED IN A CONTRIBUTION OF 4.4 LB (2.0  
KG) OF INORGANIC NITROGEN MADE BY THE BARNYARD TO THE G JUNDWATER  
DURING THE 5-MONTH STUDY PERIOD. THE CONCENTRATION OF NITROGEN WAS  
RELATED TO THE DIRECTION OF GROUNDWATER FLOW AND WAS DEPENDENT ON THE  
PRESENCE OF CONDITIONS SUITABLE FOR THE LEACHING OF NITROGEN AND THE  
DILUTION POTENTIAL OF THE LOCAL GROUNDWATER FLOW SYSTEM. THE SURFACE  
TOPOGRAPHY PROVED TO BE A POOR INDICATION OF THE DIRECTION OF  
GROUNDWATER FLOW. (KNAPP-USGS)

FIELD 05B, 05C

ACCESSION NO. W70-00665

BEHAVIOR OF SURFACTANTS AND OTHER DETERGENT COMPONENTS IN WATER AND SOIL-WATER ENVIRONMENTS,

GEOLOGICAL SURVEY, WASHINGTON, D.C. WATER RESOURCES DIV.

COOPER WAYMAN, H. L. PAGE, AND J. B. ROBERTSON.

FED HOUSING ADMIN TECH STUDIES PUBLICATION NO FHA 532, FEB 1965. 136 P, 104 FIG, 22 TAB, 283 REF.

DESCRIPTORS:

\*SURFACTANTS, \*ALKYBENZENE SULFONATES, \*DETERGENTS, \*GROUNDWATER MOVEMENT, \*WATER POLLUTION, INFILTRATION, ANALYTICAL TECHNIQUES, SOIL CONTAMINATION EFFECTS, ORGANIC COMPOUNDS, DISPERSION, SEWAGE EFFLUENTS, BIODEGRADATION, METHODOLOGY.

IDENTIFIERS:

\*DETERGENT BEHAVIOR(WATER), \*SOIL-WATER ENVIRONMENT, ANIONIC SURFACTANTS, SYNTHETIC DETERGENTS.

ABSTRACT:

THIS REPORT IS PRIMARILY CONCERNED WITH ALKYL BENZENE SULFONATE (ABS), THE ANIONIC SURFACE-ACTIVE AGENT MOST FREQUENTLY FOUND IN WATER SUPPLIES. THE MECHANISMS AND PHYSICAL PRINCIPLES OF DETERGENT MOVEMENT UNDERGROUND ARE DISCUSSED IN A MANNER TO PROVIDE BACKGROUND FOR ENGINEERING ANALYSIS OF POLLUTION PROBLEMS. UNLIKE OTHER ORGANIC WASTES, ABS IS NOT EASILY BROKEN DOWN BY MICROORGANISMS, AND IT MOVES WITH SEWAGE EFFLUENT, OFTEN INTO GROUNDWATER. ABS CAN BE DETECTED IN LOW CONCENTRATIONS AND THUS USED TO TRACE THE POLLUTION. THE REPORT PROVIDES A GOOD TECHNICAL BASIS FOR UNDERSTANDING DETERGENT MOVEMENT UNDERGROUND; IT DOES NOT CONSTITUTE AN FHA STANDARD. (LANG-USGS)

FIELD 05B, 05A

ACCESSION NO. W70-01291

THE INFILTRATION OF ALDRIN THROUGH OTTAWA SAND COLUMNS,

GEOLOGICAL SURVEY, IDAHO FALLS, IDAHO.

JOHN B. ROBERTSON, AND LLOYD KAHN.

IN: GEOL SURV RES 1969, PROF PAP 650-C, P C219-C223, 1969. 5 P, 3 FIG, 1 TAB, 17 REF.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*ALDRIN, \*GROUNDWATER MOVEMENT, LABORATORY TESTS, PERMEAMETERS, SANDS, CHLORINATED HYDROCARBON PESTICIDES, INSECTICIDES, PESTICIDE RESIDUES, INFILTRATION.

IDENTIFIERS:

OTTAWA SAND, ALDRIN INFILTRATION.

ABSTRACT:

THE PENETRABILITY OF CHLORINATED HYDROCARBON INSECTICIDES THROUGH SOILS IS DEPENDENT UPON THE TYPE OF FORMULATION APPLIED, FREQUENCY OF ITS APPLICATION, SOIL CONDITIONS, AND THE FREQUENCY AND RATE OF RAINFALL OR IRRIGATION. ALDRIN, A REPRESENTATIVE MEMBER OF THE CHLORINATED HYDROCARBON INSECTICIDE GROUP, WAS INFILTRATED THROUGH COLUMNS OF OTTAWA SAND IN FOUR EXPERIMENTS. MOST OF THE ELUTED ALDRIN IN ORGANIC SOLVENT SYSTEMS WAS ELUTED DURING THE PASSAGE OF THE FIRST LITER OF WATER. THE ALDRIN DISTRIBUTED ITSELF IN A CHARACTERISTIC MANNER THROUGH EACH COLUMN, DEPENDING UPON THE COMPOSITION AND STABILITY OF THE EMULSION AND RATE OF WATER INFILTRATION. THE CONCENTRATION OF HHDN (ACTIVE INGREDIENT IN ALDRIN) IN THE EFFLUENT FROM THE COLUMNS REACHED A 'STEADY STATE' CONDITION OF 0.5 TO 2 MICROGRAMS PER LITER OF WATER. A COMMERCIAL EMULSIBLE CONCENTRATE MIXTURE TRANSMITTED MORE ALDRIN TO THE EFFLUENT THAN DID A SYNTHETIC SOLUTION CONTAINING NO EMULSIFIER. (KNAPP-USGS)

FIELD 05B, 02G

ACCESSION NO. W70-01904

STATE ACTIVITIES,

RICHARD S. NELLE.

AM WATER WORKS ASS'N J, VOL 53, NO 6, P 857-861, JULY 1961, 5 P, 7 REF.

DESCRIPTORS:

\*ILLINOIS, \*WATER POLLUTION, \*WATER POLLUTION CONTROL, \*POLLUTION ABATEMENT, STATE GOVERNMENTS, LOCAL GOVERNMENTS, LEGISLATION, WATER RIGHTS, RIPARIAN RIGHTS, NATURAL USE, NATURAL FLOW DOCTRINE, REASONABLE USE, ARTIFICIAL USE, RIPARIAN LANDS, GROUNDWATER, PERCOLATING WATER, EMINENT DOMAIN, PUBLIC HEALTH, DOMESTIC WATER, INDUSTRIAL WATER, RECREATION, WATERSHED MANAGEMENT, WASTE DISPOSAL, PLANNING, INTER-AGENCY COOPERATION, WATER QUALITY CONTROL.

ABSTRACT:

THE COMMON-LAW WATER RIGHTS DOCTRINE HAS BEEN INTERPRETED IN ILLINOIS BY THE NATURAL FLOW AND REASONABLE USE THEORIES. STREAM POLLUTION CONTROL LAWS HAVE ADOPTED THE REASONABLE USE THEORY. IN OTHER CONSIDERATIONS OF WATER RIGHTS, THE NATURAL FLOW THEORY HAS PREVAILED IN DIVERSION QUESTIONS WHEREAS THE REASONABLE USE IS MORE FREQUENTLY APPLIED IN CONSUMPTION PROBLEMS. BECAUSE WATER POLLUTION KNOWS NO POLITICAL BOUNDARIES, DEVELOPMENT IN THIS AREA MUST COME FROM STATE GOVERNMENTS. WITH AN EXPANDING INDUSTRIAL ECONOMY AND A GREATER COMPETITION FOR WATER USE, POLLUTION CONTROL CANNOT BE ATTAINED WITHOUT CONTROL OF USE. ANY USE OF WATER INVOLVES A CHANGE IN WATER QUALITY, AND THIS QUALITY NEEDS TO BE MANAGED WITH INCREASED PRECISION AS THE QUANTITY OF WATER DIMINISHES. ALTHOUGH THE CONTROL OF POLLUTION IS ADMINISTERED AT THE STATE LEVEL, LOCAL GOVERNMENTS MUST EXERCISE THE AUTHORITY GRANTED TO THEM TO PLAN, CONSTRUCT, AND POLICE WATER SOURCES. CONTROL OF WATERSHED POLLUTION IS A COOPERATIVE VENTURE. COOPERATION MUST EXIST BETWEEN LOCAL AND STATE GOVERNMENTS AND AMONG STATE AGENCIES. SPECIFIC INTERESTS ON THE LOCAL LEVEL AND ON THE STATE LEVEL ARE DISCUSSED. (SCHRAM-FLORIDA)

FIELD 056

ACCESSION NO. W70-02896

DISTRIBUTION OF NITRATES AND OTHER WATER POLLUTANTS UNDER FIELDS AND CORRALS IN  
THE MIDDLE SOUTH PLATTE VALLEY OF COLORADO,

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO. NORTHERN PLAINS BRANCH;  
AND COLORADO AGRICULTURAL EXPERIMENT STATION, FORT COLLINS.

B. A. STEWART, F. G. VIETS, JR., G. L. HUTCHINSON, W. D. KEMPER, AND F. E.  
CLARK.

U S DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, ARS 41-134,  
DECEMBER 1967, 206 P. 31 FIG, 25 TAB, 13 REF.

DESCRIPTORS:

\*NITRATES, \*AMMONIA, \*WATER POLLUTION SOURCES, \*CORES, FIELDS, PLANTS,  
ALFALFA, CEREAL CROPS, IRRIGATED LAND, COLORADO, GROUNDWATER,  
PERCOLATION.

IDENTIFIERS:

NATIVE GRASSES, FEEDLOTS, CORRALS, SOUTH PLATTE VALLEY(COLO).

ABSTRACT:

CORES REPRESENTING NONIRRIGATED FIELDS IN NATIVE GRASS, CULTIVATED  
NONIRRIGATED FIELDS, IRRIGATED FIELDS IN ALFALFA, IRRIGATED FIELDS IN  
CROPS OTHER THAN ALFALFA, AND CORRALS WERE OBTAINED FROM NORTHEASTERN  
COLORADO DURING 1966. CULTIVATED NONIRRIGATED FIELDS USUALLY CONTAINED  
SMALL ACCUMULATIONS OF NITRATE BELOW THE ROOT ZONE. NATIVE GRASS  
FIELDS, ORDINARILY, DID NOT SHOW NITRATE ACCUMULATION IN CORE PROFILES.  
SIGNIFICANT QUANTITIES OF NITRATE WERE FOUND IN MOST CORES FROM  
IRRIGATED FIELDS WITH ROW CROPS OR CEREAL GRAINS. ALTERNATELY, CORES  
FROM IRRIGATED ALFALFA FIELDS GENERALLY CONTAINED INSIGNIFICANT AMOUNTS  
OF NITRATE. AMOUNTS OF NITROGEN AS NITRATE FOUND UNDER CORRALS WERE  
EXTREMELY VARIED, RANGING FROM ALMOST NONE TO MORE THAN 5000  
POUNDS/ACRE IN A 20-FOOT PROFILE. EVIDENCE DISCLOSED THAT  
DENITRIFICATION WAS OCCURRING UNDER FEEDLOTS, EVEN AT SEVERAL FEET  
BELOW THE SURFACE, CONSEQUENTLY, MUCH OF NITRATE UNDER FEEDLOTS WILL  
PROBABLY NEVER REACH THE WATER TABLE. WATER SAMPLES BENEATH SEVERAL  
CORRALS CONTAINED LARGE AMOUNTS OF ORGANIC CARBON AND AMMONIA AND  
POSSESSED OFFENSIVE ODOR. BACTERIAL COUNTS UNDER CORRALS WERE  
CONSIDERABLY HIGHER THAN UNDER OTHER AREAS, ESPECIALLY AT LOWER DEPTHS.  
THESE FINDINGS INDICATE SOME POLLUTION OF GROUNDWATER BY DEEP  
PERCOLATION IS OCCURRING FROM CORRALS, BUT MORE STUDIES ARE REQUIRED  
BEFORE SIGNIFICANCE AND MAGNITUDE OF THIS POLLUTION CAN BE ASSESSED.  
(KEENEY-WISCONSIN)

FIELD 05B

ACCESSION NO. W70-04488

AGRICULTURAL DRAINAGE AND EUTROPHICATION,

WISCONSIN UNIV., MADISON.

J. W. BIGGAR, AND R. B. COREY.

EUTROPHICATION: CAUSES, CONSEQUENCES, CORRECTIVES, PRINTING AND PUBLISHING OFFICE, NATIONAL ACADEMY OF SCIENCES, WASHINGTON, D C, 1969. P 404-445, 8 FIG, 14 TAB, 69 REF.

DESCRIPTORS:

\*AGRICULTURAL WATERSHED, \*SUBSURFACE DRAINAGE, \*DRAINAGE,  
\*EUTROPHICATION, NITROGEN, PHOSPHORUS, SURFACE WATERS, PERCOLATION,  
SUSPENDED LOAD, GROUNDWATER, AQUIFER CHARACTERISTICS.

IDENTIFIERS:

\*AGRICULTURAL DRAINAGE, DISSOLVED NUTRIENTS, WATER MIXING, RUSSIAN RIVER(CALIF), YAKIMA BASIN(PACIFIC NORTHWEST), LAKE MENDOTA(WIS).

ABSTRACT:

A COMPREHENSIVE REVIEW OF NUMEROUS ASPECTS INVOLVED IN THE RELATIONSHIP OF AGRICULTURAL DRAINAGE AND WATER EUTROPHICATION IS PRESENTED. PARTICULAR ATTENTION IS GIVEN TO CHEMICAL REACTIONS THAT NITROGEN AND PHOSPHORUS UNDERGO IN SOIL-WATER SYSTEM. THE FATE OF NUTRIENTS TRANSPORTED BY SURFACE RUNOFF, INTERFLOW, AND DEEP PERCOLATING WATER IS DETERMINED BY COMPLEX COINFLUENCING FACTORS, SUCH AS NATURE OF SUSPENDED MATERIAL, HETEROGENY OF SOIL PROFILE, AND DEGREE OF WATER MIXING. STRESS IS PLACED ON THE INAPPLICABILITY OF MACRO-PARAMETERS, SUCH AS AVERAGE HYDRAULIC CONDUCTIVITY, TO PROCESSES OCCURRING ON A MICROSCOPIC SCALE. THE REPORT INCLUDES ILLUSTRATIONS OF PLANT NUTRIENT LOSS FROM HARVESTED AREAS AND CONTRIBUTIONS OF FERTILIZING ELEMENTS FROM AGRICULTURAL LANDS. AN APPRAISAL OF AGRICULTURAL DRAINAGE INFLUENCE ON EUTROPHICATION REQUIRES INVESTIGATIONS OF CHEMICAL AND MINERALOGICAL CONTENTS OF RUNOFF WATERS IN DIFFERENT SEASONS, DYNAMICS OF GROUNDWATER, AND WATER IN THE UNSATURATED ZONE BELOW ROOT SYSTEMS. (SEE VOL. 3, NO. 10, FIELD 5C, W70-03975). (WILDE-WISCONSIN)

FIELD 05C, 05B

ACCESSION NO. W70-04504



MIGRATION OF POLIOVIRUS TYPE 2 IN PERCOLATING WATER THROUGH SELECTED OAHU SOILS,  
HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.

DANIEL H. HORI, NATHAN C. BURBANK, JR., REGINALD H. F. YOUNG, L. STEPHEN LAU,  
AND HOWARD W. KLEMMER.

AVAILABLE FROM THE CLEARINGHOUSE AS PB-190 271, \$3.00 IN PAPER COPY, \$0.65 IN  
MICROFICHE. TECHNICAL REPORT NO 36, HAWAII WATER RESOURCES RESEARCH CENTER,  
JANUARY 1970. 40 P. OWRR PROJECT A-001-HI.

DESCRIPTORS:

\*VIRUSES, GROUNDWATER, WATER POLLUTION, ABSORPTION, \*LEACHING,  
\*PERCOLATION.

ABSTRACT:

A LABORATORY STUDY WAS MADE TO DETERMINE THE ABILITY OF THREE OAHU SOILS, WAHIAWA, LAHAINA, (BOTH LOW HUMIC LATOSOLS), AND TANTALUS CINDER TO PREVENT POSSIBLE CONTAMINATION OF THE BASAL-WATER LENS BY THE PASSAGE OF VIRUS. THE STUDY WAS PERFORMED UTILIZING COLUMNS CONTAINING THE SELECTED SOILS AND SUBJECT TO INTERMITTENT PERCOLATING WATER CONTAINING A KNOWN CONCENTRATION OF POLIOVIRUS TYPE 2, SIMULATING THE ACTION OF A CESSPOOL LEACHING INTO THE GROUND. THE EFFLUENT FROM THE SOIL COLUMN WAS COLLECTED AND ANALYZED FOR VIRAL CONTENT BY THE PLAQUE FORMING TECHNIQUES. BREAKTHROUGH OF THE VIRUS OCCURRED IN BOTH WAHIAWA AND LAHAINA SOILS AT SOIL THICKNESSES OF 6-INCH, 2 1/2 INCH, AND 1 1/2 INCH AT APPLIED CONCENTRATION OF 150,000 PFU/ML OF FEED SOLUTION. THE VIRUS REMOVAL WAS OVER 97 PERCENT OF THE APPLIED TITER. THE TANTALUS CINDER PROVED INEFFECTIVE IN WITHHOLDING THE VIRUS AT THE APPLIED CONCENTRATION OF 150,000 PFU/ML OF FEED SOLUTION. THE VIRUS BREAKTHROUGH VARIES BETWEEN 39 PERCENT TO 78 PERCENT OF THE APPLIED TITER.

FIELD 05G, 02G

ACCESSION NO. W70-04688

GROUNDWATER RECHARGE DESIGN FOR RENOVATING WASTE WATER,

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.

HERMAN BOUWER.

ASCE PROCEEDINGS, JOURNAL SANITARY ENGINEERING DIVISION, VOL 95, NO SA1,  
PAPER 7096, P 59-74, FEBRUARY 1970. 16 P, 10 FIG, 1 TAB, 20 REF.

DESCRIPTORS:

\*ARTIFICIAL RECHARGE, \*WATER SPREADING, \*WATER REUSE, \*TERTIARY  
TREATMENT, INFILTRATION, FILTRATION, SEWAGE TREATMENT, SEWAGE DISPOSAL,  
HYDROGEOLOGY, GROUNDWATER MOVEMENT, WATER RESOURCES DEVELOPMENT,  
RECLAIMED WATER.

IDENTIFIERS:

PHOENIX(ARIZ), SALT RIVER(ARIZ).

ABSTRACT:

SOIL AND HYDROGEOLOGIC CONDITIONS PERMITTING, GROUNDWATER RECHARGE BY  
SURFACE SPREADING IS AN ECONOMIC AND ESTHETIC WAY FOR FURTHER TREATMENT  
OR RENOVATION OF SECONDARY SEWAGE EFFLUENT, CANNERY WASTES, OR SIMILAR  
LOW-QUALITY WATER. THE DESIGN OF A SYSTEM OF SPREADING AREAS WITH WELLS  
OR DRAINS FOR COLLECTING THE RECLAIMED WATER SHOULD GENERALLY BE BASED  
ON: (1) A MAXIMUM LIMIT FOR THE ELEVATION OF THE WATER TABLE MOUND  
BENEATH THE SPREADING AREAS; (2) A MINIMUM LIMIT FOR THE UNDERGROUND  
DETENTION TIME AND TRAVEL DISTANCE AS THE WATER MOVES TO THE WELLS OR  
DRAINS; AND (3) MINIMUM CONTAMINATION OF THE GROUNDWATER IN THE AQUIFER  
OUTSIDE THE RECHARGE SYSTEM. HYDRAULIC PROPERTIES OF AQUIFERS,  
INCLUDING ANISOTROPY, CAN BE DETERMINED BY ANALOG AND BY FIELD  
MEASUREMENTS. THESE DATA ARE USED TO EVALUATE THE EFFECTIVE  
TRANSMISSIBILITY FOR RECHARGE, AND TO CALCULATE WATER-TABLE POSITIONS  
AND UNDERGROUND DETENTION TIMES FOR A SYSTEM OF LONG, PARALLEL  
SPREADING STRIPS WITH WELLS MIDWAY BETWEEN THE STRIPS. (KNAPP-USGS)

FIELD 05D, 04B

ACCESSION NO. W70-04712

REUTILIZATION OF WASTEWATER RECYCLED THROUGH GROUNDWATER, VOLUME 1 AND 2.

EASTERN MUNICIPAL WATER DISTRICT, HEMET, CALIF.

AVAILABLE FROM THE CLEARINGHOUSE AS PB-190 790 (VOL. I), AND PB-190 791 (VOL. II), \$3.00 EACH IN PAPER COPY, \$0.65 EACH IN MICROFICHE. PROGRESS REPORT TO FEDERAL WATER POLLUTION CONTROL ADMINISTRATION FOR PROJECT 16060, DECEMBER 1968. VOLUME 1 - 125 P, 45 FIG, 20 TAB, 13 REF, VOLUME 2 - 87 P, 61 REF, 3 APPEND. GRANT FWPCA 16060 DDZ --- 12/69.

DESCRIPTORS:

\*ARTIFICIAL RECHARGE, \*WATER REUSE, \*CALIFORNIA, WATER YIELD, INFILTRATION, WATER SPREADING, PIT RECHARGE, SAFE YIELD, WATER BALANCE, HYDROGEOLOGY, DATA COLLECTIONS, HYDROLOGIC DATA, GROUNDWATER MOVEMENT, WATER QUALITY, WATER LEVELS, WATER SUPPLY, WATER UTILIZATION, SURVEYS, GEOPHYSICS.

IDENTIFIERS:

SAN JACINTO VALLEY(CALIF).

ABSTRACT:

THE WATER QUALITY FACTORS INVOLVED IN THE RECHARGING OF THE SAN JACINTO BASIN, CALIFORNIA ARE EVALUATED SO THAT THE OVERALL OPERATION MAY BE CONDUCTED IN A MANNER TO PROVIDE ADEQUATE PROTECTION OF GROUNDWATER QUALITY WHILE PERMITTING RECLAMATION OF WASTES FOR REGIONAL WATER CONSERVATION. ANOTHER OBJECTIVE IS TO STUDY THE BENEFITS TO THE SALT BALANCE PROBLEM CAUSED BY RECHARGING. IN THE PREVIOUS SITUATION, SOME EFFLUENTS WERE DISCHARGED TO THE SAN JACINTO RIVER AREA AND SOME WERE USED AS IRRIGATION WATER. WITH RECHARGE THERE IS A SIGNIFICANT REDUCTION IN EVAPOTRANSPIRATION LOSSES, THUS IMPROVING GROUNDWATER QUALITY BY DILUTING THE DISSOLVED SALTS. THE SAFE GROUNDWATER YIELD IS LIMITED TO APPROXIMATELY 11, 205 ACRE-FEET/YEAR. THE VOLUMES OF WATER RECLAIMED AND PUT UNDERGROUND TO REPLENISH THE OVERDRAFT NOW AVERAGE APPROXIMATELY 1430 ACRE-FEET/YEAR. WITHDRAWALS NOW APPROXIMATE 12,000 ACRE-FEET/YEAR, AND IMPORTATION OF COLORADO RIVER WATER APPROXIMATES 1900 ACRE-FEET/YEAR. INFLOW OF SALT INTO THE BASIN IS NOW ESTIMATED AT 5800 TON/YEAR; 3900 TON/YEAR FROM INFLOWING GROUNDWATER AND 1900 TON/YEAR FROM IMPORTED COLORADO RIVER WATER. (KNAPP-USGS)

FIELD 05D, 04B

ACCESSION NO. W70-05466

SEEPAGE AND SEEPAGE CONTROL PROBLEMS IN SANITARY LANDFILLS,  
LOS ANGELES COUNTY SANITATION DISTRICT, LOS ANGELES, CALIF.

FRANK R. DAIR.

PROCEEDINGS, SEEPAGE SYMPOSIUM, SECOND, MARCH 25-27, 1968, PHOENIX, ARIZONA,  
U.S. DEPT. OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE ARS 41-147, APRIL  
1969, P 14-16.

DESCRIPTORS:

\*WATER POLLUTION, \*GROUNDWATER, \*SEEPAGE, \*LANDFILLS, \*SOLID WASTES,  
WATER POLLUTION SOURCES, WATER POLLUTION CONTROL, PUBLIC HEALTH,  
ENVIRONMENTAL SANITATION, WASTE DISPOSAL, DISPOSAL, WASTES, CALIFORNIA,  
PERCOLATING WATER, PERCOLATION, LEACHING, AQUIFERS, WATER TABLE, WATER  
SUPPLY, GASES, CARBON DIOXIDE, METHANE, BARRIERS, INFILTRATION.

IDENTIFIERS:

\*SEEPAGE CONTROL.

ABSTRACT:

GROUNDWATER POLLUTION RESULTING FROM SOLID WASTE LANDFILLS HAS BEEN THE  
SUBJECT OF INTENSIVE INVESTIGATION IN SOUTHERN CALIFORNIA. ALTHOUGH  
THESE STUDIES HAVE PRODUCED AN ENORMOUS QUANTITY OF DATA, THE MAJOR  
PROBLEMS OF GROUNDWATER POLLUTION FROM LANDFILLS GO UNSOLVED. RESEARCH  
IS NEEDED TO DISCOVER FEASIBLE YET SANITARY METHODS OF DEPOSITING  
REFUSE IN DIRECT CONTACT WITH GROUNDWATER. FURTHER STUDY IS ALSO  
REQUIRED TO DETERMINE WHETHER WATER DOES IN FACT LEACH THROUGH  
LANDFILLS IN APPRECIABLE AMOUNTS AND PERCOLATE DOWN TO THE WATER TABLE.  
EXPERIMENTATION SHOULD ALSO PROCEED IN AN ATTEMPT TO DEVELOP BARRIERS  
TO PREVENT THE ESCAPE OF REFUSE-PRODUCED GASES INTO THE GROUNDWATER.  
(SEE W70-06012). (CARR-ARIZONA)

FIELD 04A, 05E

ACCESSION NO. W70-06011

EFFECT OF CLIMATE, IMPOUNDMENTS, AND LAND USE ON STREAM SALINITY,

AGRICULTURAL RESEARCH SERVICE, CHICKASHA, OKLA. SOUTHERN PLAINS BRANCH.

HARRY B. PIONKE.

JOURNAL OF SOIL AND WATER CONSERVATION, VOL 25, NO 2, P 62-64, MARCH-APRIL 1970. 3 P, 4 FIG, 7 REF.

DESCRIPTORS:

\*WATER CHEMISTRY, \*WATER QUALITY, \*CLIMATES, \*LAND USE, \*OKLAHOMA, SALINITY, STREAMFLOW, SURFACE-GROUNDWATER RELATIONSHIPS, INFILTRATION, EVAPOTRANSPIRATION, PERCOLATION, FLOOD CONTROL, RESERVOIRS, PRECIPITATION(ATMOSPHERIC).

IDENTIFIERS:

CLIMATIC CHANGE.

ABSTRACT:

AVERAGE SALINITY OF THE WASHITA RIVER IN OKLAHOMA INCREASED SUBSTANTIALLY BETWEEN 1954 AND 1967. AMONG ALL VARIABLES STUDIED, CLIMATIC CHANGES APPEARED TO EXERT THE GREATEST INFLUENCE ON STREAM SALINITY LEVELS. AFTER CORRECTING FOR THE EFFECT OF CLIMATIC CHANGE, THE SAME TREND OF SALINITY INCREASE REMAINED AND APPEARED TO BE MORE CLOSELY RELATED TO CHANGING LAND USE THAN TO THE RECENT INTRODUCTION OF NUMEROUS IMPOUNDMENTS AT UPSTREAM LOCATIONS. (KNAPP-USGS)

FIELD 04C, 05B

ACCESSION NO. W70-06102

GEOLOGIC INVESTIGATION OF THE SITE FOR AN ENVIRONMENTAL POLLUTION STUDY,  
ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.

PAUL B. DUMONTELLE.

ILLINOIS STATE GEOLOGICAL SURVEY ENVIRONMENTAL GEOLOGY NOTE NO 31, MARCH  
1970. 19 P, 4 FIG, 1 TAB, 4 REF, APPEND.

DESCRIPTORS:

\*WATER POLLUTION EFFECTS, \*ON-SITE INVESTIGATIONS, \*SOIL  
INVESTIGATIONS, \*GEOLOGIC INVESTIGATIONS, \*ILLINOIS, HYDROLOGIC DATA,  
GEOLOGY, HYDROLOGY, HYDROGEOLOGY, INFILTRATION, PERMEABILITY, SAMPLING,  
GROUNDWATER MOVEMENT, PATH OF POLLUTANTS, ENVIRONMENT.

IDENTIFIERS:

TEST HOLES, UNIVERSITY OF ILLINOIS, ENVIRONMENTAL POLLUTION.

ABSTRACT:

TO STUDY THE EFFECTS OF POLLUTANTS UNDER SIMULATED NATURAL-FLOW  
CONDITIONS, THE ILLINOIS NATURAL HISTORY SURVEY IS PLANNING A STUDY  
AREA CONTAINING 16 LARGE PONDS AND 6 SMALLER PONDS, INTERCONNECTED BY A  
CENTRAL DRAIN AND A CATCHMENT BASIN. THE LARGER PONDS WILL MEASURE 190  
BY 50 FT AND THE SMALLER ONES 85 BY 36 FT. THEY WILL BE FROM 4 TO 8 FT  
DEEP. THE CHAMPAIGN GLACIAL MORaine FORMS A PROMINENT RIDGE TRENDING  
NORTHWEST-SOUTHEAST THROUGH THE SOUTH PART OF CHAMPAIGN AND URBANA. THE  
SOUTH SIDE OF THE MORaine HAS A VERY GENTLE SLOPE OF ABOUT 50 FT PER  
MILE, WHICH EXHIBITS THE POORLY DEFINED DRAINAGE SYSTEM TYPICAL OF  
TOPOGRAPHY RELATED TO GLACIATION. THESE UPLANDS ARE UNDISSECTED, BUT  
ARE A PART OF THE EMBARRAS RIVER WATERSHED TO THE SOUTH. THE PROPOSED  
SITE FOR THE ENVIRONMENTAL POLLUTION STUDY IS LOCATED IN THE MID-PART  
OF THE SOUTH SLOPE OF THE CHAMPAIGN MORaine. THE SITE CHOSEN FOR THE  
ENVIRONMENTAL POLLUTION PROJECT IS GEOLOGICALLY FEASIBLE. THE  
RECTANGULAR-SHAPED PONDS MAY BE SATISFACTORILY CONSTRUCTED OF IN SITU  
MATERIALS IF SOME PRECAUTIONS ARE TAKEN. (KNAPP-USGS)

FIELD 05C, 06G

ACCESSION NO. W70-06322

SELECTION OF REFUSE DISPOSAL SITES IN NORTHEASTERN ILLINOIS,

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.

GEORGE M. HUGHES.

ILLINOIS STATE GEOLOGICAL SURVEY ENVIRONMENTAL GEOLOGY NOTE NO 17, SEPTEMBER 1967. 18 P, 2 FIG, 1 TAB, 41 REF.

DESCRIPTORS:

\*WASTE DISPOSAL, \*GARBAGE DUMPS, \*LANDFILLS, \*PATH OF POLLUTANTS, \*HYDROGEOLOGY, \*ILLINOIS, MUNICIPAL WASTES, LEACHING, GROUNDWATER MOVEMENT, ENVIRONMENTAL SANITATION, ENVIRONMENTAL ENGINEERING, WATER POLLUTION SOURCES.

IDENTIFIERS:

ENVIRONMENTAL GEOLOGY.

ABSTRACT:

GEOLOGIC ENVIRONMENTS IN NORTHEASTERN ILLINOIS WERE EVALUATED IN TERMS OF RESULTS OF STUDIES ON REFUSE DISPOSAL AND GROUNDWATER CONTAMINATION THAT HAVE BEEN MADE ELSEWHERE. THE GEOLOGIC ENVIRONMENTS COMMONLY CONSIDERED AS SAFE FOR REFUSE DISPOSAL IN THIS AREA ARE THOSE WITH MATERIALS OF LOW PERMEABILITY AND THOSE THAT ARE RELATIVELY DRY. A THIRD TYPE OF ENVIRONMENT, ONE WHICH IS HYDROLOGICALLY PROTECTIVE, ALSO SHOULD BE CONSIDERED FOR DISPOSAL PURPOSES. (KNAPP-USGS)

FIELD 05B, 05E

ACCESSION NO. W70-06572



SANITARY LANDFILL LOCATION STUDY.

STARK COUNTY REGIONAL PLANNING COMMISSION, CANTON, OHIO.

REPORT AVAILABLE FROM CLEARINGHOUSE AS PB-187 807, \$3.00 IN PAPER COPY, \$0.65 IN MICROFICHE. STARK COUNTY REGIONAL PLANNING COMMISSION, CANTON, OHIO, SEPT 1969. 84 P, 5 FIG, 18 REF. PROJECT NO OHIO P-238 HUD.

DESCRIPTORS:

\*LANDFILLS, \*WASTE DISPOSAL, \*HYDROGEOLOGY, WATER POLLUTION CONTROL, SURVEYS, LEACHING, GEOLOGY, GROUNDWATER MOVEMENT.

IDENTIFIERS:

STARK COUNTY(OHIO).

ABSTRACT:

TWENTY-SEVEN STRIP MINE SITES IN STARK COUNTY, OHIO WERE ANALYZED AS TO THEIR SUITABILITY FOR A SANITARY LANDFILL. TWELVE OF THE 27 SITES ARE RECOMMENDED. THE 12 SITES RECOMMENDED FOR A SANITARY LANDFILL ARE ANALYZED ACCORDING TO A LIST OF GEOHYDROLOGICAL CRITERIA. EACH OF THE 12 SITES IS CLASSIFIED ACCORDING TO ITS MAJOR GEOHYDROLOGICAL CHARACTERISTICS AND THE TYPES OF WASTE MATERIALS ACCEPTABLE TO EACH CLASS. EACH SITE IS DESCRIBED AND ANALYZED ON AN INDIVIDUAL BASIS ACCORDING TO: (A) LOCATION, LAND USE AND ZONING, (B) SIZE AND OWNERSHIP, (C) CLASSIFICATION, SUITABILITY, AND LIFE EXPECTANCY, (D) POTENTIAL REUSE OF THE COMPLETED LANDFILL, AND (E) GENERALIZED ANALYSIS OF GEOLOGIC MATERIALS. (KNAPP-USGS)

FIELD 05E, 05G

ACCESSION NO. W70-07193



SWIFT AND CO V PEOPLES COAL AND OIL CO (LIABILITY FOR UNDERGROUND OIL SEEPAGE).

186 A 629-635 (CONN 1936).

DESCRIPTORS:

\*CONNECTICUT, \*OILY WATER, \*UNDERSEEPAGE, \*POLLUTION, JUDICIAL DECISIONS, OIL, SEEPAGE, DAMAGES, OIL INDUSTRY, STORAGE TANKS, SUBSURFACE DRAINAGE, UNDERFLOW, UNDERGROUND STREAMS, PERCOLATING WATER, SUBSURFACE WATERS, UNDERGROUND, LEAKAGE, PERCOLATION, WATER RIGHTS, WATER POLLUTION SOURCES, GROUNDWATER, GROUNDWATER MOVEMENT, PERMEABILITY, LEGAL ASPECTS.

ABSTRACT:

PLAINTIFF SUED DEFENDANT OIL COMPANY FOR DAMAGES RESULTING FROM OIL SEEPAGE INTO PLAINTIFF'S CELLAR. DYE TESTS SHOWED THAT WATER PERCOLATED FROM DEFENDANT'S PROPERTY INTO PLAINTIFF'S CELLAR, AND SINCE THERE WAS A CONSIDERABLE AMOUNT OF FREE OIL ON DEFENDANT'S PROPERTY THE COURT FOUND THAT TO BE THE SOURCE OF OIL ON PLAINTIFF'S PREMISES. THE COURT HELD THAT THE ABSOLUTE RIGHT A LANDOWNER HAS TO USE UNDERGROUND WATERS DOES NOT CARRY WITH IT A RIGHT TO MAKE THAT WATER UNUSEABLE FOR OTHERS. A LANDOWNER'S RIGHTS ARE RESTRICTED WHEN HE KNOWS OR SHOULD KNOW THAT HIS USE OF HIS LAND WILL CAUSE INJURY TO ANOTHER. THE POLLUTION OF SUBTERRANEAN WATERS WAS HELD TO BE A NUISANCE WITHOUT A SHOWING OF NEGLIGENCE. THE RULE THAT REMOVED LIABILITY FOR POLLUTION BROUGHT TO ANOTHER'S LANDS BY SUBTERRANEAN CURRENTS WAS OVERRULED. ALTHOUGH HE LEASED THE PROPERTY TO THE OIL COMPANY, DEFENDANT LANDOWNER WAS ALSO HELD LIABLE BECAUSE HE RENEWED THE LEASE TO DEFENDANT OIL COMPANY WITHOUT ABATING THE KNOWN NUISANCE. (DOUBERLEY-FLORIDA)

FIELD 05G

ACCESSION NO. W70-07631

JACKSON V UNITED STATES PIPE LINE CO (LIABILITY FOR UNDERGROUND OIL SEEPAGE).

325 PA 436, 191 A 165-166 (1937).

DESCRIPTORS:

\*PENNSYLVANIA, \*OILY WATER, \*PIPELINES, \*LEAKAGE, JUDICIAL DECISIONS, OIL, OIL INDUSTRY, SUBSURFACE DRAINAGE, WATER POLLUTION SOURCES, PIPES, CLOSED CONDUITS, METAL PIPES, WELLS, ARTESIAN WELLS, WATER WELLS, INFLOW, UNDERGROUND, GROUNDWATER, WATER SUPPLY, SEEPAGE, INFILTRATION, WATER POLLUTION, POLLUTANTS, LEGAL ASPECTS.

ABSTRACT:

DEFENDANT OPERATED A PIPE CARRYING OIL ACROSS PLAINTIFF'S PROPERTY AT A HIGHER ELEVATION THAN PLAINTIFF'S WATER WELL. UPON DISCOVERING SUBSTANTIAL AMOUNTS OF OIL IN HIS WELL, PLAINTIFF SUED FOR DAMAGES. THE COURT FOUND THAT THE EVIDENCE WAS SUFFICIENT TO JUSTIFY A VERDICT IN FAVOR OF PLAINTIFF, EVEN IN THE ABSENCE OF DIRECT PROOF OF LEAKAGE FROM DEFENDANT'S PIPE. A SECTION OF THE PIPE THAT WAS REPLACED WAS FOUND TO HAVE HOLES IN IT, AND SUBSEQUENT TO THE REPLACEMENT THE OIL CONTENT IN THE WELL WAS SUBSTANTIALLY REDUCED. THE GROUND SLOPED DOWNWARD FROM THE PIPE TO PLAINTIFF'S WELL, AND THERE WERE NO OTHER POSSIBLE SOURCES FOR THE OIL IN THE VICINITY. AN EXPERIENCED WELL DRILLER TESTIFIED THAT THE OIL CAME FROM THE DEFECTIVE PIPE LINE. UNDER THE APPLICABLE STATUTE THE DEFENDANT WAS HELD TO BE LIABLE WITHOUT A SHOWING OF NEGLIGENCE SINCE OIL FROM ITS PIPE WAS FOUND TO HAVE POLLUTED THE WELL.  
(DOUBERLEY-FLORIDA)

FIELD 05G

ACCESSION NO. W70-07632

GROUNDWATER CONTAMINATION,

GUELPH UNIV. (ONTARIO). DEPT. OF SOIL SCIENCE.

ROBERT W. GILLHAM, AND L. R. WEBBER.

WATER AND POLLUTION CONTROL, VOL 106, NO 5, P 54-57, MAY 1968. 5 FIG, 1 TAB,  
11 REF.

DESCRIPTORS:

\*GROUNDWATER, \*PIEZOMETRY, \*WATER TABLE, \*SURFACE-GROUNDWATER  
RELATIONSHIPS, \*WATER POLLUTION SOURCES, INFILTRATION, WASTES,  
HYDRAULIC CONDUCTIVITY, SUBSURFACE DRAINAGE, TRANSMISSIVITY, HEAD LOSS,  
DARCYS LAW, TIME LAG, NITROGEN COMPOUNDS, NITRATES, DISCHARGE  
MEASUREMENT, DISCHARGE(WATER), ON-SITE DATA COLLECTIONS, UNDERFLOW.

IDENTIFIERS:

\*HYDRAULIC POTENTIAL, CANADA.

ABSTRACT:

ALL INORGANIC SALTS OF N ARE VERY SOLUBLE IN WATER AND N IN THE NITRATE  
FORM IS PARTICULARLY HAZARDOUS FOR BOTH HUMANS AND LIVESTOCK. BARNYARDS  
AND FEEDLOTS MAY BE PRIME SOURCES OF INORGANIC N IN GROUNDWATER. A  
PIEZOMETRIC NETWORK WAS INSTALLED RADIALY THROUGHOUT A BARNYARD FOR  
DETERMINATION OF GROUNDWATER DISCHARGE OUT OF THE BARNYARD SO THAT IT  
COULD BE CORRELATED WITH THE CHANGES IN THE N CONCENTRATION OF THE  
WATER AS IT PASSED BENEATH THE BARNYARD. THE ACTIVE HEAD OF WATER IN A  
GIVEN PIEZOMETER WAS MEASURED AT DIFFERENT TIMES. ITS BASIC TIME LAG,  
TOGETHER WITH THE GEOMETRY OF THE PIEZOMETER, COULD BE USED TO  
CALCULATE HYDRAULIC CONDUCTIVITIES FROM A LARGE NUMBER OF SITES. THESE  
WERE THEN USED TO CONSTRUCT A MAP OF ISOPOTENTIAL LINES INDICATING  
CHANGES IN HYDRAULIC POTENTIAL WITH DISTANCE. A SIMPLIFYING ASSUMPTION  
WAS THAT HYDRAULIC POTENTIAL DID NOT VARY VERTICALLY IN THE WATER TABLE  
TO BEDROCK. TOGETHER WITH N MEASUREMENTS AT VARIOUS DEPTHS TO BEDROCK,  
THE RESULTS SHOWED THAT THE BARNYARD CONTRIBUTED 0.00189 LB N/HR TO THE  
GROUNDWATER, OR ABOUT 17.5 LB N/YR. THIS WAS CONSIDERED SURPRISINGLY  
LOW, SINCE THE MANURE OF A SINGLE COW COULD PRODUCE 74 LB N/YR.  
(CASEY-ARIZONA)

FIELD 05B, 04B

ACCESSION NO. W70-07766

ROSE V SOCONY-VACUUM CORP (NEGLIGENT POLLUTION OF GROUNDWATER).

24 A2D 422-428 (R I 1942).

DESCRIPTORS:

\*RHODE ISLAND, \*GASOLINE, \*PERCOLATING WATER, \*WELLS, GROUNDWATER, OILY WATER, OIL INDUSTRY, WATER POLLUTION SOURCES, GROUNDWATER MOVEMENT, UNDERFLOW, ARTESIAN WELLS, STREAMS, JUDICIAL DECISIONS, POLLUTION ABATEMENT, POTABLE WATER, STANDARDS, WATER POLLUTION EFFECTS, IMPAIRED WATER QUALITY, PERCOLATION, PENETRATION, DIFFUSION, SEEPAGE, HOGS, STORAGE TANKS, WATER SUPPLY.

IDENTIFIERS:

\*NUISANCE.

ABSTRACT:

PLAINTIFF OWNED FARMLAND ON WHICH HE RAISED CROPS AND PIGS. DEFENDANT OWNED A GAS STATION ON ADJOINING LAND. A BREAK OCCURRED IN A PIPELINE TO A TANK ON DEFENDANT'S PROPERTY AND OVER 800,000 GALLONS OF GAS ESCAPED INTO THE GROUND. A YEAR AND A HALF LATER PLAINTIFF CLAIMED GASOLINE APPEARED IN THE WELL ON HIS LAND. IN AN ACTION FOR NUISANCE, PLAINTIFF ALLEGED THAT THE GASOLINE HAD PERCOLATED IN GROUNDWATERS TO PLAINTIFF'S PREMISES, POLLUTING HIS WATER SUPPLY AND CAUSING THE DEATHS OF HIS PIGS. THE COURT FOUND THAT THE DEFENDANT WAS NEGLIGENT IN HANDLING THE GASOLINE. HOWEVER, IN HOLDING FOR THE DEFENDANT, THE COURT HELD THE EVIDENCE INSUFFICIENT TO ESTABLISH THAT GASOLINE HAD ENTERED PLAINTIFF'S WELL AND STREAM OR WAS THE CAUSE OF DEATH OF THE HOGS. TESTIMONY THAT THE WATER HAD THE TASTE OF GAS, OR AN OILY APPEARANCE, WAS NOT SUFFICIENT TO PROVE THAT THE GASOLINE SPILLED ON DEFENDANT'S GROUND HAD INVADDED PLAINTIFF'S WATER SUPPLY. MOREOVER, THE EVIDENCE TENDED TO SHOW THAT THE GROUNDWATER SLOPE FROM DEFENDANT'S PREMISES DID NOT LEAD IN THE DIRECTION OF PLAINTIFF'S WELL. (HUBENER-FLORIDA)

FIELD 05G

ACCESSION NO. W70-08025

JOLDERSMA V MUSKEGON DEVELOPMENT CO (POLLUTION OF WATER SUPPLY BY OIL WELL ON ADJOINING LAND).

286 MICH 520, 282 NW 229-231 (1938).

DESCRIPTORS:

\*MICHIGAN, \*OIL WASTES, \*PATH OF POLLUTANTS, \*SALINE WATER INTRUSION, WATER POLLUTION, IMPAIRED WATER QUALITY, POLLUTANTS, INDUSTRIAL WASTES, GROUNDWATER, WATER POLLUTION EFFECTS, LEGAL ASPECTS, JUDICIAL DECISIONS, GROUNDWATER MOVEMENT, PERCOLATING WATER, SUBSURFACE WATERS, DIFFUSION, GRAVITATIONAL WATER, SALTS, SALINE SOILS, WASTE STORAGE, OIL INDUSTRY, OIL FIELDS, OIL.

ABSTRACT:

PLAINTIFFS OWNED A 10 ACRE TRACT OF FARMLAND ON WHICH THEY RAISED CELERY. DEFENDANTS OPERATED AN OIL WELL ON ADJOINING LAND AND DISPOSED OF SALT WATER AND OTHER DRILLING REFUSE BY DEPOSITING IT INTO A PIT. PLAINTIFFS BROUGHT ACTION FOR DAMAGES ALLEGING THAT SALT DEPOSITS WHICH APPEARED IN THEIR LAND AND WATER SUPPLY, AND WHICH RENDERED PLAINTIFFS' FARM USELESS FOR RAISING CROPS, CAME FROM DEFENDANTS' PIT. THE COURT FOUND FOR DEFENDANT, HOLDING INSUFFICIENT PLAINTIFFS' EVIDENCE THAT THE SALT DEPOSITED ON THEIR LAND WAS DUE TO A SUBTERRANEAN FLOW OF PERCOLATING WATERS CONTAINING SALT FROM DEFENDANTS' PIT. THE COURT NOTED THE EXISTENCE OF OTHER WELLS IN THE VICINITY AND CONCLUDED THAT IT WAS IMPOSSIBLE TO DETERMINE THAT THE DIRECTION OF UNDERGROUND FLOW LED FROM THE AREA OF THE DEFENDANTS' PIT TO PLAINTIFFS' LAND.  
(HUBENER-FLORIDA)

FIELD 05G

ACCESSION NO. W70-08026

LIABILITY FOR POLLUTION OF SUBTERRANEAN WATERS.

38 ALR2D 1265-1306 (1954).

DESCRIPTORS:

\*PERCOLATING WATER, \*WATER POLLUTION, \*SEEPAGE, \*SUBSURFACE WATERS, PRIOR APPROPRIATION, GROUNDWATER, UNDERGROUND STREAMS, SUBSURFACE RUNOFF, REASONABLE USE, DAMAGES, SURFACE RUNOFF, GASOLINE, WATER POLLUTION SOURCES, MINE WATER, OIL WASTES, CESSPOOLS, SEWAGE DISPOSAL, DOMESTIC WASTES, FARM WASTES, MUNICIPAL WASTES, NATURAL GAS, SALINE WATER INTRUSION, JUDICIAL DECISIONS, LEGAL ASPECTS, MINE ACIDS, DEEP PERCOLATION, WATER POLLUTION CONTROL.

IDENTIFIERS:

CEMETERIES.

ABSTRACT:

CONSIDERED HEREIN IS THE LIABILITY IN DAMAGES FOR, OR THE ENJOINING OF, THE POLLUTION OF SUBTERRANEAN WATERS. A DEFINITIONAL SECTION EXPLAINS THE TERMS USED IN THE ANNOTATION. VARIOUS ASPECTS OF THE RIGHTS AND LIABILITIES OF PARTIES WHO POLLUTE SUBTERRANEAN OR PERCOLATING WATERS FORM THE BULK OF THIS WORK. MAJOR CASES IN VARIOUS JURISDICTIONS ARE CITED AS AUTHORITY FOR THE PROPOSITIONS PRESENTED IN THE BODY OF THE TEXT. GENERALLY, THE AREAS CONSIDERED ARE: (1) LIABILITY FOR THE POLLUTION OF WATERS WHETHER PERCOLATING OR IN SUBTERRANEAN STREAMS; (2) THE RIGHT TO ENJOIN THE CONTINUANCE OF AN EXISTING OR A POSSIBLE FUTURE POLLUTION; (3) WHETHER LIABILITY EXISTS UNDER A CHARGE OF NEGLIGENCE OR NUISANCE; (4) THE SOURCES OF POLLUTION OF SUBTERRANEAN WATERS INCLUDING REFINERIES, CESSPOOLS, PRIVIES, OIL AND GAS WORKS, SALINE INTRUSION, MUNICIPAL WASTES, MANURE, DEAD ANIMALS AND THE LIKE; AND (5) INJUNCTIONS AGAINST THE ESTABLISHMENT OF CEMETERIES IF POLLUTION IS LIKELY TO RESULT. A DISTINCTION IS MADE BETWEEN THE AMERICAN RULE OF REASONABLE USE AND THE ENGLISH RULE OF ABSOLUTE OWNERSHIP. (SEE ALSO W70-08050 AND W70-08051). (BARNETT-FLORIDA)

FIELD 05G

ACCESSION NO. W70-08049

LIABILITY FOR POLLUTION OF SUBTERRANEAN WATERS (THE DISTINCTION BETWEEN  
SUBTERRANEAN STREAMS AND PERCOLATING WATERS).

38 ALR2D P 1269-1272 (1954)

DESCRIPTORS:

\*PERCOLATING WATER, \*WATER POLLUTION, \*SEEPAGE, \*SUBSURFACE WATERS,  
GROUNDWATER, UNDERGROUND STREAMS, SUBSURFACE RUNOFF, REASONABLE USE,  
PRIOR APPROPRIATION, WATER POLLUTION SOURCES, JUDICIAL DECISIONS, LEGAL  
ASPECTS, DEEP PERCOLATION.

ABSTRACT:

WITH REGARD TO LIABILITY FOR THEIR POLLUTION, A CLEAR DISTINCTION IS  
MADE BETWEEN WELL-DEFINED SUBTERRANEAN STREAMS AND PERCOLATING WATERS.  
THE GENERAL RULE IS THAT THE OWNER OF LAND ABUTTING ON A SURFACE STREAM  
MAY NOT POLLUTE IT TO THE INJURY OF OTHER RIPPARIAN OWNERS. THIS SAME  
RULE WAS FOUND APPLICABLE IN RHODE ISLAND TO SUBTERRANEAN STREAMS  
FOLLOWING A WELL-DEFINED COURSE, BUT NOT SO FOR WATERS PASSING BY  
PERCOLATION OR SEEPAGE. IN MICHIGAN, AN INADVERTENT AND NON-NEGLIGENT  
POLLUTION OF SUBTERRANEAN WATERS WAS HELD TO BE NOT ACTIONABLE. THE  
PROBLEM OF DIFFERENTIATION BETWEEN 'FLOW AND SEEPAGE' IS DISCUSSED WITH  
REGARD TO LIABILITY FOR POLLUTION OF A WELL BY SEEPAGE WHERE A CONTRAST  
WAS DRAWN ONLY TO IMPOSE LIABILITY FOR THE FLOW OF CERTAIN WATERS. (SEE  
ALSO W70-08049 AND W70-08051). (BARNETT-FLORIDA)

FIELD 05G

ACCESSION NO. W70-08050



NITRATE CONTENT OF THE UPPER RIO GRANDE AS INFLUENCED BY NITROGEN FERTILIZATION  
OF ADJACENT IRRIGATED LANDS,

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.; BUREAU OF  
RECLAMATION, EL PASO, TEX.; AND INTERNATIONAL BOUNDARY AND WATER  
COMMISSION, EL PASO, TEX.

C. A. BOWER, AND L. V. WILCOX.

SOIL SCIENCE SOCIETY OF AMERICA PROCEEDINGS, VOL 33, NO 6, 1969. 1 FIG, 3  
TAB, 11 REF.

DESCRIPTORS:

\*NITRATES, \*NITROGEN, \*RIO GRANDE, \*SUBSURFACE DRAINAGE, DRAINAGE  
WATER, SALINITY, FERTILIZERS, GROUNDWATER, IRRIGATION EFFECTS,  
LEACHING, DENITRIFICATION, RIVER FLOW, WATER POLLUTION SOURCES.

IDENTIFIERS:

UPPER RIO GRANDE, SALT BALANCE.

ABSTRACT:

AN ANALYSIS OF SALT BALANCE CONDITIONS ON THREE IRRIGATED AREAS ALONG  
UPPER RIO GRANDE BETWEEN 1934-1963 IS SUMMARIZED. NITRATE CONTENT OF  
WATER BEFORE IRRIGATION AND OF DRAINAGE WATER WAS OF SPECIFIC INTEREST.  
DURING 30-YEAR PERIOD AMOUNT OF NITROGEN FERTILIZER APPLIED INCREASED  
BY 35- TO 100-FOLD. DECREASING ANNUAL RIVER FLOWS WERE MAJOR CAUSE OF  
SIGNIFICANT INCREASE OF AVERAGE ANNUAL NITRATE LOAD OF RIVER BETWEEN  
1954-1963 PERIOD. INCREASED USE OF NITROGEN FERTILIZER IN THREE AREAS  
HAS NOT INCREASED OVERALL NITRATE NITROGEN IN UPPER RIO GRANDE. EL PASO  
VALLEY HAS SLIGHTLY INCREASED RIVER NITRATE NITROGEN DUE TO VERY LOW  
FLOWS AND SEWAGE EFFLUENT. INSIGNIFICANT CONTRIBUTION OF NITRATE  
NITROGEN LOAD TO RIVER FROM RINCON AND MESILLA VALLEYS WAS RESULT OF  
DENITRIFICATION OF LEACHED NITRATE NITROGEN UNDER ANAEROBIC CONDITIONS  
IN WATER SATURATED SOIL. (BANNERMAN-WISCONSIN)

FIELD 05B

ACCESSION NO. W70-08662



LEACHING FROM SIMULATED LANDFILLS,

BATTELLE MEMORIAL INST., COLUMBUS, OHIO; AND WEST VIRGINIA UNIV., MORGANTOWN.  
DEPT. OF CIVIL ENGINEERING.

SYED R. QASIM, AND JERRY C. BURCHINAL.

JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 3, PART 1, P 371-379,  
MARCH 1970. 9 P, 10 FIG, 4 TAB, 8 REF. USPHS GRANT EF-40(R1).

DESCRIPTORS:

\*LEACHING, \*LANDFILLS, \*PERCOLATION, \*GROUNDWATER MOVEMENT, MODEL  
STUDIES, LABORATORY TESTS, PATH OF POLLUTANTS, WATER POLLUTION SOURCES,  
SELF-PURIFICATION, BIODEGRADATION.

IDENTIFIERS:

SIMULATED LANDFILL.

ABSTRACT:

SIMULATED LANDFILLS 3 FT IN DIAM AND 4 TO 16 FT IN HEIGHT WERE FILLED  
WITH MIXED MUNICIPAL REFUSE. THE CYLINDERS WERE SATURATED WITH WATER  
AND ADDITIONAL WATER ADDED AT TWO-WEEK INTERVALS. PERCOLATED WATER WAS  
DRAINED AND ANALYZED ON A REGULAR SCHEDULE FOR CHEMICAL AND BACTERIAL  
QUALITY. THE STUDY COVERED A MAXIMUM OF 163 DAYS. CONCENTRATION OF  
EXTRACTED MATERIAL INCREASED INITIALLY BUT BEGAN TO DECREASE AFTER  
ABOUT FOUR WEEKS. ANOTHER INCREASE AFTER EIGHT WEEKS WAS EVIDENT. THE  
CONCENTRATION IN THE LEACHATE OF 18 ORGANIC AND INORGANIC COMPOUNDS  
OVER THE PERIOD OF THE STUDY IS REPORTED. PH SHOWED A SLIGHT INCREASE  
FOLLOWED BY A RAPID DECREASE. LEACH SAMPLES TEND TO UNDERGO  
BACTERIOLOGICAL AND CHEMICAL SELF-PURIFICATION. DEEPER FILLS CONSUME  
MORE WATER, BEFORE LEACHING OCCURS, TAKE A LONGER TIME TO DECOMPOSE,  
AND THE BULK OF THE EXTRACTED MATERIAL IS DISTRIBUTED OVER A LONGER  
PERIOD. (KNAPP-USGS)

FIELD 05B

ACCESSION NO. W70-09548

HYDROGEOLOGY OF SOLID WASTE DISPOSAL SITES IN NORTHEASTERN ILLINOIS,

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.

G. M. HUGHES, R. A. LANDON, AND R. N. FARVOLDEN.

AVAILABLE FROM BUREAU OF SOLID WASTE MANAGEMENT, 5555 RIDGE AVE, CINCINNATI, OHIO, 45213. U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, BUREAU OF SOLID WASTE MANAGEMENT, 1969. 137 P, 24 ILLUS, 9 TABS, 3 REF. NO. DO 1 - UI - 00006.

DESCRIPTORS:

\*HYDROGEOLOGY, \*SOLID WASTES, \*LANDFILL, \*INFILTRATION, \*WATER QUALITY POLLUTION, RECHARGE, DISCHARGE, GROUNDWATER, SURFACE WATERS, AQUIFERS, FLOW RATES, LEACHING.

IDENTIFIERS:

NORTHEASTERN ILLINOIS.

ABSTRACT:

THIS PROJECT DESCRIBES THE HYDROGEOLOGIC ENVIRONMENTS IN THE VICINITY OF FOUR EXISTING LANDFILL SITES IN THE CHICAGO METROPOLITAN AREA, IN ORDER TO DETERMINE THE CONTROLS ON THE MOVEMENT OF THE GROUND WATER AND THE SOLIDS DISSOLVED IN GROUND WATER. GROUNDWATER RECHARGE AND DISCHARGE AREAS ARE DEFINED AND THE QUANTITIES OF WATER MOVED AND RATES OF MOVEMENT THROUGH VARIOUS MATERIALS AND IN VARIOUS ENVIRONMENTS HAVE BEEN ESTIMATED. INFORMATION FROM THIS PRELIMINARY STUDY CAN BE USED BY REGULATORY AGENCIES TO HELP DETERMINE ENVIRONMENTS MOST SUITABLE FOR NEAR-SURFACE DISPOSAL OF WASTE INsofar AS CONTAMINATION OF GROUNDWATER AND SURFACE WATER IS CONCERNED. THE PROBLEM OF GROUNDWATER CONTAMINATION BY NEAR-SURFACE SOLID WASTE DISPOSAL IS APPROACHED IN TERMS OF THE HYDROGEOLOGIC ENVIRONMENT. IN SOME SITES, WATER THAT INFILTRATES THE GROUND BECOMES PART OF A LOCAL FLOW SYSTEM AND IS DISCHARGED INTO A NEARBY STREAM OR SWAMP WITH LITTLE RISK OF CONTAMINATING AN AQUIFER. IN OTHER SITES THIS WATER BECOMES PART OF A REGIONAL FLOW SYSTEM AND MAY ENTER PRODUCTIVE AQUIFERS WITH DEFINITE RISK OF CONTAMINATION. THE DEFINITION OF FLOW SYSTEMS IN HOMOGENEOUS MATERIALS IS RELATIVELY SIMPLE; HOWEVER, THE EFFECTS ON THIS FLOW SYSTEM OF CHANGES FROM ONE GEOLOGIC MATERIAL TO ANOTHER ARE MORE DIFFICULT TO EVALUATE. THIS INFORMATION IS NECESSARY IF MOVEMENT OF REFUSE LEACHATE FROM PROPOSED DISPOSAL SITES IS TO BE PREDICTED. (MARRIOTT-CHICAGO)

FIELD 05B, 04C

ACCESSION NO. W70-09637

ENVIRONMENTAL POLLUTION FROM HIGHWAY DEICING COMPOUNDS,

MAINE UNIV., ORONO. DEPT. OF PLANT AND SOIL SCIENCES.

F. E. HUTCHINSON.

JOURNAL OF SOIL AND WATER CONSERVATION, VOL 25, NO 4, P 144-146, JULY-AUGUST 1970. 3 P, 1 FIG, 3 TAB, 7 REF. OWRR PROJECT A-007-ME.

DESCRIPTORS:

\*WATER POLLUTION EFFECTS, \*SODIUM CHLORIDE, \*HIGHWAY ICING, \*SNOW REMOVAL, \*MAINE, DEICERS, ROADS, CHEMCONTROL, SALTS, GROUNDWATER, LEACHING, SALINE SOILS, SALINE WATER.

IDENTIFIERS:

HIGHWAY ICE REMOVAL.

ABSTRACT:

DURING THE PERIOD 1965-1969, A STUDY WAS MADE TO DETERMINE WHAT ENVIRONMENTAL POLLUTION, IF ANY, RESULTED FROM THE AVERAGE ANNUAL APPLICATION OF 25 TONS OF SODIUM CHLORIDE TO EACH MILE OF PAVED HIGHWAY IN MAINE. ANALYSES OF WATER SAMPLES INDICATED THAT WELLS AND FARM PONDS WERE SERIOUSLY CONTAMINATED WITH CHLORIDE IONS. SOIL SAMPLE ANALYSES REVEALED THAT SOILS CONTIGUOUS TO HIGHWAYS CONTAINED SODIUM LEVELS THAT THREATEN VEGETATION AND SOIL DRAINAGE. CONCENTRATIONS OF THESE IONS IN RIVERS APPARENTLY WERE NOT INFLUENCED BY THIS PRACTICE. (KNAPP-USGS)

FIELD 05C

ACCESSION NO. W70-09844

FLOW FROM A SPHERICAL SOURCE WITH WATER CONTENT DEPENDENT DIFFUSIVITY,  
SAN JOSE STATE COLL., CALIF.

RAMESHWAR SINGH.

WATER RESOURCES RESEARCH, VOL 6, NO 4, P 1140-1147, AUGUST 1970. 8 P, 3 FIG,  
1 TAB, 8 REF.

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*PATH OF POLLUTANTS, \*DIFFUSION, \*SOIL WATER  
MOVEMENT, \*RADIOACTIVE WASTES, EQUATIONS, GROUNDWATER MOVEMENT,  
LEACHING, MATHEMATICAL MODELS, MIXING, RADIOACTIVE WASTE DISPOSAL,  
UNSATURATED FLOW, SATURATED FLOW, ADSORPTION, ADSORPTION, ION TRANSPORT.

IDENTIFIERS:

SPHERICAL DIFFUSIVITY.

ABSTRACT:

LEAKAGE OF MOISTURE FROM UNDERGROUND BURIED SOURCES CAN OCCUR BECAUSE  
OF CRACKING OR DETERIORATION OF CONTAINERS. LEAKING MOISTURE CAN BE  
RADIOACTIVE OR CONTAMINATED AND MAY ENDANGER PUBLIC HEALTH. IN DISPOSAL  
OF SUCH SUBSTANCES UNDERGROUND, CONSIDERATION MUST BE GIVEN TO THE  
EXTENT OF DISPERSAL OF MOISTURE FROM WET CONTAINERS IN CASE OF  
ACCIDENTS. THE MOVEMENT OF MOISTURE FROM A SPHERICAL BURIED SOURCE INTO  
PARTIALLY SATURATED SURROUNDINGS IS DESCRIBED BY A NONLINEAR PARTIAL  
DIFFERENTIAL EQUATION. COMPLEXITY OF THE EQUATION PREVENTS OBTAINING AN  
EXPLICIT SOLUTION OF THE PROBLEM; HOWEVER, AN APPROXIMATE SOLUTION MAY  
BE EXTRACTED BY THE METHOD OF WEIGHTED RESIDUALS. THE TECHNIQUE CALLS  
FOR REPRESENTING THE SOLUTION WITH A POLYNOMIAL IN SPACE VARIABLE THAT  
HAS ITS COEFFICIENTS AS UNKNOWN FUNCTIONS OF TIME, TO BE DETERMINED  
FROM THE CONDITIONS AND BY SATISFYING THE EQUATION BY AVERAGING OVER  
THE RANGE OF SPACE-VARIABLE. THIS PROCEDURE ACCEPTS ANY KIND OF  
DIFFUSIVITY FUNCTION INCLUDING NUMERICAL VALUES OBTAINED FROM  
EXPERIMENTS. THE METHOD IS SIMPLE IN ITS APPLICATION AND PRODUCES  
RESULTS THAT COMPARE WELL WITH THE KNOWN SOLUTION. (KNAPP-USGS)

FIELD 05B, 02G

ACCESSION NO. W70-10058

EFFECTS OF A CONCENTRATED ACID ON WATER CHEMISTRY AND WATER USE IN A  
PLEISTOCENE OUTWASH AQUIFER,

GEOLOGICAL SURVEY, LOUISVILLE, KY. WATER RESOURCES DIV.

HAYES F. GRUBB.

GROUNDWATER, VOL 8, NO 5, P 4-7, SEPTEMBER-OCTOBER 1970. 4 P, 9 FIG, 2 TAB, 3  
REF.

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*INDUSTRIAL WASTES, \*GROUNDWATER MOVEMENT,  
\*RECHARGE, \*SURFACE-GROUNDWATER RELATIONSHIPS, MALENCLES, PATH OF  
POLLUTANTS, ACIDS, LEACHING, CHLORIDES, GLACIAL DRIFT, AQUIFERS, OHIO  
RIVER, KENTUCKY.

IDENTIFIERS:

HYDROCHLORIC ACID.

ABSTRACT:

A BREAK IN A WASTE-DISCHARGE LINE AT THE SAME TIME AS A 49-FOOT RISE IN  
STAGE OF THE OHIO RIVER IN MARCH 1967 ALLOWED HYDROCHLORIC ACID TO  
ENTER THE PLEISTOCENE OUTWASH AQUIFER USED BY A KENTUCKY INDUSTRY.  
CHLORIDE CONCENTRATIONS IN EXCESS OF 30,000 MG/LITER WERE OBSERVED IN  
THE WATER DISCHARGED FROM THE INDUSTRIAL WELL NEAREST THE BREAK IN THE  
WASTE-DISCHARGE LINE. BY MARCH 1968, THE WELL NEAREST THE ACID SOURCE  
WAS ABANDONED, THE REMAINING TWO WELLS NEAR THE RIVER WERE USED IN A  
SUPPLEMENTAL CAPACITY AND A FOURTH WELL 1,500 FEET FROM THE RIVER PLUS  
A NEW WELL WERE THE PRIMARY WATER SOURCES. FLUCTUATIONS OF CHLORIDES IN  
AN INDUSTRIAL WELL NEAR THE RIVER FOR A 16-MONTH PERIOD INDICATE A  
PERSISTENT BODY OF HIGHLY MINERALIZED WATER NEAR THE ACID SOURCE.  
MOVEMENT OF THIS WATER BODY APPEARS TO BE REGULATED AT LOW RIVER STAGES  
BY THE INCLINED SURFACE OF THE NEW ALBANY SHALE BEDROCK. (KNAPP-USGS)

FIELD 05B, 05C

ACCESSION NO. W71-00194

SCHLICHTKRULL V MELLON-POLLOCK OIL CO (ILLNESS CAUSED BY POLLUTION OF WELL).

301 PA 560, 152 A 832-834 (1930).

DESCRIPTORS:

\*PENNSYLVANIA, \*WATER POLLUTION, \*SALINE WATER INTRUSION, \*WATER WELLS, OIL INDUSTRY, PUBLIC HEALTH, OIL WELLS, DRILLING, OIL FIELDS, SALINE WATER, SALINE WATER-FRESHWATER INTERFACES, WELLS, WELL CASINGS, GROUNDWATER, WATER SUPPLY, PERCOLATING WATER, SUBSURFACE WATERS, JUDICIAL DECISIONS, LEGAL ASPECTS, ADJUDICATION PROCEDURE.

ABSTRACT:

PLAINTIFF LANDOWNER BROUGHT SUIT FOR DAMAGES AGAINST DEFENDANT OIL COMPANY. DEFENDANT HAD DRILLED AN OIL WELL AND THEREBY CAUSED SALT TO ACCUMULATE IN PLAINTIFF'S WATER WELL. PLAINTIFF'S WIFE BECAME ILL AND PLAINTIFF CLAIMED THE ILLNESS WAS CAUSED BY THE SALT IN THE WATER. THE SUPREME COURT OF PENNSYLVANIA, REVERSING THE TRIAL COURT'S DECISION FOR PLAINTIFF, RULED THAT BEFORE AN ACTION FOR NEGLIGENCE IN DRILLING AN OIL WELL WOULD LIE, DANGER TO PUBLIC HEALTH MUST HAVE BEEN FORESEEABLE. PLAINTIFF HAD NOT MET THE BURDEN OF PROOF REQUISITE TO SUCH AN ACTION. (BARKER-FLORIDA)

FIELD 06E, 05C

ACCESSION NO. W71-01028

ROSE V SOCONY-VACCUUM CORP (POLLUTION OF STREAMS BY SUBSTANCES IN GROUNDWATER).

173 A 627-632 (RI 1934).

DESCRIPTORS:

\*RHODE ISLAND, \*SEEPAGE, \*WATER POLLUTION, \*PERCOLATING WATER, RIPARIAN RIGHTS, RELATIVE RIGHTS, WATER POLLUTION EFFECTS, STREAMS, GROUNDWATER, JUDICIAL DECISIONS, LEGAL ASPECTS, RIPARIAN LAND, PERCOLATION, SUBSURFACE WATERS, UNDERGROUND STREAMS, GROUNDWATER MOVEMENT, PATH OF POLLUTANTS, SOIL WATER MOVEMENT, OILY WATER, OIL WASTES, WATER POLLUTION SOURCES.

ABSTRACT:

DEFENDANT OPERATED A REFINERY ON PROPERTY ADJACENT TO THAT OF PLAINTIFF. ON PLAINTIFF'S PROPERTY WERE A WELL AND A STREAM USED BY PLAINTIFF TO WATER HIS PIGS AND HENS. COLLECTIONS OF PETROLEUM PRODUCTS ON DEFENDANT'S LAND ENTERED PERCOLATING WATERS BENEATH THE LAND AND THEREBY PASSED TO THE WATER SOURCES ON PLAINTIFF'S LAND. THIS RENDERED THE WATER UNFIT FOR ANIMAL CONSUMPTION AND CAUSED THE DEATH OF NUMBERS OF PLAINTIFF'S POULTRY AND LIVESTOCK. PLAINTIFF SOUGHT DAMAGES AND AN INJUNCTION, ALLEGING THAT DEFENDANT WAS PERPETUATING A NUISANCE ON HIS PROPERTY. NO NEGLIGENCE WAS ALLEGED. DEFENDANT'S DEMURRER WAS SUSTAINED, AND THE APPELLATE COURT AFFIRMED, REJECTING THE DOCTRINE OF RYLANDS V FLETCHER AND STATING THAT NEGLIGENCE MUST BE SHOWN FOR RECOVERY WHERE POLLUTION IS SPREAD BY PERCOLATING WATERS. THE RULE THAT ONE RIPARIAN OWNER MAY NOT INJURE ANOTHER'S USE OF THE WATER WAS HELD TO APPLY TO SURFACE STREAMS AND NOT TO PERCOLATING WATERS, WHERE THE LOCATION AND COURSE OF THE WATER IS GENERALLY UNKNOWN. (DYE-FLORIDA)

FIELD 06E, 05B

ACCESSION NO. W71-01043



LEACHATE MOVEMENT IN THE SUB-SOIL BENEATH A SANITARY LANDFILL TRENCH TRACED BY MEANS OF SUCTION LYSIMETERS,

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF GEOLOGY AND GEOPHYSICS.

BURKE E. LANE, AND RICHARD R. PARIZEK.

PROCEEDINGS OF THE 2ND MID-ATLANTIC INDUSTRIAL WASTE CONFERENCE, NOVEMBER 18-20, 1968, DREXEL INSTITUTE OF TECHNOLOGY, P 261-277, 1968. 17 P, 11 FIG, 1 REF.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*LEACHING, \*LANDFILLS, \*GARBAGE DUMPS, \*GROUNDWATER MOVEMENT, KARST, INFILTRATION, ION TRANSPORT, PENNSYLVANIA, SUBSURFACE DRAINAGE, WATER QUALITY, WATER POLLUTION SOURCES, LYSIMETERS.

IDENTIFIERS:

STATE COLLEGE(PENN), SANITARY LANDFILL DRAINAGE.

ABSTRACT:

THE LANDFILL SITE LIES ABOUT 2 MILES NORTHWEST OF STATE COLLEGE. THE LANDFILLING OPERATION IS ON STEEP HILLSIDES. THE TOPS OF THE VALLEY WALLS ARE ABOUT 100 FEET HIGH AND THE SLOPES APPROACH 40 DEGREES NEAR THE VALLEY BOTTOM. THE VALLEY BOTTOM IS A DRY, UNDERDRAINED KARST STREAM BED. GROUNDWATER EXISTS UNDER WATER TABLE CONDITIONS AT A DEPTH OF ABOUT 250 FEET. THE WATER QUALITY MONITORING SYSTEM CONSISTED OF A 900 SQUARE-FOOT SHEET OF PLASTIC TO LINE THE BOTTOM OF A LANDFILL TRENCH, A SPREADER PIPE IN AN INFILTRATION TRENCH, AND A PROTECTIVE HOUSING. THE SOIL WATER SAMPLING DEVICES CONSISTED OF 17 SUCTION LYSIMETERS INSTALLED AT VARIOUS DEPTHS IN THE SOIL BENEATH THE LANDFILL TRENCH. MOVEMENT OF A WAVE FRONT OF LEACHATE-POLLUTED SOIL WATER COULD BE TRACED IN THE SOIL BENEATH THE LANDFILL TRENCH. SEVERE POLLUTION OF THE SOIL WATER IN THE IMMEDIATE VICINITY OF A LANDFILL CAN RESULT EVEN THOUGH THE LANDFILL IS NOT IN DIRECT CONTACT WITH A WATER TABLE AND EVEN BEFORE THE REFUSE HAS BECOME SATURATED TO FIELD CAPACITY. (KNAPP-USGS)

FIELD 05B, 02G

ACCESSION NO. W71-01204



FURTHER CONSIDERATIONS ON INLAND SEWAGE DISPOSAL IN FALMOUTH, MASSACHUSETTS,  
GEOLOGICAL SURVEY, WOODS HOLE, MASS.

ROBERT H. MEADE.

WOODS HOLE OCEANOGRAPHIC INSTITUTION TECHNICAL REPORT, REFERENCE NO 70-42,  
SEPTEMBER 1970. 24 P, 5 FIG, 2 TAB, 6 REF. 3 APPEND. (UNPUBLISHED  
MANUSCRIPT).

DESCRIPTORS:

\*SEWAGE DISPOSAL, \*INFILTRATION, \*WATER SPREADING, \*MONITORING, WATER  
POLLUTION SOURCES, SEWAGE TREATMENT, WASTE WATER DISPOSAL, NITRATES,  
EUTROPHICATION, AQUIFERS, GROUNDWATER MOVEMENT, MASSACHUSETTS.

IDENTIFIERS:

INFILTRATION PONDS, CAPE COD(MASS), FALMOUTH(MASS).

ABSTRACT:

IF THE TOWN OF FALMOUTH, MASS., DECIDES TO DISPOSE OF SECONDARY-TREATED  
SEWAGE EFFLUENT AT AN INLAND SITE, THE GROUNDWATERS DOWNSTREAM OF THE  
DISPOSAL SITE SHOULD BE MONITORED CAREFULLY, AND ADEQUATE SPACE AND  
ACCESS FOR MORE ADVANCED WASTE-TREATMENT FACILITIES SHOULD BE INCLUDED  
IN THE PLANT IN CASE THE MONITORING SHOWS THAT DELETERIOUS SUBSTANCES  
ARE BEGINNING TO CONTAMINATE THE GROUNDWATER. THE PRESENT INLAND SEWAGE  
DISPOSAL PLANT AT OTIS AIR FORCE BASE HAS NO SIGNIFICANT EFFECT ON  
GROUNDWATER QUALITY AT ITS PRESENT LOW LEVEL OF OPERATIONS. EFFLUENT  
FROM A PROPOSED INLAND SITE COULD CONTAMINATE NEARLY GROUNDWATER AND  
CONTRIBUTE TO THE OVERFERTILIZATION OF ESTUARIES IN SOUTHERN FALMOUTH.  
DISPOSAL OF 3.7 MGD OF EFFLUENT THROUGH A SEA OUTFALL COULD RESULT IN A  
GENERAL DECLINE IN GROUNDWATER LEVELS OF 3 TO 5 INCHES; THEREFORE,  
CAREFUL DISPOSAL BY RECHARGE IS RECOMMENDED TO CONSERVE GROUNDWATER.  
(KNAPP-USGS)

FIELD 05E, 05B

ACCESSION NO. W71-01205

CONSIDERATIONS ON INLAND SEWAGE DISPOSAL IN FALMOUTH, MASSACHUSETTS,  
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.

ROBERT H. MEADE, AND RALPH F. VACCARO.

TECHNICAL REPORT, REFERENCE NO 70-3, FEBRUARY 1970. 22 P, 4 FIG, 1 TAB, 9  
REF, 2 APPEND. (UNPUBLISHED MANUSCRIPT).

DESCRIPTORS:

\*INFILTRATION, \*WATER SPREADING, \*MONITORING, WATER POLLUTION SOURCES,  
SEWAGE TREATMENT, WASTE WATER DISPOSAL, NITRATES, EUTROPHICATION,  
AQUIFERS, GROUNDWATER MOVEMENT, MASSACHUSETTS.

IDENTIFIERS:

INFILTRATION PONDS, CAPE COD(MASS), FALMOUTH(MASS).

ABSTRACT:

THE CONSEQUENCES ARE CONSIDERED OF DISPOSING OF SECONDARY TREATED EFFLUENT FROM THE TOWN OF FALMOUTH, MASS., BY INFILTRATION INLAND SITES RATHER THAN BY MARINE OUTFALLS. FOR THE TERMINAL DISPOSAL OF TREATED SEWAGE EFFLUENTS, TRANSFER INTO THE GROUND CAN BE AN ACCEPTABLE AND EFFECTIVE METHOD. VERY MANY SEWAGE TREATMENT PLANTS OPERATE IN THIS MANNER. IN MANY INSTANCES, SUCH PRACTICE ENHANCES WATER CONSERVATION BY HELPING MAINTAIN GROUNDWATER RESERVES. HOWEVER, IN TOWNS SUCH AS FALMOUTH, WHICH DEPEND UPON GROUNDWATER FOR POTABLE WATER, GREAT CARE MUST BE TAKEN TO ASSURE THAT RECHARGING DOES NOT CAUSE ANY UNDUE CONTAMINATION OF THE LOCAL GROUNDWATER SYSTEM. NITRATE IS ONE OF THE MORE UNPREDICTABLE BY-PRODUCTS OF SEWAGE TREATMENT AND ITS ULTIMATE APPEARANCE IN NATURAL WATERS CAN HAVE AN ADVERSE EFFECT ON WATER QUALITY. EXCESSIVE AMOUNTS OF NITRATE, IN CONJUNCTION WITH OTHER PLANT NUTRIENTS, CAN LEAD TO UNSIGHTLY BLOOMS OF NUISANCE AQUATIC PLANTS ONCE EXPOSURE TO SUNLIGHT IS PROVIDED. ADEQUATE ALLOWANCE FOR THIS UNCERTAINTY SHOULD BE PROVIDED AT THE PLANNING STAGES OF ANY INLAND SEWAGE DISPOSAL PLANT WHICH DEPENDS UPON TERMINAL DISPOSAL INTO THE GROUND. AN EARLY-WARNING MONITORING SYSTEM OF OBSERVATION WELLS NEAR THE DISPOSAL SITE IS RECOMMENDED TO DETECT ANY INCIPIENT CONTAMINATION PROBLEM BEFORE IT BECOMES SERIOUS. (KNAPP-USGS)

FIELD 05E, 05B

ACCESSION NO. W71-01324

SEPARATION OF OIL AND WATER WITH GRAVITY SEPARATOR (FRENCH),

LAVAL UNIV., QUEBEC; AND HYDRAULIC RESEARCH INST., BRATISLAVA  
(CZECHOSLOVAKIA).

K. ROHAN, AND M. ZAJDLIK.

ENGLISH SYNOPSIS. IN: PROCEEDINGS 13TH CONGRESS OF THE INTERNATIONAL  
ASSOCIATION FOR HYDRAULIC RESEARCH, KYOTO, JAPAN, AUGUST 31-SEPTEMBER 5,  
1969, VOL 2 (SUBJECT B), SCIENCE COUNCIL OF JAPAN, KYOTO, P 177-189, 1969.  
13 P, 6 FIG, 2 TAB, 5 REF.

DESCRIPTORS:

\*WATER POLLUTION, \*GROUNDWATER, \*OIL WASTES, \*SEPARATION TECHNIQUES,  
INFILTRATION, MODEL STUDIES, MATHEMATICS, EQUATIONS, PATH OF  
POLLUTANTS, FOREIGN PROJECTS.

IDENTIFIERS:

\*HYDRAULICS LABORATORY OF BRATISLAVA(CZECHOSLOVAKIA).

ABSTRACT:

THIS PAPER GIVES THE TEST RESULTS AND COMPUTATION METHODS USED IN THE  
HYDRAULICS LABORATORY OF BRATISLAVA, CZECHOSLOVAKIA, CONCERNING OIL AND  
WATER MIXTURES WITH EMPHASIS ON PROTECTION OF GROUNDWATER SUPPLIES  
AGAINST POLLUTION FROM OIL PENETRATION. RELATED EQUATIONS AND GRAPHS ARE  
INCLUDED. IT IS POSSIBLE TO UTILIZE GRAVITY SEPARATORS BECAUSE WATER  
AND OIL USUALLY DO NOT CREATE EMULSIONS. (WOODARD-USGS)

FIELD 05G, 05B, 04B

ACCESSION NO. W71-01930

REMOVAL OF SALINE WATER FROM AQUIFERS,

BUREAU OF RECLAMATION, DENVER, COLO. OFFICE OF CHIEF ENGINEER.

E. J. CARLSON, AND P. F. ENGER.

FRENCH RESUME. IN: PROCEEDINGS 13TH CONGRESS OF THE INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH, KYOTO, JAPAN, AUGUST 31-SEPTEMBER 5, 1969, VOL 4 (SUBJECT D), SCIENCE COUNCIL OF JAPAN, KYOTO, P 121-134, 1969. 14 P, 4 FIG, 1 TAB, 16 REF.

DESCRIPTORS:

\*SALINE WATER-FRESH-WATER INTERFACES, \*LEACHING, \*SALINE WATER SYSTEMS, \*GROUNDWATER MOVEMENT, DRAINAGE SYSTEMS, HYDRAULIC MODELS, MATHEMATICAL MODELS, AQUIFERS, MODEL STUDIES, DRAINAGE PROGRAMS, SUBSURFACE DRAINAGE, WATER MANAGEMENT(APPLIED).

IDENTIFIERS:

AQUIFER SWEETENING, AQUIFER DESALINATION.

ABSTRACT:

AQUIFER DESALTING WAS STUDIED IN A RECTANGULAR, GLASS-WALLED, SAND-FILLED TANK AND IN A MATHEMATICAL MODEL. TWO TYPES OF AQUIFERS WERE STUDIED: (1) A 1:40 SCALE, TWO-PART AQUIFER (COURSE AND FINE SAND) REPRESENTING A VERTICAL CROSS SECTION THROUGH AN IDEALIZED PORTION OF AN IRRIGATED VALLEY; AND (2) A FINE SAND, SINGLE-PART AQUIFER USED TO EVALUATE A FORMULA DERIVED FROM THE GHYBEN-HERZBERG PRINCIPLE FOR COMPUTING DEPTH TO A SALINE-FRESH WATER INTERFACE. SALT WATER WAS FLUSHED FROM THE AQUIFERS INTO SUBSURFACE DRAINS BY APPLYING FRESH WATER TO THE SURFACE. TEST RESULTS FOR BOTH AQUIFER TYPES SHOWED THAT TILE DRAINS PLACED NEAR THE GROUND SURFACE WILL NOT INTERCEPT AND DISCHARGE SURFACE-APPLIED FRESH WATER IF ALL OR PART OF THE AQUIFER CONTAINS SALT WATER. THE FRESH WATER DISPLACES THE SALT WATER WITHOUT APPRECIABLE MIXING AND MOVES IT INTO THE DRAINS. A STABLE FRESH-SALT WATER INTERFACE IS THEREBY FORMED IN THE AQUIFER. REDUCED SPACING OF DRAINS REDUCED THE AMOUNT OF SALT WATER THAT WILL BE REMOVED FROM THE AQUIFER. PROGRESS OF THE TESTS WAS RECORDED IN STILL AND TIMED-SEQUENCE MOTION PICTURES. (KNAPP-USGS)

FIELD 05G, 02F, 04B

ACCESSION NO. W71-01932

FERTILIZERS AND FEEDLOTS --- WHAT ROLE IN GROUNDWATER POLLUTION.

AGRICULTURAL RESEARCH, VOL 18, NO 6, DECEMBER 1969, P 14-15.

DESCRIPTORS:

\*FARM WASTES, \*SOIL CONTAMINATION, \*FERTILIZERS, \*NITRATES, WATER POLLUTION, NITROGEN, NITRITES, AQUIFERS, COLORADO, DENITRIFICATION, WATER TABLE, PERCOLATION.

IDENTIFIERS:

\*FEEDLOTS, SOUTH PLATTE RIVER VALLEY.

ABSTRACT:

NO SIGNIFICANT CONTAMINATION OF THE WATER TABLE WITH NITRATE FROM FARM FERTILIZERS OR EXTENSIVE CATTLE FEEDING OPERATIONS WAS FOUND IN PRELIMINARY ARS STUDIES IN NORTHEASTERN COLORADO. BUT STUDIES INDICATED THAT SUBSTANTIAL AMOUNTS OF NITRATE COULD EVENTUALLY REACH THE WATER TABLE UNDER HEAVILY FERTILIZED IRRIGATED FIELDS AND UNDER FEEDLOTS. ARS SOIL SCIENTISTS MEASURED NITRATES IN 129 SOIL CORES DRILLED TO BEDROCK OR THE WATER TABLE AND IN 75 SAMPLES OF GROUNDWATER TAKEN WITH THE CORES IN COLORADO'S SOUTH PLATTE RIVER VALLEY. THE INVESTIGATORS FOUND THAT, ON THE AVERAGE, THE KIND OF LAND USE DID NOT EFFECT THE NITRATE CONCENTRATION OF WATER ENTERING THE BOTTOM OF THE HOLES WHERE THE CORES WERE TAKEN. THE SURFACE MAY CONTAIN MORE POLLUTANTS THAN WATER DEEPER IN THE AQUIFER. (WHITE-IOWA STATE)

FIELD 05B

ACCESSION NO. W71-02036

MOVEMENT OF BACTERIA FROM A RIVER TO A MUNICIPAL WELL--A CASE HISTORY,  
GEOLOGICAL SURVEY, ALBANY, N.Y.

ALLAN D. RANDALL.

JOURNAL AMERICAN WATER WORKS ASSOCIATION, VOL 62, NO 11, PART 1, P 716-720,  
NOVEMBER 1970. 5 P, 5 FIG, 4 REF.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*INDUCED INFILTRATION, COLIFORMS, ALLUVIAL  
CHANNELS, DREDGING, EXCAVATION, AQUIFERS, GRAVELS, AQUITARDS, PUMPING,  
WATER WELLS, MUNICIPAL WATER, SURFACE-GROUNDWATER RELATIONSHIPS,  
GROUNDWATER MOVEMENT.

IDENTIFIERS:

\*SUSQUEHANNA RIVER(NY), BINGHAMTON(NY).

ABSTRACT:

COLIFORM BACTERIA REGULARLY TRAVEL AT LEAST 180 FT TO MUNICIPAL WELL  
FROM A REACH OF THE SUSQUEHANNA RIVER (NY) POLLUTED BY SEWAGE.  
EXCAVATION OF THE RIVERBED, IN AN AREA ALREADY GEOLOGICALLY FAVORABLE  
FOR INDUCED INFILTRATION, SEEMS RESPONSIBLE FOR BACTERIA REACHING THE  
WELL, AFTER 19 YR OF TROUBLE-FREE OPERATION. THE WELL PRODUCES FROM  
BEDS OF COARSE SAND AND GRAVEL AND 10 TO 80 FT BELOW LAND SURFACE. FROM  
1945 THROUGH 1964 IT WAS IN DAILY USE, WITH ONLY OCCASIONAL  
INTERRUPTIONS DUE TO EQUIPMENT FAILURE, SUPPLYING 1.0 TO 1.6 MGD OF  
GOOD WATER. (KNAPP-USGS)

FIELD 05B, 02G

ACCESSION NO. W71-02909

SCHLICHTRULL V MELLON-POLLOCK OIL CO (NEGLIGENT DRILLING OF OIL WELL ALLEGED TO HAVE CAUSED SALINE WATER INTRUSION).

301 PA 553, 152 A 829-831 (1930).

DESCRIPTORS:

\*PENNSYLVANIA, \*SALINE WATER INTRUSION, \*OIL WELLS, \*WATER WELLS, GROUNDWATER, SALINE WATER-FRESH WATER INTERFACES, MIXING, PENETRATION, DRILL HOLES, GROUNDWATER MOVEMENT, DAMAGES, LEGAL ASPECTS, COMPENSATION, BRINES, WATER SUPPLY, BOUNDARIES(SURFACES), WELL CASINGS, SALINE WATER, WELLS, SEEPAGE, DAMAGES, REMEDIES.

ABSTRACT:

PLAINTIFF FARMOWNER SUED DEFENDANT OIL WELL LESSEE FOR DAMAGES CAUSED BY POLLUTION OF PLAINTIFF'S WELL. DEFENDANT HAD ENCOUNTERED SALT WATER IN DRILLING, AND BECAUSE DEFENDANT HAD FAILED TO DRIVE CASINGS TO PREVENT INTRUSION OF THE SALT WATER INTO THE FRESH WATER STRATA LYING ABOVE, THE SALT WATER SEEPED INTO PLAINTIFF'S WELL. THE COURT NOTED THAT WITHOUT NEGLIGENCE NO LIABILITY INURES FOR INTERFERENCE WITH SUBTERRANEAN WATERS. HOWEVER, DEFENDANT WAS LIABLE BECAUSE IT HAD FAILED TO EXERCISE DUE CARE. DEFENDANT ASSERTED THAT THE OIL WELL WAS TO BE ABANDONED IN SIX MONTHS AND THAT, THEREFORE, THE INJURY WAS TEMPORARY. PLAINTIFF ASSERTED THAT THE INJURY WAS PERMANENT, SINCE DEFENDANT HAD NOT PROVEN THAT PLUGGING THE WELL WOULD PREVENT SALT WATER INTRUSION OR RESTORE THE PROPERTY TO ITS ORIGINAL CONDITION. HOLDING THAT THE INJURY WAS PERMANENT, THE COURT AFFIRMED THE TRIAL COURT'S MEASURE OF DAMAGES BASED UPON THE DIMINUTION IN MARKET VALUE OF PLAINTIFF'S TRACT. (HART-FLORIDA)

FIELD 06E, 05B

ACCESSION NO. W71-03230



RELATIONSHIP OF AGRICULTURE TO SOIL AND WATER POLLUTION.

CORNELL UNIV., ITHACA, N.Y.

PROCEEDINGS, CORNELL UNIVERSITY CONFERENCE ON AGRICULTURAL WASTE MANAGEMENT,  
JANUARY 19-21, 1970. ITHACA, 1970. 270 P.

DESCRIPTORS:

\*SOILS, \*FARM WASTES, \*FERTILIZERS, GROUNDWATER, PRECIPITATION,  
POTASSIUM, POULTRY, CATTLE, HOGS, NITROGEN, NITRATE, PHOSPHORUS,  
PHOSPHATES, RATES OF APPLICATION, NUTRIENTS, EFFLUENT, AQUIFER,  
AMMONIA, SOIL CONTAMINATION, WATER POLLUTION, WATER TABLE, OXIDATION  
LAGOON, IRRIGATION, AERATION, BIOCHEMICAL OXYGEN DEMAND, CHEMICAL  
OXYGEN DEMAND, ODOR, BIOLOGICAL TREATMENT, COSTS, DENITRIFICATION,  
NITRIFICATION, SLUDGE, STORAGE, NUTRIENT REQUIREMENTS, FLORIDA,  
NEBRASKA, SURFACE RUNOFF, INFILTRATION.

IDENTIFIERS:

\*FEEDLOTS, OXIDATION DITCH, SLOTTED FLOORS, AERATOR, SPREADING, LAND  
DISPOSAL.

ABSTRACT:

THE 1970 CONFERENCE ATTEMPTED TO BRING KNOWLEDGEABLE INDIVIDUALS FROM  
MANY DISCIPLINES TOGETHER TO DISCUSS VARIOUS ASPECTS OF THE PROBLEM. IT  
WAS DESIGNED TO SERVE AS A MECHANISM FOR TRANSMITTING NEW RESEARCH  
FINDINGS TO THOSE INTERESTED IN THIS AREA AND TO DEMONSTRATE THAT  
AGRICULTURE IS AWARE OF ITS POTENTIAL CONTRIBUTIONS TO ENVIRONMENTAL  
POLLUTION AS WELL AS ITS RESPONSIBILITY TO SOCIETY TO FIND METHODS OF  
ALLEVIATING SUCH POLLUTION WHILE INCREASING THE EFFICIENCY OF  
PRODUCTION. THE CONFERENCE PLAYED A USEFUL ROLE IN PROVIDING  
COMMUNICATION ACROSS DISCIPLINES. THIRTY-TWO PAPERS ARE PUBLISHED IN  
THE PROCEEDINGS DEALING WITH ALL AREAS OF AGRICULTURAL POLLUTION. (SEE  
ALSO W71-03543 THRU W71-03554) (WHITE-IOWA STATE)

FIELD 05B, 05D, 05C, 05G

ACCESSION NO. W71-03542



GROUNDWATER QUALITY AND FLUCTUATIONS IN A SHALLOW UNCONFINED AQUIFER UNDER A  
LEVEL FEEDLOT,

DEPARTMENT OF AGRICULTURE, LINCOLN, NEBR.

L. N. MIELKE, J. R. ELLIS, N. P. SWANSON, J. C. LORIMOR, AND

IN: RELATIONSHIP OF AGRICULTURE TO SOIL AND WATER POLLUTION; PROCEEDINGS,  
CORNELL UNIVERSITY CONFERENCE ON AGRICULTURAL WASTE MANAGEMENT, ROCHESTER,  
JANUARY 19-21, 1970, ITHACA, 1970, P 31-40. 2 TAB, 4 FIG, 13 REF.

DESCRIPTORS:

\*FARM WASTES, \*CATTLE, \*GROUNDWATER, \*NITRATE, AQUIFER, DISCHARGE,  
AQUIFER CHARACTERISTICS, EFFLUENT STREAM, GROUNDWATER RECHARGE,  
TRANSMISSIVITY, WATER LEVEL FLUCTUATIONS, AMMONIA, NEBRASKA, SOIL  
CONTAMINATION, OBSERVATION WELLS, WATER TABLE, INFILTRATION.

IDENTIFIERS:

\*FEEDLOT, PLATTE RIVER VALLEY.

ABSTRACT:

THE QUALITY WAS INVESTIGATED OF THE GROUNDWATER IN THE PROXIMITY OF A  
LEVEL FEEDLOT ON A PERMEABLE SOIL WITH FLUCTUATING HIGH WATER TABLE. AT  
THE FEEDLOT SITE, THE AQUIFER CONSISTS OF 30-35 FEET OF HIGH QUALITY  
GRAVEL HAVING A COEFFICIENT OF TRANSMISSIBILITY IN THE RANGE OF  
90,000-120,000 GALLONS PER DAY PER FOOT. AQUIFER RECHARGE OCCURS AS A  
RESULT OF DIRECT PRECIPITATION AND INTERFLOW FROM THE VALLEY UPLANDS.  
SIX OBSERVATION WELLS WERE INSTALLED IN THE VICINITY OF THE FEEDLOT AS  
WELL AS SIX WATER LEVEL MEASURING WELLS. TWO RECORDING WELLS,  
CONSTRUCTED OF 4-INCH DIAMETER ALUMINUM IRRIGATION PIPE, WERE JETTED  
INTO THE GRAVEL AQUIFER. THE WATER TABLE DEPTH AT THE FEEDLOT VARIES  
WITH THE SEASON. GROUNDWATER LEVEL CHANGES REFLECT MAJOR RAINSTORMS  
WITHIN HOURS AFTER THE EVENT. THE MAXIMUM GROUNDWATER ELEVATION UNDER  
THE FEEDLOT WAS APPROXIMATELY 2 FEET BELOW THE SOIL SURFACE. SOIL CORES  
WERE TAKEN TO DETERMINE THE QUANTITY OF NITRATE WHICH COULD MOVE INTO  
THE WATER TABLE. LOW LEVELS OF NITRATE WERE FOUND BELOW THE FIRST FOOT.  
AMMONIA WAS PRESENT IN ONLY MODERATE AMOUNTS BELOW 3 FEET ( 30PPM) AND  
RAPIDLY DECREASED IN CONCENTRATION WITH INCREASED DEPTH TO THE WATER  
TABLE. ANALYSIS OF THE CORE SAMPLES INDICATED THAT DOWNWARD MOVEMENT OF  
NITRATES AND OTHER FORMS OF NITROGEN IN THE SOIL WAS MINOR. THE 12-15  
INCHES OF MANURE PACK DECREASED THE ACTUAL PENETRATION DEPTH OF THE  
NITROGEN INTO THE PROFILE. SOME SAMPLES EXHIBITED LEVELS OF NITRATE  
THAT EXCEEDED PUBLIC HEALTH STANDARDS (10PPM). THIS MAY HAVE BEEN DUE  
TO THE APPLICATION OF ANHYDROUS AMMONIA PRIOR TO THE FIRST IRRIGATION.  
GENERALLY, THE NITRATE ANALYSIS SHOWED RELATIVELY LOW NITRATE LEVEL IN  
THE PROFILE. (SEE ALSO W71-03542) (WHITE-IOWA STATE)

FIELD 05B

ACCESSION NO. W71-03543

MOVEMENT OF AGRICULTURAL POLLUTANTS WITH GROUNDWATER,

GEOLOGICAL SURVEY, RALEIGH, N.C.

HARRY E. LEGRAND.

IN: AGRICULTURAL PRACTICES AND WATER QUALITY, IOWA STATE UNIVERSITY PRESS,  
AMES, 1970, P 303-313. 2 FIG, 18 REF.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*FARM WASTES, \*WATER POLLUTION SOURCES,  
\*GROUNDWATER, \*AGRICULTURAL CHEMICALS, FERTILIZERS, PESTICIDES,  
NUTRIENTS, SOIL WATER, SOILS, SEEPAGE, SOIL CHEMISTRY, ABSORPTION, SOIL  
MECHANICS, WATER QUALITY, SOIL PROPERTIES, WATER WELLS, WATER TABLE,  
ENVIRONMENTAL EFFECTS, WATER CHEMISTRY, INFILTRATION.

IDENTIFIERS:

\*AGRICULTURAL POLLUTANTS.

ABSTRACT:

THE VOLUME OF GROUNDWATER POLLUTED BY PLANT NUTRIENTS, ANIMAL WASTES,  
AND PESTICIDES APPEARS TO BE SMALL. NUMEROUS SMALL POLLUTED ZONES OF  
WATER OCCUR IN THE UPPER PART OF THE ZONE OF SATURATION. SUFFICIENT  
SAFEGUARDS ARE AVAILABLE TO MINIMIZE GROUNDWATER POLLUTION TO THE  
EXTENT THAT GOOD AGRICULTURAL PRACTICES SHOULD NOT BE DETERRED. THE  
UNSATURATED ZONE ABOVE THE WATER TABLE ATTENUATES ALMOST ALL OF THE  
FOREIGN BODIES THAT ARE POTENTIAL POLLUTANTS OF THE UNDERLYING  
GROUNDWATER. CHEMICAL FERTILIZERS, ANIMAL WASTES, AND PESTICIDES VARY  
GREATLY IN THEIR TENDENCY TO DEGRADE IN GROUND ENVIRONMENTS. THE  
FOLLOWING FAVORABLE ENVIRONMENTAL FACTORS TEND TO REDUCE THE CHANGES OF  
POLLUTION OF WATER FROM WELLS AND SPRINGS: (1) A DEEP WATER TABLE,  
WHICH (A) ALLOWS FOR SORPTION OF POLLUTANTS ON EARTH MATERIALS, (B)  
SLOWS SUBSURFACE MOVEMENT OF POLLUTANTS, AND (C) FACILITATES OXIDATION  
OR OTHER BENEFICIAL 'DIE-AWAY' EFFECTS. (2) SUFFICIENT CLAY IN THE PATH  
OF POLLUTANTS SO THAT RETENTION OR SORPTION OF POLLUTANTS IS FAVORABLE.  
(3) A GRADIENT OF THE WATER TABLE BENEATH A WASTE SITE AWAY FROM NEARBY  
WELLS. (4) A GREAT DISTANCE BETWEEN WELLS AND WASTES. (WOODARD-USGS)

FIELD 05B, 04B

ACCESSION NO. W71-04121

PREDICTING CHANGES IN NITROGENOUS COMPOUNDS IN SOIL-WATER SYSTEMS,

ARIZONA UNIV., TUCSON.

MARVIN J. SHAFFER, GORDON R. DUTT, AND WILLIAM J. MOORE.

IN: COLLECTED PAPERS REGARDING NITRATES IN AGRICULTURAL WASTE WATERS, FEDERAL WATER QUALITY ADMINISTRATION WATER POLLUTION CONTROL RESEARCH SERIES 13030ELY 12/69, P 15-28, DECEMBER 1969. 14 P, 7 FIG, 4 TAB, 9 REF. FWQA PROJECT NO 13030ELY; BUR RECLAM. CONTRACT NO 10-06-D-6464.

DESCRIPTORS:

\*SIMULATION ANALYSIS, \*PATH OF POLLUTANTS, \*RETURN FLOW, \*NITRATES, MATHEMATICAL MODELS, COMPUTER PROGRAMS, CALIFORNIA, WATER POLLUTION SOURCES, LEACHING, DRAINAGE WATER, AMMONIA, DRAINAGE EFFECTS, GROUNDWATER, WATER QUALITY, SOIL WATER.

IDENTIFIERS:

\*GROUNDWATER POLLUTION, \*CENTRAL VALLEY(CALIF).

ABSTRACT:

A DIGITAL COMPUTER PROGRAM WAS DEVELOPED TO MODEL SOIL-WATER SYSTEMS WITH RESPECT TO NITROGEN TRANSFORMATIONS, INCLUDING HYDROLYSIS OF UREA, IMMOBILIZATION-MINERALIZATION OF AMMONIA AND ORGANIC NITROGEN, AND IMMOBILIZATION OF NITRATE NITROGEN. COMPARISONS WERE MADE OF PREDICTED AND OBSERVED DATA FOR SEVERAL SOILS HAVING DIFFERENT TEXTURES AND VARIOUS MOISTURE CONTENTS, TEMPERATURES, AND FERTILIZER APPLICATIONS. THIS PROCEDURE YIELDED SIMPLE CORRELATION COEFFICIENTS OF 0.99, 0.97, AND 0.97 FOR THE UREA, ORGANIC, AND AMMONIA NITROGENOUS TYPES. A MODEL PREDICTING THE CONCENTRATIONS OF NITROGENOUS SPECIES OCCURRING IN SOIL-WATER SYSTEMS AIDS IN PLANNING MANAGEMENT CRITERIA FOR POLLUTION CONTROL AND FERTILIZER PROGRAMS. (SEE ALSO W71-04546) (KNAPP-USGS)

FIELD 05G, 05B

ACCESSION NO. W71-04548

NUMERICAL SIMULATION OF DISPERSION IN GROUNDWATER AQUIFERS,

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRICULTURAL ENGINEERING; AND  
COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.

DONALD LEE REDDELL, AND DANIEL K. SUNADA.

COLORADO STATE UNIVERSITY HYDROLOGY PAPER NO 41, JUNE 1970. 79 P, 35 FIG, 1  
TAB, 96 REF, 8 APPEND. OWRR PROJECT A-001-COLO(8).

DESCRIPTORS:

\*SIMULATION ANALYSIS, \*DISPERSION, \*GROUNDWATER MOVEMENT, \*NUMERICAL  
ANALYSIS, MIXING, COMPUTER PROGRAMS, COMPUTER MODELS, MATHEMATICAL  
MODELS, SALINE WATER INTRUSION, AQUIFERS, POROUS MEDIA, DIFFUSION,  
CONVECTION, DIFFUSIVITY.

IDENTIFIERS:

LONGITUDINAL DISPERSION.

ABSTRACT:

A FLOW EQUATION FOR A MIXTURE OF MISCIBLE FLUIDS WAS DERIVED BY  
COMBINING THE LAW OF CONSERVATION OF MASS, DARCY'S LAW, AND AN EQUATION  
OF STATE DESCRIBING THE PRESSURE-VOLUME-TEMPERATURE-CONCENTRATION  
RELATIONSHIP. THE RESULT IS AN EQUATION INVOLVING TWO DEPENDENT  
VARIABLES, PRESSURE AND CONCENTRATION. A RELATIONSHIP FOR DETERMINING  
CONCENTRATION WAS DERIVED BY EXPRESSING A CONTINUITY EQUATION FOR THE  
DISPERSED TRACER. AN IMPLICIT NUMERICAL TECHNIQUE WAS USED TO SOLVE THE  
FLOW EQUATION FOR PRESSURE, AND THE METHOD OF CHARACTERISTICS WITH A  
TENSOR TRANSFORMATION WAS USED TO SOLVE THE CONVECTIVE-DISPERSION  
EQUATION. THE RESULTS FROM THE FLOW EQUATION WERE USED IN SOLVING THE  
CONVECTIVE-DISPERSION EQUATION AND THE RESULTS FROM THE  
CONVECTIVE-DISPERSION EQUATION WERE THEN USED TO RESOLVE THE FLOW  
EQUATION. THE COMPUTER SIMULATOR SUCCESSFULLY SOLVED THE LONGITUDINAL  
DISPERSION PROBLEM AND THE LONGITUDINAL AND LATERAL DISPERSION PROBLEM.  
USING THE TENSOR TRANSFORMATION, PROBLEMS OF LONGITUDINAL AND LATERAL  
DISPERSION WERE SUCCESSFULLY SOLVED IN A ROTATED COORDINATE SYSTEM. THE  
COMPUTER SIMULATOR WAS USED TO SOLVE THE SALT-WATER INTRUSION PROBLEM.  
THE NUMERICAL RESULTS FOR THE FRESH WATER HEAD IN THE AQUIFER CLOSELY  
MATCHED THOSE OBTAINED ANALYTICALLY. (SEE W70-04051) (KNAPP-USGS)

FIELD 06A, 05B, 02F

ACCESSION NO. W71-04559

THE 'FINAL' WATER WELL LAW AND REGULATIONS (STANDARDS FOR WATER WELL  
CONSTRUCTION AND PUMP INSTALLATION),

GROUND WATER RESOURCES INST.

DURWARD HUMES.

WATER WELL JOURNAL, VOL 20, P 3-11, JAN 1966. 1 TAB, 9 REF.

DESCRIPTORS:

\*PUBLIC HEALTH, \*WELL REGULATIONS, \*WATER WELLS, \*LEGISLATION,  
CONSTRUCTION, PUMPS, PUMPING, STANDARDS, REGULATION, WELL PERMITS,  
DRILLING, ADMINISTRATIVE AGENCIES, ADMINISTRATION, GROUNDWATER, WATER  
QUALITY, INSPECTION, INSTALLATION, WELL CASINGS, ARTESIAN WELLS, WELL  
SCREENS, EXCAVATION, WATER POLICY, AQUIFERS, PERCOLATING WATER, LEGAL  
ASPECTS.

ABSTRACT:

REFLECTING THE DESIRE OF THE WELL-MANUFACTURING INDUSTRY TO PROTECT  
PUBLIC HEALTH AND TO UPGRADE CONSTRUCTION STANDARDS IN THE INDUSTRY,  
THE MODEL WATER WELL CONSTRUCTION AND PUMP INSTALLATION ACT PRESCRIBES  
STATE REGULATION OF THE WELL-CONSTRUCTION INDUSTRY. THIS REPORT  
CONTAINS THE PROPOSED LAW, EXPLANATORY COMMENTS ACCOMPANYING IMPORTANT  
SECTIONS, AND PROPOSED MODEL ADMINISTRATIVE REGULATIONS. ALSO INCLUDED  
IS A TABLE OUTLINING STANDARDS FOR THE CONSTRUCTION OF WELLS. THE  
GENERAL SCOPE OF THE ACT IS TO PROHIBIT CONSTRUCTION OF WELLS IN  
VIOLATION OF ITS APPLICABLE RULES AND REGULATIONS. THE STATE DEPARTMENT  
OF HEALTH OR SOME OTHER APPROPRIATE AGENCY WOULD ADMINISTER AND ENFORCE  
THE ACT, AND THE DEPARTMENT WOULD HAVE THE POWERS NECESSARY TO: (1)  
REQUIRE PERMISSION AND NOTIFICATION IN DESIGNATED AREAS BEFORE  
CONSTRUCTION OF WATER WELLS, ABANDONMENT OF WATER WELLS, OR  
INSTALLATION OF PUMPING EQUIPMENT IN ANY WELLS; (2) INSPECT WATER  
WELLS, ABANDONED WATER WELLS OR PUMP INSTALLATIONS; (3) LICENSE WATER  
WELL CONTRACTORS; AND (4) GRANT EXEMPTIONS FROM THE OPERATION OF THE  
ACT. SECTIONS COVER FEES, PROCEDURES FOR ENFORCEMENT, ADMINISTRATIVE  
HEARINGS, JUDICIAL REVIEW AND PENALTIES FOR VIOLATIONS. THE  
ADMINISTRATIVE REGULATIONS DEFINE MORE SPECIFICALLY STANDARDS AND  
PROCEDURES UNDER THE ACT. (DUSS-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-04742



MODEL OF HYDROLOGIC REDISTRIBUTION OF RADIONUCLIDES AROUND NUCLEAR-EXCAVATED  
SEA-LEVEL CANALS,

ISOTOPES, INC., PALO ALTO, CALIF. PALO ALTO LABS.

R. L. CHARNELL, D. E. HOLLY, AND P. R. FENSKE.

IN: ISOTOPE HYDROLOGY, 1970, PROCEEDINGS SYMPOSIUM OF INTERNATIONAL ATOMIC  
ENERGY AGENCY AND UNESCO, VIENNA, MARCH 9-13, 1970; VIENNA, INTERNATIONAL  
ATOMIC ENERGY AGENCY STI/PUB/255, PAPER NO SM-129/51, P 801-814, 1970. 14  
P, 5 FIG, 14 REF. USAEC CONTRACT AT(26-1)-171.

DESCRIPTORS:

\*RADIOECOLOGY, \*FALLOUT, \*LEACHING, \*PATH OF POLLUTANTS, \*NUCLEAR  
ENGINEERING, NUCLEAR EXPLOSIONS, CANALS, CANAL CONSTRUCTION,  
GROUNDWATER MOVEMENT, INFILTRATION, NAVIGATION, SEEPAGE.

IDENTIFIERS:

\*VENEZUELA, \*NUCLEAR CANAL EXCAVATION.

ABSTRACT:

AS PART OF THE BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY  
STUDIES FOR NUCLEAR EXCAVATION OF A SEA-LEVEL CANAL IN CENTRAL AMERICA,  
A MODEL WAS DEVELOPED TO ESTIMATE THE RATE AT WHICH EXCAVATION-PRODUCED  
RADIONUCLIDES ARE REDISTRIBUTED BY NATURAL HYDROLOGIC PROCESSES. THE  
MODEL CAN BE USED TO ESTIMATE THE AMOUNT OF A SPECIFIC RADIONUCLIDE  
AVAILABLE FOR INTERACTION WITH PLANT, ANIMAL, OR MAN. THE MODEL WAS  
FORMULATED FOR TWO DISTINCT REGIONS: IN THE CANAL CHANNEL ITSELF AND  
THE REGION AWAY FROM THE CANAL WHERE DUST AND FINE PARTICLES ARE  
DEPOSITED AS WIND-DISTRIBUTED FALLOUT. FOR THE FALLOUT ZONE PORTION OF  
THE MODEL, REDISTRIBUTION IS CONTROLLED BY THE INITIAL REMOVAL BY  
RAINWATER LEACHING. THE AMOUNT OF RADIONUCLIDE WHICH IS REMOVED WITH  
RAINFALL IS REPRESENTED BY THE SIMPLE DISTRIBUTION COEFFICIENT  $K_D$ .  
ONCE THE NUCLIDE IS DISSOLVED, ITS RATE OF ENTRY INTO THE GROUNDWATER  
RESERVOIR AND INTO THE STREAM CAN BE DETERMINED FROM SOIL DENSITY AND  
POROSITY, LONG-TERM INFILTRATION RATES, AND SOME PRE-EXCAVATION  
HYDROLOGIC DATA. THIS MODEL WAS APPLIED TO TWO OF THE PROPOSED CANAL  
SITES IN PANAMA AND COLOMBIA. FOR RADIONUCLIDES WITH DISTRIBUTION  
COEFFICIENTS HIGHER THAN 100, CONCENTRATION OF THE RADIONUCLIDE IN  
RIVER WATER CONTINUES AT A NEAR CONSTANT LEVEL DECREASED ONLY BY  
RADIOACTIVE DECAY. REMOVAL FROM THE LAND SURFACE BY LEACHING IS NOT  
SIGNIFICANT DURING THE FIRST YEAR FOLLOWING EXCAVATION. ON THE OTHER  
HAND, FOR NUCLIDES WITH DISTRIBUTION COEFFICIENTS LESS THAN 100,  
LEACHING REMOVAL FROM THE LAND SURFACE IS SIGNIFICANT IN ONE YEAR AND  
THE CONCENTRATION IN STREAMS DROPS RAPIDLY. (KNAPP-USGS)

FIELD 05B, 07B, 08H

ACCESSION NO. W71-04882

HYDROLOGIC IMPLICATIONS OF SOLID-WASTE DISPOSAL,

GEOLOGICAL SURVEY, WASHINGTON, D.C.

WILLIAM J. SCHNEIDER.

FREE ON APPLICATION TO THE US GEOLOGICAL SURVEY, WASH, DC 20242. GEOLOGICAL SURVEY CIRCULAR 601-F, 1970. 10 P, 2 FIG, 2 TAB, 7 REF.

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*URBANIZATION, \*SOLID WASTES, \*WASTE DISPOSAL, SURFACE WASTERS, GROUNDWATER, GARBAGE DUMPS, LANDFILLS, WASTE DUMPS, WATER POLLUTION, PRECIPITATION(ATMOSPHERIC), SEEPAGE, INFILTRATION, GROUNDWATER MOVEMENT, HYDRAULICS, SURFACE RUNOFF, STREAMS, SOIL TYPES, PERMEABILITY, FLOODS, EVALUATION, PLANNING.

IDENTIFIERS:

\*URBAN HYDROLOGY.

ABSTRACT:

THE DISPOSAL OF MORE THAN 1,400 MILLION POUNDS OF SOLID WASTES IN THE UNITED STATES EACH DAY IS A MAJOR PROBLEM. FOUR DISPOSAL METHODS-OPEN DUMPS, SANITARY LANDFILL, INCINERATION, AND ONSITE DISPOSAL-CARRY AN INHERENT POTENTIAL FOR POLLUTION OF WATER RESOURCES. SEEPAGE OF RAINWATER THROUGH THE WASTES LEACHES UNDESIRABLE CONSTITUENTS WHICH REACH THE GROUNDWATER IN THE AREA. THIS LEACHATE IS GENERALLY BOTH BIOLOGICALLY AND CHEMICALLY CONTAMINATED. POLLUTION POTENTIAL IS HIGHEST IN PERMEABLE AREAS WITH A SHALLOW WATER TABLE WHERE THE WASTES ARE IN DIRECT CONTACT WITH THE GROUNDWATER. SITE SELECTION FOR DISPOSAL OF SOLID WASTES MUST BE BASED ON ADEQUATE WATER-RESOURCES INFORMATION IF POLLUTIONAL POTENTIAL IS TO BE MINIMIZED. THIS WILL REQUIRE REGIONAL AS WELL AS LOCALIZED DATA ON THE WATER RESOURCES OF THE AREA. ONLY THROUGH SUCH AN APPROACH CAN ADEQUATE PROTECTION BE AFFORDED TO THE ENVIRONMENT IN GENERAL AND THE WATER RESOURCES IN PARTICULAR.  
(WOODARD-USGS)

FIELD 05B, 05E, 04B

ACCESSION NO. W71-05094

DEGRADATION OF WATER QUALITY IN IRRIGATION RETURN FLOWS,

ROBERT S. KERR WATER RESEARCH CENTER, ADA, OKLA.; AND OKLAHOMA STATE UNIV.,  
STILLWATER. DEPT. OF AGRONOMY.

JAMES P. LAW, JR., J. M. DAVIDSON, AND LESTER W. REED.

OKLAHOMA AGRICULTURAL EXPERIMENT STATION, BULLETIN B-684, OCTOBER 1970. 26 P,  
9 TAB, 7 FIG, 27 REF.

DESCRIPTORS:

\*IRRIGATION WATER, \*RETURN FLOW, \*DRAINAGE WATER, \*DETERIORATION,  
\*WATER POLLUTION EFFECTS, WATER QUALITY, SALINITY, GROUNDWATER,  
DISSOLVED SOLIDS, LEACHING, SALT BALANCE, PERCOLATING WATER, POLLUTION  
IDENTIFICATION, SOIL WATER, SALINE WATER, WATER CONSERVATION,  
IRRIGATION PRACTICES.

IDENTIFIERS:

\*SALT WATER IRRIGATION, SALT TRANSPORT.

ABSTRACT:

THE OBJECT WAS TO DETERMINE WATER-QUALITY DEGRADATION IN IRRIGATION  
RETURN FLOWS, TO DETERMINE SALINITY STATUS OF A SALT-WATER-IRRIGATED  
CLAY LOAM SOIL, AND TO RELATE THESE RESULTS TO IRRIGATION RETURNS ON  
SURFACE AND GROUNDWATER QUALITY. TOTAL DISSOLVED SOLIDS (TDS) INCREASED  
20% IN THE SURFACE RETURN FLOW, WHILE PERCOLATING SOIL WATER INCREASED  
5 TO 8 FOLD IN TDS. THE CLAY LOAM SOIL SHOWED AN INCREASE IN SOLUBLE  
SALT AFTER 15 YEARS OF HIGH-SALT-WATER IRRIGATION (TDS OF 1,430 PPM),  
THOUGH LEACHING BY RAIN CONTRIBUTED A FAVORABLE SALT BALANCE.  
PERCOLATING IRRIGATION WATER TRANSPORTS ABOUT 10 TONS OF SALT PER  
ACRE-FOOT. DRAINING AND PERCOLATING WATERS ADVERSELY AFFECT SURFACE AND  
GROUNDWATER. FUTURE STUDIES WILL CONSIDER SEASONAL FLUCTUATIONS AND  
DYNAMICS OF SOIL WATER QUALITY AND QUANTITY. TABLES SHOW WATER-TABLE  
DEPTHS, WATER-SAMPLING LOCATIONS, SCHEDULE OF OPERATIONS, QUALITY DATA  
OF IRRIGATION, DRAINAGE AND GROUNDWATER, AND ESTIMATED NUTRIENT LOSSES.  
FIGURES SHOW SALT CONTENT AT TIME AND DEPTH OF WATER. (POPKIN - ARIZONA)

FIELD 03F, 05C, 02G

ACCESSION NO. W71-06063



SOURCES OF NITROGEN IN WATER SUPPLIES,

GEOLOGICAL SURVEY, DENVER, COLO.

MARVIN C. GOLDBERG.

AGRICULTURAL PRACTICES AND WATER QUALITY, IOWA STATE UNIVERSITY PRESS, AMES,  
IOWA, 1970, CHAPTER 7, P 94-124. 4 FIG, 8 TAB, 72 REF.

DESCRIPTORS:

\*NITROGEN, \*NITRATES, GROUNDWATER, AMMONIA, PRECIPITATION, SEDIMENTS,  
DENITRIFICATION, RUNOFF, UREAS, FERTILIZERS, DRAINAGE WATER,  
IRRIGATION, RETURN FLOW, WATER SUPPLY, LIVESTOCK, SEWAGE, INFILTRATION,  
INDUSTRIAL WASTES, ALGAE, PONDS, FARM WASTES.

IDENTIFIERS:

\*SURFACE WATERS, GEOLOGICAL SOURCES, MINERALIZATION, NITROGEN SOURCES,  
WELL WATER, FEEDLOTS.

ABSTRACT:

WATER SUPPLIES CAN BE CATEGORIZED AS SURFACE WATERS OR GROUNDWATERS.  
THIS PAPER EXAMINES REPRESENTATIVE STUDIES OF NITRATE ENTRANCE TO BOTH  
TYPES OF WATER SUPPLIES, WITH SUMMARIES OF SOME OF THE MANY LABORATORY  
AND FIELD STUDIES DESCRIBED IN THE CURRENT LITERATURE. SOME OF THE  
SOURCES OF NITROGEN ENTRANCE TO WATER SUPPLIES INCLUDE ATMOSPHERIC,  
GEOLOGIC, RURAL AND URBAN RUNOFF, SEWAGE, IRRIGATION, ANIMAL WASTES,  
AND INDUSTRIAL WASTES AMONG MANY OTHERS. SOURCES OF MAJOR IMPORTANCE TO  
BOTH SURFACE AND GROUNDWATER SUPPLIES ARE POINTED OUT AND FIELD OR  
LABORATORY STUDIES ARE REPORTED. (SEE ALSO W71-05437) (WHITE-IOWA STATE)

FIELD 05B

ACCESSION NO. W71-06435

EFFECTS OF AGRICULTURAL POLLUTION ON EUTROPHICATION,

WISCONSIN UNIV., MADISON. DEPT. OF SANITARY ENGINEERING, AND WISCONSIN UNIV.,  
MADISON. DEPT. OF WATER CHEMISTRY.

D. E. ARMSTRONG, AND G. A. ROHLICH.

AGRICULTURAL PRACTICES AND WATER QUALITY, IOWA STATE UNIVERSITY PRESS, AMES,  
IOWA, 1970, CHAPTER 23, P 314-330. 14 TAB, 2 FIG, 26 REF.

DESCRIPTORS:

\*EUTROPHICATION, \*NITROGEN, \*PHOSPHORUS, NUTRIENTS, ALGAE, NITRATES,  
SURFACE RUNOFF, BASE FLOW, PERCOLATION, LEACHING, DRAINAGE, FARM  
WASTES, SOIL MANAGEMENT, GROUNDWATER, WISCONSIN, WATER SUPPLY.

IDENTIFIERS:

\*AGRICULTURAL DRAINAGE, LAKE METABOLISM, MOBILITY, PARTICULATE FORM,  
FEEDLOTS, NUTRIENT SOURCES.

ABSTRACT:

THE PAPER DISCUSSES NITROGEN AND PHOSPHORUS TRANSPORT IN AGRICULTURAL DRAINAGE SINCE THESE ARE THE MOST IMPORTANT NUTRIENTS INVOLVED IN EUTROPHICATION. IT IS GENERALLY EXPECTED THAT INORGANIC NITROGEN IS TRANSPORTED MAINLY AS NITRATE BY PERCOLATING WATER, ALTHOUGH THE AMOUNTS OF AMMONIUM AND NITRATE CARRIED IN RUNOFF WATERS MAY BE HIGHLY SIGNIFICANT IN TERMS OF THE RECEIVING WATER. SIMILARLY, THE LARGEST AMOUNT OF PHOSPHORUS IS LIKELY TRANSPORTED IN PARTICULATE FORM IN RUNOFF WATERS, BUT THE AMOUNT OF DISSOLVED PHOSPHORUS IN RUNOFF WATER MAY BE OF EQUAL OR GREATER IMPORTANCE EVEN THOUGH LOWER IN QUANTITY. THE CONTRIBUTION OF AGRICULTURAL DRAINAGE TO THE NITROGEN AND PHOSPHORUS STATUS OF WATERS IS NEXT EXAMINED. THE DATA PRESENTED SUGGEST THAT AGRICULTURAL LAND IS AN IMPORTANT CONTRIBUTOR OF NITROGEN AND PHOSPHORUS TO WATER. ABOUT 60% OF THE NITROGEN AND 42% OF THE PHOSPHORUS WERE ESTIMATED TO COME FROM AGRICULTURAL LAND. NUTRIENT BUDGET ESTIMATIONS WERE BASED ON DATA OBTAINED ON A SMALL SCALE AND EXTRAPOLATED AND THUS HAVE A LOW RELIABILITY. NUTRIENT SOURCES ARE NUMEROUS AND GENERALIZATIONS AS TO WHICH SOURCE IS THE MOST IMPORTANT CANNOT BE MADE. THE CONTRIBUTION OF AGRICULTURE SHOULD BE REDUCED BY IMPROVED AND MORE EFFICIENT AGRICULTURAL MANAGEMENT PRACTICES. (SEE ALSO W71-05437) (WHITE-IOWA STATE)

FIELD 05C, 02H

ACCESSION NO. W71-06443

MOVEMENT OF 2,4-D IN SOILS,

NEW MEXICO AGRICULTURAL EXPERIMENT STATION, UNIVERSITY PARK.

H. E. DREGNE, S. GOMEZ, AND W. HARRIS.

NEW MEXICO AGRICULTURAL EXPERIMENT STATION WESTERN REGIONAL RESEARCH PROJECT  
PROGRESS REPORT, NOVEMBER 1969. 35 P, 21 FIG, 8 TAB, 41 REF.

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*HERBICIDES, \*NEW MEXICO, \*SOIL WATER  
MOVEMENT, GROUNDWATER, SURFACE WATERS, TESTING, TEST PROCEDURES,  
METHODOLOGY, WATER QUALITY, SOILS, PESTICIDES, CHROMATOGRAPHY,  
ADSORPTION, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, BIOASSAY, SOIL  
STRUCTURE, INFILTRATION, SOIL PROPERTIES, LEACHING, PATH OF POLLUTANTS.

ABSTRACT:

MOVEMENT OF 2,4-DICHLOROPHENOXYACETIC ACID (2,4-D) IN THREE SOILS WAS  
STUDIED TO DETERMINE THE EXTENT TO WHICH HERBICIDES APPLIED IN THE  
FIELD ENTER THE SURFACE AND GROUNDWATER SYSTEMS. ANALYTICAL TECHNIQUES  
USED INCLUDED GAS CHROMATOGRAPHY, THIN LAYER CHROMATOGRAPHY, SOIL THIN  
LAYER CHROMATOGRAPHY, RESIN THIN LAYER CHROMATOGRAPHY, BIOASSAYS, AND  
AUTORADIOGRAPHY. PRIMARY EMPHASIS WAS PLACED UPON THE EFFECT OF  
EXCHANGEABLE CATIONS ON 2,4-D MOVEMENT. ADSORPTION ISOTHERMS,  
BREAKTHROUGH CURVES, LEACHING STUDIES, AND BIOASSAYS INDICATE THAT  
2,4-D IN THE ACID OR SALT FORM, IS ONLY SLIGHTLY ADSORBED BY SOIL  
PARTICLES. IT IS EASILY LEACHED IF THE SOILS ARE PERMEABLE. VIRTUALLY  
100% OF APPLIED 2,4-D WAS RECOVERED FROM A SANDY LOAM IN SIX AND  
ONE-HALF HOURS OF LEACHING. ONLY 38% WAS RECOVERED FROM A SLOWLY  
PERMEABLE SILTY CLAY LOAM OVER A PERIOD OF TEN MONTHS. DEGRADATION  
PRODUCTS OF 2,4-D WERE LEACHED AS EASILY AS 2,4-D ITSELF.  
(WOODARD-USGS)

FIELD 05B, 02G

ACCESSION NO. W71-06514

DIGESTED SLUDGE LAGOONS,

DAYTON, OHIO.

DEFRO TOSSEY.

2ND INTERNATIONAL SYMPOSIUM FOR WASTE TREATMENT LAGOONS, JUNE 23-25, 1970,  
KANSAS CITY, MISSOURI, P 333-334.

DESCRIPTORS:

\*OXIDATION LAGOONS, \*TERTIARY TREATMENT, \*SLUDGE DIGESTION, ANAEROBIC  
DIGESTION, ODORS, GROUNDWATER, EVAPORATION, INFILTRATION, CLIMATIC  
CONDITIONS, INCINERATION, AIR POLLUTION, TEMPERATURE, WASTE WATER  
TREATMENT, OHIO.

IDENTIFIERS:

\*SUPERNATANT RE-CYCLE.

ABSTRACT:

DISPOSAL OF DIGESTED SLUDGES IN SLUDGE LAGOONS HAS BEEN ACCEPTED  
PRACTICE FOR THE CITY OF DAYTON FOR 35 YEARS. THE CURRENT LAND DISPOSAL  
FACILITIES OCCUPY 15 ACRES AND INCLUDE BOTH THE LAGOONS AND  
INFILTRATION BEDS WHERE THE SUPERNATANT IS USED TO IRRIGATE THE LAND.  
SUCCESS OF SLUDGE LAGOONING HAS BEEN FOUND TO BE DEPENDENT UPON THE  
QUALITY OF SLUDGE ENTERING THE LAGOON. INADEQUATE PRIMARY AND SECONDARY  
DIGESTION PRODUCES TROUBLESOME CONDITIONS IN A SLUDGE LAGOON SYSTEM.  
SOLIDS DESTRUCTION CONTINUES WITHIN THE BOTTOM SLUDGES, WHICH ARE  
ESTIMATED TO BE 20 TO 25% SOLIDS, HELPING TO ALLEVIATE PROBLEMS  
ASSOCIATED WITH POORLY DIGESTED SLUDGES. THE SOIL THROUGH WHICH THE  
SUPERNATANT INFILTRATES HAS SHOWN NO SIGNS OF BLINDING AND HAS BECOME  
QUITE ENRICHED THROUGH DEPOSITION OF ORGANIC MATTER. NO DOCUMENTED  
EVIDENCE OF GROUNDWATER DETERIORATION HAS BEEN FOUND BUT A SYSTEM OF  
TESTING IS CURRENTLY BEING ORGANIZED TO DETERMINE WHETHER ANY  
DETERIORATION IS TAKING PLACE. LAGOONING HAS BEEN ECONOMICAL, AND LAND  
DISPOSAL HAS AVOIDED BOTH SUPERNATANT RECYCLE AND SLUDGE INCINERATION  
WITH ITS ASSOCIATED AIR POLLUTIONAL PROBLEMS. BOTH PRACTICES WILL  
THEREFORE CONTINUE TO BE USED BY THE CITY OF DAYTON. (SEE ALSO  
W71-07079) (LOWRY-TEXAS)

FIELD 05D

ACCESSION NO. W71-07118

GROUNDWATER POLLUTION FROM SANITARY LANDFILLS AND REFUSE DUMP GROUNDS, A  
CRITICAL REVIEW,

MARQUETTE UNIV., MILWAUKEE, WIS. DEPT. OF CIVIL ENGINEERING.

A. E. ZANONI.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES, RESEARCH REPORT 69, 1971. 43 P, 8  
TAB, 62 REF.

DESCRIPTORS:

\*LANDFILLS, \*WATER POLLUTION, \*WASTE DUMPS, \*SOLID WASTES, \*LEACHING,  
\*GROUNDWATER, HYDROGEOLOGY, WATER POLLUTION SOURCES, GROUNDWATER  
MOVEMENT, PERCOLATION, WATER MANAGEMENT, IMPAIRED WATER QUALITY, WASTE  
DISPOSAL, GARBAGE DUMPS.

IDENTIFIERS:

\*GROUNDWATER POLLUTION, LANDFILL POLLUTION EFFECTS.

ABSTRACT:

A CRITICAL REVIEW IS PRESENTED OF THE IMPORTANT LITERATURE COVERING THE  
AREA OF THE GROUNDWATER POLLUTION POTENTIAL FROM SANITARY LANDFILLS AND  
DUMP GROUNDS. THIS IS FOLLOWED BY A REVIEW OF THE PRACTICES IN  
TWENTY-ONE STATES IN THE U.S. RELATED TO THIS SAME TOPIC. BASED ON THE  
INFORMATION DERIVED FROM THESE TWO SOURCES, A SERIES OF RECOMMENDATIONS  
ARE SUGGESTED TO REGULATORY AGENCIES CONCERNED WITH THE TASK OF  
APPROVING AND LICENSING SOLID WASTE DISPOSAL SITES. IT IS EMPHASIZED  
THAT A REGULATORY AGENCY SHOULD HAVE AVAILABLE A GEOLOGIST, IDEALLY ONE  
TRAINED IN HYDROGEOLOGY, TO ASSIST IN SANITARY LANDFILL SITE SELECTION  
PROCESSES. HE SHOULD ACCUMULATE GEOLOGICAL DATA AND BROADLY OUTLINE  
AREAS CONSIDERED AS EITHER GOOD OR POOR POTENTIAL LANDFILL SITES.  
EXTREME CAUTION SHOULD BE EXERCISED BEFORE APPROVING GROUND DISPOSAL OF  
INDUSTRIAL WASTES. MONITORING WELLS SHOULD BE USED IN CASES WHERE DOUBT  
EXISTS AS TO THE FUTURE EFFECTS OF A PARTICULAR LANDFILL ON GROUNDWATER  
SUPPLIES. THE REGULATORY AGENCY SHOULD FOLLOW A POLICY OF SLOWING DOWN  
THE REFUSE DEGRADATION PROCESS BY MINIMIZING WATER PERCOLATION THROUGH  
REFUSE MASSES TO PROVIDE FOR LEACHATE ATTENUATION. THE REGULATORY  
AGENCY SHOULD ENCOURAGE REGIONAL OR DISTRICT APPROACHES TO SOLID WASTES  
COLLECTION AND DISPOSAL. AS A RULE, IT SHOULD PROHIBIT THE USE OF  
ABANDONED ROCK, GRAVEL OR SAND QUARRIES AS SITES FOR REFUSE DISPOSAL.  
REGULATORY AGENCIES SHOULD SUPPORT RESEARCH IN THE AREA OF GROUND WATER  
POLLUTION. (POERTNER)

FIELD 05E, 02F, 10

ACCESSION NO. W71-07194

LEACHING OF NUTRIENTS BY DRAINAGE WATERS,

LITOVSKAYA SELSKOKHOZYAISTVENNAYA AKADEMIYA SSR, KAUNAS.

Z. B. KINDERIS.

TRANS. FROM POCHVOVEDENIYE, NO 2, 1970. SOVIET SOIL SCIENCE, NO 1, P 99-108, 1970. 1 FIG, 4 TAB, 19 REF.

DESCRIPTORS:

\*NUTRIENTS, \*SOILS, \*LEACHING, \*AQUIFER CHARACTERISTICS, SOIL ANALYSIS, TEST PROCEDURES, CHEMICAL PROPERTIES, GROUNDWATER, SOIL WATER, SOLUBILITY, SOIL WATER TRANSMISSIVITY.

IDENTIFIERS:

LITHUANIA(USSR).

ABSTRACT:

SAMPLES OF WATER WERE PERIODICALLY COLLECTED FROM TILE DRAINAGE SYSTEM ESTABLISHED IN A WEAKLY PODZOLIZED DIORN-GLEY SOIL. ANALYSES INCLUDED DETERMINATION OF POTASSIUM, SODIUM, CALCIUM, MAGNESIUM, AND CARBONATE, NITRATE, SULFATE, AND CHLORIDE RADICALS. THE REMOVAL OF CHEMICAL CONSTITUENTS VARIED DEPENDING UPON THE SEASON AND METEOROLOGICAL CONDITIONS, RATE OF WATER DISCHARGE, NATURE OF CROPS, AND FERTILIZER TREATMENTS. (WILDE-WISCONSIN)

FIELD 05B, 02F

ACCESSION NO. W71-07887

THE EFFECTS OF RETURN IRRIGATION WATER ON THE BASAL LENS IN KAHUKU PLANTATION,  
OAHU AND PIONEER MILL AND HAWAIIAN COMMERCIAL AND SUGAR COMPANY PLANTATIONS  
ON MAUI,

HAWAII UNIV., HONOLULU.

PEDRO A. TENORIO.

M. S. THESIS, HAWAII UNIVERSITY, AUG 1970. 176 P, 66 FIG, 7 TAB, 54 REF,  
APPEND. PROJECT B-012-HI (2).

DESCRIPTORS:

\*WATER POLLUTION SOURCES, \*WATER POLLUTION EFFECTS, \*RETURN FLOW,  
\*SALINE WATER INTRUSION, \*HAWAII, IRRIGATION WATER, WATER CHEMISTRY,  
SOLUTES, NITRATES, SALINITY, WITHDRAWAL, GROUNDWATER, GROUNDWATER  
MOVEMENT, LEACHING, INFILTRATION, WATER QUALITY.

IDENTIFIERS:

OAHU(HAWAII), MAUI(HAWAII).

ABSTRACT:

THE EFFECTS OF IRRIGATION RETURN WATER ON THE QUALITY OF THE BASAL  
GROUNDWATER BODIES WERE IDENTIFIED AND DESCRIBED IN 3 AREAS ON THE  
ISLANDS OF OAHU AND MAUI. PRESENTLY, ALL THREE AREAS ARE PLANTED WITH  
SUGARCANE. LEACHING OF FERTILIZER COMPONENTS, PRINCIPALLY NITRATE AND  
SULFATE, INTO THE BASAL AQUIFER OCCURS AS A RESULT OF IRRIGATION WATER  
APPLICATION OVER THE FIELDS. EXCESSIVE WITHDRAWALS OF THE BASAL WATER  
IN SIMPLE GHYBEN-HERZBERG LENS ACCELERATES SALINE WATER INTRUSION. ALL  
OF THE IRRIGATION WATER SOURCES FROM THE THREE AREAS ARE SUITABLE FOR  
THE IRRIGATION OF SUGARCANE CROP. (KNAPP-USGS)

FIELD 05C, 05B

ACCESSION NO. W71-08044



PALMER CORPORATION V COLLINS (CONTAMINATION OF OIL BY WATER SEEPAGE FROM  
NEGLIGENTLY ABANDONED OIL WELL).

214 KY 838, 284 SW 95-98 (1926).

DESCRIPTORS:

\*KENTUCKY, \*OIL WELLS, \*GROUNDWATER, \*SEEPAGE, DRILL HOLES, OILY WATER,  
GROUNDWATER MOVEMENT, OIL-WATER INTERFACES, IMPERVIOUS SOILS,  
GROUNDWATER BARRIERS, INFILTRATION, OIL, OIL RESERVOIRS, DRILLING  
EQUIPMENT, LEASES, DAMAGES, LAND TENURE, JUDICIAL DECISIONS,  
LEGISLATION, LEGAL ASPECTS.

ABSTRACT:

PLAINTIFF LEASEHOLDER SUED DEFENDANT CORPORATION FOR DAMAGES CAUSED BY  
DEFENDANT'S FAILURE TO ADEQUATELY PLUG UP ABANDONED OIL WELLS.  
PLAINTIFF CONTENDED THAT THE ABANDONED WELLS ALLOWED WATER TO SEEP INTO  
THE OIL-BEARING STRATUM, THUS CONTAMINATING PLAINTIFF'S OIL WITH WATER.  
DEFENDANT CONTENDED THAT PLAINTIFF HAD NOT SUFFICIENTLY PROVEN THAT THE  
WATER CAME FROM DEFENDANT'S ABANDONED WELLS. DEFENDANT ALSO CONTENDED  
THAT A STATUTE AUTHORIZING PLAINTIFF TO GO ON DEFENDANT'S LAND AND PLUG  
UP THE WELLS AND THEN MAINTAIN AN ACTION AGAINST DEFENDANT TO RECOVER  
THE COST PRECLUDED THE PLAINTIFF FROM ADDITIONALLY SEEKING DAMAGES TO  
HIS OIL. THE COURT OF APPEALS OF KENTUCKY, IN AFFIRMING THE LOWER COURT  
JUDGMENT FOR PLAINTIFF, NOTED THAT WATER HAD NOT APPEARED IN  
PLAINTIFF'S OIL UNTIL DEFENDANT'S WELLS WERE ABANDONED AND SUBSEQUENTLY  
FOUND TO CONTAIN WATER. THE STATUTE AUTHORIZING PLAINTIFF TO PREVENT  
FUTURE DAMAGES DID NOT PRECLUDE HIS RIGHT TO RECOVER FOR THE PAST  
INJURY INCURRED BY THE WATER. TO DESTROY THE PRODUCTION OF OIL IS TO  
DESTROY PROPERTY, ALLOWING THE OWNER TO RECOVER DAMAGES THEREBY  
SUSTAINED. (SMILJANICH-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-08055



A STUDY ON CHANGES IN QUALITY OF UNDERGROUND WATER,

TABELA HOUSE, KOTA (INDIA). AGRICULTURAL CHEMISTRY SECTION.

B. L. DARRA, HARVINDER SINGH, AND R. S. MENDIRATTA.

JOURNAL OF SOIL AND WATER CONSERVATION IN INDIA, VOL 18, NOS 1 AND 2, P 1-3,  
JAN-JUNE 1970. 3 P, 3 TAB, 6 REF.

DESCRIPTORS:

\*WATER QUALITY, \*RETURN FLOW, \*GROUNDWATER, \*SATURATED SOILS,  
\*IRRIGATION EFFECTS, LEACHING, WATER LEVEL FLUCTUATIONS, SALINE SOILS,  
LAND RECLAMATION, PATH OF POLLUTANTS.

IDENTIFIERS:

\*INDIA.

ABSTRACT:

UNDERGROUND WELL WATERS WERE COLLECTED IN PRE AND POST SEASONS TO  
ASSESS THE CHANGES BROUGHT ABOUT IN QUALITY OF WATERS IN THE TWO  
IRRIGATION SEASONS UNDER SALINE AND SALINE-ALKALI WATER LOGGED AREAS OF  
BUNDI DISTRICT OF CHAMBAL COMMAND, INDIA. THE QUALITY OF WATER SLIGHTLY  
IMPROVED AFTER RAINS, WHILE IN ANOTHER PART IT WAS SLIGHTLY IMPAIRED.  
THE CANAL WATER IS OF GOOD QUALITY. EFFORTS ARE IN PROGRESS TO DECREASE  
THE SALT CONTENTS OF THE SURFACE BY LEACHING AND FLUSHING AIDED BY  
LOWERING THE WATER TABLE USING SURFACE DRAINAGE FACILITIES.  
SIMULTANEOUSLY OTHER SOIL RECLAMATION MEASURES HAVE ALSO BEEN  
UNDERTAKEN TO BOOST CROP PRODUCTION. (KNAPP-USGS)

FIELD 05B, 03C, 04B

ACCESSION NO. W71-08073

NITRATE AND OTHER WATER POLLUTANTS UNDER FIELDS AND FEEDLOTS,

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO. SOIL AND WATER  
CONSERVATION RESEARCH DIV.

B. A. STEWART, F. G. VIETS, JR., G. L. HUTCHINSON, AND W. D. KEMPER.

ENVIRONMENTAL SCIENCE AND TECHNOLOGY, VOL 1, NO 9, P 736-739, 1967. 2 FIG, 1  
TAB, 1 REF.

DESCRIPTORS:

\*NITRATES, \*WATER POLLUTION SOURCES, LEACHING, FARM WASTES,  
GROUNDWATER, HYDRAULIC CONDUCTIVITY.

IDENTIFIERS:

ORGANIC CARBON, FEEDLOTS.

ABSTRACT:

AGRICULTURE'S EFFECT ON NITRATE POLLUTION OF GROUNDWATER WAS  
INVESTIGATED IN THE SOUTH PLATTE VALLEY OF COLORADO. THE VALLEY IS  
INTENSIVELY FARMED AND CONTAINS MANY CONCENTRATED LIVESTOCK FEEDING  
OPERATIONS. A WATER TABLE, GENERALLY BETWEEN 3 AND 20 METERS BELOW THE  
SURFACE, UNDERLIES MUCH OF THE AREA. THE AVERAGE TOTAL NITRATE-NITROGEN  
TO A DEPTH OF 6.7 METERS IN THE PROFILES FOR THE VARIOUS KINDS OF LAND  
USE WAS: ALFALFA (MEDICAGO SATIVA) (13 CORES), 70; NATIVE GRASSLAND (17  
CORES), 81; CULTIVATED DRYLAND (21 CORES), 233; IRRIGATED FIELDS NOT IN  
ALFALFA (28 CORES), 452; AND FEEDLOTS (47 CORES), 1282 KG. PER HECTARE.  
GROUNDWATER SAMPLES OFTEN CONTAINED HIGH CONCENTRATIONS OF NITRATE, AND  
THOSE OBTAINED BENEATH FEEDLOTS CONTAINED AMMONIUM-NITROGEN AND ORGANIC  
CARBON. DATA PRESENTED SHOW THAT NITRATE IS MOVING THROUGH THE SOIL AND  
INTO THE GROUNDWATER SUPPLY UNDER BOTH FEEDLOTS AND IRRIGATED FIELDS IN  
CROPS, EXCLUDING ALFALFA. (PARKER-IOWA STATE)

FIELD 05B

ACCESSION NO. W71-08218

CASE STUDIES OF MUNICIPAL WASTE DISPOSAL SYSTEMS,

BUREAU OF MINES, PITTSBURGH, PA. EASTERN FIELD OPERATION CENTER.

H. W. SHEFFER, E. C. BAKER, AND G. C. EVANS.

BUREAU OF MINES INFORMATION CIRCULAR 8498, 1971. 36 P, 14 FIG, 19 REF.

DESCRIPTORS:

\*WASTE DISPOSAL, \*MUNICIPAL WASTES, \*WASTE TREATMENT, \*UNITED STATES, \*REVIEWS, METHODOLOGY, SANITARY ENGINEERING, LANDFILLS, HYDROLOGY, WATER POLLUTION, PATH OF POLLUTANTS, MINE WASTES, GEOLOGY, GROUNDWATER, WATER QUALITY, COMPACTION, COMPRESSIBILITY, SOLID WASTES, INCINERATION, PERCOLATION, SEEPAGE.

IDENTIFIERS:

\*LANDFILL HYDROLOGY.

ABSTRACT:

TECHNICAL AND ECONOMIC ASPECTS OF COMMUNITY REFUSE DISPOSAL SYSTEMS AND THEIR EFFECTS ON THE ENVIRONMENT ARE IDENTIFIED AND DESCRIBED. SEVEN LANDFILLS AND TWO INCINERATION SYSTEMS, LOCATED THROUGHOUT THE UNITED STATES, ARE REVIEWED. FOR EXAMPLE, A SOLID WASTES LANDFILL STABILIZATION PROJECT CONDUCTED FOR THE CITY OF SANTA CLARA, CALIF., PROVED THAT AERATION OF SANITARY LANDFILLS PROVIDES MORE RAPID STABILIZATION, GREATER REFUSE DENSITY FOLLOWING COMPACTION, THE CONSERVATION OF LANDFILL SPACE, AND ELIMINATION OF VERMIN AND BACTERIA BY HIGH-TEMPERATURE OXIDATION. (WOODARD-USGS)

FIELD 05E, 05D

ACCESSION NO. W71-08907

JAMES RIVER-WILSON CREEK STUDY, SPRINGFIELD, MISSOURI.

FEDERAL WATER POLLUTION CONTROL ADMIN., ROBERT S. KERR WATER RESEARCH CENTER,  
ADA, OKLA.

VOL 1, JUNE 1969. 60 P, 14 FIG, 2 TAB, 23 REF.

DESCRIPTORS:

\*WATER POLLUTION EFFECTS, \*WATER POLLUTION CONTROL, \*WATER POLLUTION SOURCES, \*FISHKILL, STORM RUNOFF, ODOR, SUBSURFACE RUNOFF, GROUNDWATER MOVEMENT, LIMESTONES, INFILTRATION, DOMESTIC WASTES, BENTHIC FAUNA, INDUSTRIAL WASTES, DRAINAGE, AQUIFERS, SINKS, CITIES, SEWAGE TREATMENT, SEWERS, AERATION, MONITORING, LANDFILLS, BIOCHEMICAL OXYGEN DEMAND, CHEMICAL OXYGEN DEMAND.

IDENTIFIERS:

\*URBAN STORM RUNOFF, JAMES RIVER(MO), WILSON CREEK(MO),  
SPRINGFIELD(MO), SEWAGE PLANT BYPASSES.

ABSTRACT:

FISH KILLS, ASSOCIATED WITH STORM RUNOFF, AND ODOROUS AND UNSIGHTLY CONDITIONS IN WILSON CREEK WHICH FLOWS PAST SPRINGFIELD (MO) AND THE WILSON'S CREEK BATTLEFIELD NATIONAL PARK PROMPTED INVESTIGATION. THUNDERSTORMS CAUSED WILSON CREEK TO DOMINATE FLOW AT POINT OF CONFLUENCE WITH THE JAMES RIVER. SINCE THE AREA IS UNDERLAIN WITH LIMESTONE, SIGNIFICANT VOLUMES OF SURFACE AND WASTE WATER ENTER THE UPPER GROUNDWATER AQUIFERS THROUGH NUMEROUS SINKHOLES AND CREVICES, SOME OF WHICH ARE IN THE WILSON CREEK BED. THIS WATER, PASSING THROUGH A MAZE OF FRACTURES AND SOLUTION CHANNELS IN THE LIMESTONE, OFTEN REAPPEARS IN DEGRADED CONDITION. POSSIBLE POLLUTION CAUSES WERE SEWAGE TREATMENT PLANT BYPASSES (ESPECIALLY FOLLOWING RAINS), SCOURING OF SLUDGE DEPOSITS, INDUSTRIAL WASTE DISCHARGES, STORM RUNOFF FROM SPRINGFIELD, AND SLUGS OF POOR QUALITY SUBSURFACE WATER FROM RADER SPRING ENTERING SURFACE WATERS. RECOMMENDATIONS ARE STORM RUNOFF CONTROL, SEWAGE TREATMENT PLANT IMPROVEMENT, IMPROVEMENT OF INDUSTRIAL WASTE TREATMENT FACILITIES, EFFORT TO RESTORE RADER SPRING TO HIGH QUALITY, ATTEMPT TO PRECLUDE POLLUTION OF GROUNDWATER AQUIFERS, CONSTRUCTION OF A RESERVOIR ON THE JAMES RIVER FOR FLOW AUGMENTATION, AND ESTABLISHMENT OF A MONITORING SYSTEM. HISTORY, DESCRIPTION OF PROBLEMS AND DISCUSSION ARE INCLUDED. (JONES-WISCONSIN)

FIELD 05C

ACCESSION NO. W71-09154

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS,

GUELPH UNIV. (ONTARIO).

D. W. LAWSON.

SUPPORTED BY NATIONAL RESEARCH COUNCIL OF CANADA. WATER RESOURCES RESEARCH, VOL 7, NO 3, P 721-725, JUN 1971. 5 P, 1 FIG, 2 TAB, 6 REF.

DESCRIPTORS:

\*DISPERISON, \*NUMERICAL ANALYSIS, COMPUTER PROGRAMS, DIFFUSION, MIXING, GROUNDWATER MOVEMENT, SEEPAGE, POROUS MEDIA, EQUATIONS, MATHEMATICAL MODELS.

IDENTIFIERS:

\*FINITE DIFFERENCE METHOD.

ABSTRACT:

TWO MODIFICATIONS OF SHAMIR AND HARLEMAN'S TWO-EQUATION SCHEME FOR THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS ARE PRESENTED. THESE MODIFICATIONS IMPROVE BOTH THE ACCURACY AND THE EFFICIENCY OF THE SOLUTION. SHAMIR AND HARLEMAN'S ONE-EQUATION SCHEME IS MORE EFFICIENT THAN THE IMPROVED TWO-EQUATION SCHEMES, BUT IT IS NOT AS ACCURATE. (KNAPP-USGS)

FIELD 05B, 02F, 06A

ACCESSION NO. W71-09611

QUANTITY AND CHEMICAL QUALITY OF RETURN FLOW,

UTAH WATER RESEARCH LAB., LOGAN.

JIMMIE L. THOMAS, J. PAUL, AND EUGENE K. ISRAELSEN.

AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS PB-201 004,  
\$3.00 IN PAPER COPY, \$0.95 MICROFICHE. REPORT PRWG 77-1, JUNE, 1971, 94 P,  
28 FIG, 6 TAB, 92 REF, 4 APPEND. OWRR PROJECT B-038-UTAH(1).

DESCRIPTORS:

WATER POLLUTION SOURCES, \*ION EXCHANGE, \*WATER QUALITY, \*IRRIGATION  
EFFICIENCY, SIMULATION, GROUNDWATER, PLANNING, MANAGEMENT, PERCOLATION,  
\*MODEL STUDIES, \*COMPUTER PROGRAMS.

IDENTIFIERS:

\*IRRIGATION RETURN FLOW, HYDROLOGIC-QUALITY MODEL.

ABSTRACT:

A HYBRID COMPUTER PROGRAM IS DEVELOPED TO PREDICT THE WATER AND SALT  
OUTFLOW FROM A RIVER BASIN IN WHICH IRRIGATION IS THE MAJOR WATER USER.  
A CHEMICAL MODEL WHICH PREDICTS THE QUALITY OF WATER PERCOLATED THROUGH  
A SOIL PROFILE IS COMBINED WITH A GENERAL HYDROLOGIC MODEL TO FORM THE  
SYSTEM SIMULATION MODEL. THE CHEMICAL MODEL CONSIDERS THE REACTIONS  
THAT OCCUR IN THE SOIL, INCLUDING THE EXCHANGE OF CALCIUM, MAGNESIUM,  
AND SODIUM CATIONS ON THE SOIL COMPLEX, AND THE DISSOLUTION AND  
PRECIPITATION OF GYPSUM AND LIME. THE CHEMICAL COMPOSITION OF THE  
OUTFLOW IS A FUNCTION OF THESE CHEMICAL PROCESSES WITHIN THE SOIL, PLUS  
THE BLENDING OF UNDIVERTED INFLOWS, EVAPORATION, TRANSPIRATION, AND THE  
MIXING OF SUBSURFACE RETURN FLOWS WITH GROUNDWATER. THE SIX COMMON IONS  
OF WESTERN WATERS, NAMELY CALCIUM (CA(++)), MAGNESIUM (MG(++)), SODIUM  
(NA(+)), SULFATE (SO4(=)), CHLORIDE (CL(-)), AND BICARBONATE (HCO3(-))  
ARE CONSIDERED IN THE STUDY. TOTAL DISSOLVED SOLIDS (TDS) OUTFLOW IS  
OBTAINED BY ADDING THE INDIVIDUAL IONS. THE OVERALL MODEL OPERATES ON  
MONTHLY TIME INCREMENTS. THE MODEL IS TESTED ON A PORTION OF THE LITTLE  
BEAR RIVER BASIN IN NORTHERN UTAH. THE MODEL SUCCESSFULLY SIMULATES  
MEASURED OUTFLOWS OF WATER AND EACH OF THE SIX IONS FOR 24-MONTH  
PERIOD. ONLY SODIUM IONS, WHICH OCCURRED IN SMALL CONCENTRATIONS  
COMPRISING APPROXIMATELY 2 PERCENT OF THE TOTAL SALT OUTFLOW, EXHIBIT  
SIGNIFICANT DISCREPANCIES BETWEEN PREDICTED AND OBSERVED VALUES. ALL  
OTHER IONS AGREE WITHIN 10 PERCENT ON A WEIGHT BASIS FOR THE TWO-YEAR  
MODEL PERIOD, WITH CORRELATION COEFFICIENTS RANGING FROM .87 TO .97.  
THE USEFULNESS OF THE MODEL IS DEMONSTRATED BY A MANAGEMENT STUDY OF  
THE PROTOTYPE SYSTEM. FOR EXAMPLE, PRELIMINARY RESULTS INDICATED THAT  
THE AVAILABLE WATER SUPPLY COULD BE USED TO IRRIGATE ADDITIONAL LAND  
WITHOUT UNDULY INCREASING THE SALT OUTFLOW FROM THE BASIN. WITH MINOR  
ADJUSTMENTS THE MODEL CAN BE APPLIED TO OTHER AREAS.

FIELD 05B, 02A, 02G, 03F, 02K

ACCESSION NO. W71-09936

REGULATIONS FOR PREVENTION OF POLLUTION OF SUBSURFACE WATERS OF THE STATE,  
MISSOURI WATER POLLUTION BOARD, JEFFERSON CITY, MO.

1967, 3 P.

DESCRIPTORS:

\*MISSOURI, \*PERMITS, \*SUBSURFACE WATERS, \*WATER POLLUTION CONTROL, WATER POLLUTION TREATMENT, WELL PERMITS, ADMINISTRATIVE AGENCIES, CONTROL, REGULATION, AQUIFERS, WELL REGULATIONS, SUBSURFACE DRAINAGE, WASTE TREATMENT, WASTE WATER TREATMENT, WATER POLLUTION, PERCOLATING WATER, WATER CONSERVATION, ADMINISTRATION.

ABSTRACT:

THE PURPOSE OF THIS REGULATION IS TO PROTECT SUBSURFACE WATERS FROM POLLUTION. A PERMIT MUST BE OBTAINED FROM THE STATE WATER POLLUTION BOARD BY ANY PERSON DESIRING TO ERECT, MODIFY, COMMENCE, OR OPERATE ANY SYSTEM FOR THE DISPOSAL OF SEWAGE OR OTHER WASTE INTO THE SUBSURFACE WATERS OF THE STATE. OPERATING PERMITS SHALL SPECIFY THE CONDITIONS UPON WHICH THEY ARE ISSUED AND SHALL BE DESIGNED TO CARRY OUT THE PURPOSES OF THE STATE WATER POLLUTION ACT. THE BOARD SHALL ISSUE CONSTRUCTION PERMITS AFTER APPROVING PRELIMINARY ENGINEERING REPORTS AND DETAILED FINAL PLANS SUBMITTED BY A REGISTERED ENGINEER. THE OPERATING PERMIT SHALL BE ISSUED UPON THE BOARD'S DETERMINATION THAT THE COMPLETED WORK SUBSTANTIALLY ADHERES TO THE APPROVED PLANS. REPRESENTATIVES OF THE BOARD SHALL CONDUCT PERIODIC INSPECTION OF ALL OPERATING PLANTS. THE PERMIT OF ANY PLANT OPERATING IN A FASHION NOT IN ACCORD WITH APPROVED PLANS SHALL BE REVOKED AFTER ALLOWING A REASONABLE TIME FOR CORRECTION. THE BOARD MUST BE NOTIFIED WHEN ANY WELL IS ABANDONED, AND SUCH WELL MUST BE PLUGGED OR SEALED TO PREVENT POLLUTION. NO WASTE THAT CAUSES POLLUTION IS TO BE PLACED IN SINKHOLES WHICH CONNECT WITH AQUIFERS. (HORWITZ-FLORIDA)

FIELD 05G, 06E

ACCESSION NO. W71-10157



TRANSPORT OF MINERAL OIL COMPONENTS TO GROUNDWATER--1. MODEL EXPERIMENTS ON THE  
TRANSFER OF HYDROCARBONS FROM A RESIDUAL OIL ZONE TO TRICKLING WATER,

KONINKLIJKE/SHELL-LABORATORIUM, AMSTERDAM (NETHERLANDS).

M. VAN DER WAARDEN, A. L. A. M. BRIDIE, AND W. M. GROENEWOUD.

WATER RESEARCH, VOL 5, NO 5, P 213-226, MAY 1971. 14 P, 7 FIG, 3 TAB, 12 REF.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*LEACHING, \*SOIL WATER MOVEMENT, \*OILY WATER,  
\*GROUNDWATER RECHARGE, MODEL STUDIES, HYDRAULIC MODELS, OIL WASTES,  
WATER POLLUTION SOURCES.

IDENTIFIERS:

\*OIL SPILLS.

ABSTRACT:

OIL SPILLS IN SOILS BECOME IMMOBILE AFTER SOME TIME. SUBSEQUENT  
RAINFALL MAY THEN LEACH OUT WATER-SOLUBLE COMPONENTS, WHICH ARE CARRIED  
DOWNWARD. IN LABORATORY EXPERIMENTS A PACK OF NON-ADSORBING GLASS  
PARTICLES WAS USED AS A SOIL MODEL TO STUDY THE TRANSFER OF OIL  
COMPONENTS TO GROUNDWATER. OIL WAS INJECTED INTO A ZONE WITH RESIDUAL  
WATER SATURATION OF THIS MODEL AND ALLOWED TO DISPERSE FREELY.  
SUBSEQUENTLY WATER WAS ALLOWED TO TRICKLE THROUGH THE PACK AND THE  
DRAIN WATER, WHICH DID NOT CONTAIN ANY FREE OIL, WAS ANALYZED FOR  
CONTAMINANTS. EXPERIMENTS WERE CARRIED OUT WITH A GAS OIL RAFFINATE  
CONTAINING VERY SMALL AMOUNTS OF 2-ISOPROPYLPHENOL AS A MODEL FOR  
TRANSFERABLE COMPONENTS AND WITH ACTUAL MINERAL OIL PRODUCTS: GASOLINE,  
KEROSENE AND GAS OIL. IN ALL THE EXPERIMENTS WATER-EXTRACTABLE  
COMPONENTS WERE LEACHED OUT FROM AN OIL ZONE BY TRICKLING WATER AT A  
RATE DETERMINED BY THE PARTITION COEFFICIENT OF THE COMPONENTS AND BY  
THE WATER/OIL RATIO. WHEN THE GLASS PARTICLES WERE REPLACED BY NATURAL  
DUNE SAND THE TRANSFER OF OIL COMPONENTS WAS DELAYED BY ADSORPTION AND  
THEIR CONCENTRATION IN THE DRAIN WATER DECREASED CORRESPONDINGLY. UNDER  
FIELD CONDITIONS THESE EFFECTS OF ADSORPTION MIGHT BE MUCH STRONGER; IN  
ADDITION, CHEMICAL OR BIOLOGICAL OXIDATION AND EVAPORATION MAY ALSO TO  
SOME EXTENT DETERMINE THE FATE OF OIL IN SOIL. (KNAPP-USGS)

FIELD 05B, 02G, 02F

ACCESSION NO. W71-10325



CONTRIBUTION OF FERTILIZERS TO WATER POLLUTION,

MISSOURI UNIV., COLUMBIA. WATER RESOURCES RESEARCH CENTER.

G. E. SMITH.

IN: 2ND COMPENDIUM OF ANIMAL WASTE MANAGEMENT, JUNE 1969, PAPER NO. 7, 16 P,  
7 TAB, 5 FIG, 24 REF. PHS-FWPCA-USDI - WPO0533.

DESCRIPTORS:

\*EUTROPHICATION, FERTILIZERS, FARM WASTES, NUTRIENTS, DENITRIFICATION,  
NITRIFICATION, AMMONIFICATION, LEACHING, EROSION, NITROGEN, RUNOFF,  
WATER POLLUTION CONTROL, GROUNDWATER, SEPTIC TANKS, MANAGEMENT.

IDENTIFIERS:

\*METHEMOGLOBIN, NITRATE MOVEMENT, FEEDLOTS, RESIDUAL ACCUMULATION, SOIL  
CORES.

ABSTRACT:

WITHOUT CHEMICAL SOIL AMENDMENTS THE UNITED STATES WOULD BE A FOOD  
IMPORTING NATION. DESPITE LIBERAL FERTILIZER USE, CROPS ARE REMOVING  
MORE NITROGEN AND MINERALS THAN ARE BEING ADDED IN SOIL AMENDMENTS.  
MANY SHALLOW WELLS IN MISSOURI ARE CONTAMINATED WITH NITRATES AS A  
RESULT OF LEACHING FROM LIVESTOCK FEEDING OPERATIONS. THE NITRATE IS  
NOT ASSOCIATED WITH LOSSES FROM FERTILIZED FARM FIELDS IN MOST CASES.  
THERE IS LITTLE QUESTION THAT SOME OF THE NUTRIENTS APPLIED IN CHEMICAL  
FERTILIZERS ARE MOVING INTO BOTH SURFACE AND GROUND WATER; THE  
PERCENTAGE IS THOUGHT TO BE RELATIVELY SMALL. IT IS POSSIBLE THAT  
NUTRIENT LOSSES MAY BE LESS WHERE GOOD FERTILIZATION PRACTICES ARE  
FOLLOWED THAN ON UNFERTILIZED SOILS. (SEE ALSO W71-10366) (IOWA STATE)

FIELD 05G, 05B

ACCESSION NO. W71-10372

POLLUTION OF UNDERGROUND WATER.

WYOMING STATUTES SECS 41-121, 41-126 (1959).

DESCRIPTORS:

\*WYOMING, \*GROUNDWATER, \*WATER POLLUTION, \*WATER POLLUTION CONTROL, POLLUTION ABATEMENT, SUBSURFACE WATERS, PERCOLATING WATER, UNDERGROUND, WELLS, SALINE WATER INTRUSION, WATER POLLUTION SOURCES, MINERALOGY, INDUSTRIAL WASTES, MUNICIPAL WASTES, SEWAGE, WATER QUALITY CONTROL, WATER POLLUTION TREATMENT, ADMINISTRATIVE AGENCIES, LEGISLATION, PUBLIC HEALTH, REGULATION, LEGAL ASPECTS, ADMINISTRATION.

ABSTRACT:

AN ACT RELATING TO UNDERGROUND WATER PROVIDES THAT POLLUTION OF UNDERGROUND WATER MEANS ANY IMPAIRMENT OF THE NATURAL QUALITY OF SUCH WATER, HOWEVER CAUSED, INCLUDING IMPAIRMENT BY SALINES, MINERALS, INDUSTRIAL WASTES, DOMESTIC WASTES, OR SEWAGE. UNDERGROUND WATER REFERS TO ANY WATER BENEATH THE SURFACE OF THE LAND OR THE BED OF ANY STREAM, LAKE, OR OTHER BODY OF SURFACE WATER. IN THE ADMINISTRATION AND ENFORCEMENT OF THIS ACT THE STATE ENGINEER IS AUTHORIZED TO REQUIRE THE ABATEMENT OF ANY CONDITION, OR THE SEALING OF ANY WELL, RESPONSIBLE FOR ADMITTING POLLUTING MATERIALS INTO AN UNDERGROUND WATER SUPPLY, AND IS FURTHER AUTHORIZED TO PERFORM NECESSARY DUTIES RELATING TO INVESTIGATION, REGULATION, AND CONSTRUCTION OF WELLS IN ORDER TO CONSERVE THE STATE'S UNDERGROUND WATER RESOURCES. (SMILJANICH-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-10446

TRITIATED WATER AS A TRACER IN THE DUMP LEACHING OF COPPER,

BUREAU OF MINES, BARTLESVILLE, OKLA. BARTLESVILLE PETROLEUM RESEARCH CENTER.,  
AND INSTITUTE OF MINING AND TECHNOLOGY, SOCORRO, N. MEX. DEPT. OF  
GROUND-WATER HYDROLOGY.

F. E. ARMSTRONG, G. C. EVANS, AND G. E. FLETCHER.

BUREAU OF MINES REPORT OF INVESTIGATIONS RI 7510, MAY 1971. 39 P, 12 FIG, 5  
TAB, 10 REF, 5 APPEND.

DESCRIPTORS:

\*TRITIUM, \*TRACERS, \*LEACHING, \*COPPER, \*WASTE DUMPS, MINE WASTES,  
MINING, GROUNDWATER MOVEMENT, FLOW PROFILES, SAMPLING, DATA COLLECTION,  
WELLS, METHODOLOGY, CHEMICAL ANALYSIS.

IDENTIFIERS:

TRITIATED WATER(TRACER), MINE DUMP LEACHING.

ABSTRACT:

TRITIATED WATER WAS USED AS A TRACER TO FOLLOW THE PATH OF LEACH LIQUIDS AS THEY FLOW THROUGH A COPPER-MINE DUMP. SEMIPERMEABLE LAYERS, PRODUCED WITHIN THE DUMP BY COMPACTION AND 'STRATIFICATION' OF DEPOSITED DUMP MATERIAL, RESTRICT THE VERTICAL MOVEMENT OF WATER. KNOWLEDGE OF THIS RESTRICTION AIDS IN THE OPTIMIZATION OF THE LEACHING PROCESS. THE PORTION OF THE DUMP STUDIED WAS APPROXIMATELY 2,000 FEET LONG, 800 FEET WIDE, AND 200 FEET HIGH. A TOTAL OF 94 CURIES OF TRITIATED WATER WAS INJECTED INTO THE DUMP AT THE RATE OF 650 GPM OVER A PERIOD OF 39 HOURS. THE LEACH LIQUID WAS SAMPLED AT NATURAL SURFACE OUTFLOWS AND THROUGH A SERIES OF WELLS, SOME DRILLED TO THE BOTTOM OF THE DUMP AND OTHERS TO INTERMEDIATE LEVELS. MORE THAN 3,300 SAMPLES WERE ANALYZED EITHER BY LIQUID SCINTILLATION COUNTING OR BY GAS COUNTING. DATA OBTAINED PERMITTED CALCULATION OF FLOW PATHS, RECYCLE TIMES, TOTAL FLUID VOLUME, AND ESTIMATES OF RETENTION TIMES IN VARIOUS PORTIONS OF THE DUMP. LEACHING WITH SUBSEQUENT RECOVERY FROM THE PREGNANT LEACH LIQUID IS AN IMPORTANT SOURCE OF COPPER. (WOODARD-USGS)

FIELD 05B, 02F

ACCESSION NO. W71-11255

A METHOD TO DESCRIBE THE FLOW OF RADIOACTIVE IONS IN GROUND WATER,  
GEOLOGICAL SURVEY, DENVER, COLO.

DAVID B. GROVE.

AVAILABLE FROM NAT. TECH. INF. SERVICE, SPRINGFIELD, VA. 22151 PRICE \$3.00  
PRINTED COPY, 95 CENTS MICROFICHE. SANDIA LABORATORIES CONTRACT REPORT  
SC-CR-70-6139, DEC 1970. 38 P, 4 FIG, 1 TAB, 17 REF.

DESCRIPTORS:

\*PATH OF POLLUTANTS, \*RADIOISOTOPES, \*GROUNDWATER MOVEMENT,  
\*DISPERSION, \*ION EXCHANGE, DIFFUSION, MIXING, RADIOACTIVITY,  
RADIATION, RADIOACTIVE WASTES, IONS, EQUATIONS, MATHEMATICAL MODELS,  
CONVECTION, NUCLEAR POWERPLANTS.

ABSTRACT:

AN EQUATION BASED ON INSTANTANEOUS ION EXCHANGE AND ON A LINEAR  
ADSORPTION ISOTHERM PREDICTS RADIOACTIVE IONIC CONCENTRATIONS IN  
GROUNDWATER SYSTEMS AS A FUNCTION OF TIME AND POSITION. THIS EQUATION  
ACCOUNTS FOR RADIOACTIVE DECAY, ION EXCHANGE, AND LONGITUDINAL  
HYDRAULIC DISPERSION. DATA NECESSARY FOR SOLUTION INCLUDE GROUNDWATER  
VELOCITY, ION-EXCHANGE DISTRIBUTION COEFFICIENT, EXCHANGE RATIO, AND  
DISPERSION COEFFICIENT. THE NEED FOR SIMPLICITY DICTATES THE USE OF AN  
EQUILIBRIUM CONCEPT RATHER THAN A RATE PROCESS TO DESCRIBE THE  
ION-EXCHANGE REACTION. (KNAPP-USGS)

FIELD 07B, 05B, 02F

ACCESSION NO. W71-11356

NELSON V C AND C PLYWOOD CORP (STATUTE OF LIMITATIONS AND THEORIES OF LIABILITY FOR POLLUTING UNDERGROUND WATER).

465 P2D 314-326 (MONT 1970).

DESCRIPTORS:

\*MONTANA, \*WATER POLLUTION SOURCES, \*WATER WELLS, \*REMEDIES, INDUSTRIAL WASTES, WATER POLLUTION, POLLUTION ABATEMENT, WATER POLLUTION EFFECTS, POLLUTANTS, WASTE DISPOSAL, GROUNDWATER, PERCOLATING WATER, PERCOLATION, PATH OF POLLUTANTS, WOOD WASTES, PULP AND PAPER INDUSTRY, DAMAGES, HYDROLOGIC DATA, LEGISLATION, LAND TENURE, LEGAL ASPECTS, JUDICIAL DECISIONS, WELLS.

ABSTRACT:

PLAINTIFF LANDOWNER SUED DEFENDANT CORPORATION FOR DAMAGES FOR THE POLLUTION OF HIS WELL BY DEFENDANT'S PLYWOOD OPERATION. PLAINTIFF CONTENDED THAT THE DEFENDANT'S DUMPING OF GLUE WASTES INTO THE GROUND POLLUTED HIS WELL AND RENDERED IT UNFIT FOR USE. DEFENDANT CONTENDED THAT THE TRIAL JUDGE INCORRECTLY INSTRUCTED THE JURY ON BOTH NEGLIGENCE AND PRIVATE NUISANCE, AN ADJOINING LAND-OWNER IS NOT RESPONSIBLE FOR DAMAGE TO THE PERCOLATING WATER OF A NEIGHBOR, AND THE STATUTE OF LIMITATIONS HAD RUN ON A PERMANENT NUISANCE. IN AFFIRMING A VERDICT FOR PLAINTIFF, THE SUPREME COURT OF MONTANA HELD THAT THEORIES OF NEGLIGENCE AND PRIVATE NUISANCE ARE BOTH APPLICABLE TO UNDERGROUND WATER POLLUTION, AND THAT DUE TO ADVANCES IN HYDROLOGICAL SCIENCE, UNDERGROUND WATER POLLUTION CAN BE PROVEN AND IS THUS ACTIONABLE. THE COURT ALSO RULED THAT WHERE A PRIVATE NUISANCE IS TEMPORARY AND CONTINUOUS IN CHARACTER, ACTUAL DAMAGES CREATE SEPARATE CAUSES OF ACTION. THUS, A RECOVERY MAY BE HAD FOR DAMAGES ACCRUING WITHIN THE STATUTORY PERIOD NEXT PRECEDING THE COMMENCEMENT OF THE ACTION. THE POLLUTION OF GROUNDWATER BY THE DUMPING OF GLUE WASTES IS SUCH A CONTINUING, TEMPORARY NUISANCE. (SMILJANICH-FLORIDA)

FIELD 06E, 5G

ACCESSION NO. W71-11692

NORMAN V GREENLAND DRILLING CO (INFERRED LIABILITY FOR WATER POLLUTION FROM OIL PRODUCTION OPERATIONS).

403 P2D 507-511 (OKLA 1965).

DESCRIPTORS:

\*OKLAHOMA, \*WATER POLLUTION SOURCES, \*OIL WASTES, \*REMEDIES, WATER POLLUTION, WATER POLLUTION EFFECTS, POLLUTION ABATEMENT, PATH OF POLLUTANTS, OIL INDUSTRY, OIL, GASES, POLLUTANTS, PERCOLATION, WASTES, WASTE DISPOSAL, LEGISLATION, WELLS, IMPAIRED WATER QUALITY, WATER POLLUTION CONTROL, DAMAGES, LEGAL ASPECTS, JUDICIAL DECISIONS, GROUNDWATER.

ABSTRACT:

PLAINTIFF LANDOWNER SUED DEFENDANT OIL DRILLING COMPANY TO RECOVER DAMAGES FOR THE POLLUTION OF LAND, PONDS, AND A WATER WELL BY GAS, OIL AND SALT WATER THAT ESCAPED FROM DEFENDANT'S OIL WELL. PLAINTIFF CONTENDED THAT AN OKLAHOMA STATUTE, RELATING TO THE FLOW OF OIL WASTES OVER LAND, PRECLUDED THE NECESSITY FOR PROOF OF DEFENDANT'S NEGLIGENCE. PLAINTIFF ALSO CONTENDED THAT THE DOCTRINE OF RES IPSA LOQUITUR WAS APPLICABLE AND INFERRED DEFENDANT'S NEGLIGENCE. DEFENDANT DENIED NEGLIGENCE AND CONTENDED THAT THE STATUTE DID NOT APPLY. REVERSING A DISMISSAL OF PLAINTIFF'S ACTION, THE SUPREME COURT OF OKLAHOMA HELD THAT THE OKLAHOMA STATUTE RELATING TO DAMAGES FROM THE FLOW OF OIL WASTES OVER LAND IS NOT APPLICABLE TO POLLUTION FROM UNDERGROUND SOURCES. THE COURT HELD, HOWEVER, THAT DEFENDANT'S NEGLIGENCE COULD BE FAIRLY INFERRED FROM THE FACTS. WHERE AN INJURY-PRODUCING POLLUTION SOURCE IS SHOWN TO BE UNDER THE MANAGEMENT OF A DEFENDANT, AND THE ACCIDENT IS SUCH AS DOES NOT ORDINARILY HAPPEN IF PROPER CARE IS USED, IT AFFORDS A REASONABLE INFERENCE, IN THE ABSENCE OF EXPLANATION, THAT LACK OF CARE CAUSED THE ACCIDENT. (SMILJANICH-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-11724

STATISTICAL POROUS MEDIA HYDRODYNAMICS,

ILLINOIS UNIV., URBANA. DEPT. OF MINING METALLURGY AND PETROLEUM ENGINEERING.

A. E. SCHEIDEGGER.

ILLINOIS UNIVERSITY WATER RESOURCES CENTER RESEARCH REPORT NO 17, JUL 1968.  
70 P, 5 FIG, 1 TAB, 16 REF. OWRR PROJECT B-010-ILL(4).

DESCRIPTORS:

\*STOCHASTIC PROCESSES, \*POROUS MEDIA, \*GROUNDWATER MOVEMENT,  
\*STATISTICAL MODELS, \*PATH OF POLLUTANTS, MATHEMATICAL MODELS,  
PROBABILITY, THERMODYNAMICS, FLOW, MASS TRANSFER, DIFFUSION, MIXING,  
DISPERSION.

IDENTIFIERS:

\*MULTIPHASE FLOW.

ABSTRACT:

AN INVESTIGATION WAS MADE OF THE STOCHASTIC ASPECTS OF SINGLE AND MULTIPLE PHASE FLOW THROUGHOUT POROUS MEDIA. THE COMPLETE CORRESPONDENCE BETWEEN TRANSPORT THEORY AND THERMODYNAMICS WAS ESTABLISHED, AND THE COROLLARIES OF THE THERMODYNAMIC STABILITY CONDITIONS IN TRANSPORT THEORY WERE INVESTIGATED. A FURTHER DEVELOPMENT OF THE CORRESPONDENCE BETWEEN TRANSPORTED QUANTITIES AND THERMODYNAMICS WAS OBTAINED BY EXTENDING THE THEORY TO NON-POSITIVE DEFINITE TRANSPORTED QUANTITIES. THE THEORY WAS THEN APPLIED TO FLOW THROUGH POROUS MEDIA. A GENERAL INVESTIGATION WAS MADE OF THE POSSIBILITY OF THE DEVELOPMENT OF A STEADY STATE IN FRONTAL DISPLACEMENT PROCESSES IN POROUS MEDIA WITH AND WITHOUT 'FINGERS', WITH THE RESULT THAT THIS STABILIZATION APPEARS TO BE IMPOSSIBLE. A NEW TYPE OF STATISTICAL MODEL FOR FLOW THROUGH POROUS MEDIA WAS BASED ON A RANDOM ENSEMBLE OF TOPOLOGICAL GRAPHS. (KNAPP-USGS)

FIELD 02F, 05B

ACCESSION NO. W71-11776



WATER QUALITY IN RELATION TO FARM USE OF FERTILIZER,

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO. SOIL AND WATER  
CONSERVATION DIV.

FRANK G. VIETS, JR.

BIOSCIENCE, VOL 21, NO 10, P 460-467, 1971. 2 TAB, 35 REF.

DESCRIPTORS:

\*WATER QUALITY, \*CROP PRODUCTION, \*FERTILIZERS, \*WATER POLLUTION  
SOURCES, NITROGEN, NITRATES, NITROGEN CYCLE, PHOSPHORUS, REGULATION,  
GROUNDWATER, RUNOFF, PERCOLATION, EUTROPHICATION, DRAINAGE EFFECTS,  
DETERGENTS, DENITRIFICATION, NITRITES, BIOCHEMICAL OXYGEN DEMAND.

ABSTRACT:

THE EXTENT OF COMMERCIAL FERTILIZER USAGE TO DETERIORATION OF WATER  
QUALITY IS DISCUSSED. THE SIGNIFICANCE OF DRAINAGE ENRICHMENT BY  
FERTILIZERS MUST BE EVALUATED ON THE BASIS OF COMPOSITION OF AFFECTED  
DRAINAGE AND THE EFFECTS OF VARIOUS LAND USES. FERTILIZERS PERMIT  
HIGHER PRODUCTION ON FEWER CULTIVATED ACRES, THUS REDUCTION OF  
FERTILIZERS WOULD REDUCE FOOD SUPPLIES AND INCREASE FOOD PRICES. THE  
ASSEMBLED DATA INDICATE THAT FERTILIZER RESTRICTIONS IMPOSED ON  
NATIONAL OR STATE LEVEL WOULD NOT RESULT IN SUFFICIENT IMPROVEMENT IN  
WATER QUALITY TO RISK HAZARDS OF A LESS ABUNDANT FOOD SUPPLY.  
RESTRICTIONS COULD RESULT IN MORE NITROGEN AND PHOSPHORUS IN SEDIMENT  
AND RUNOFF DUE TO CROP EXPANSION OF ACREAGE WITH HIGH EROSION HAZARD  
(LARGELY ROW CROPS) TO MEET FOOD AND FIBER REQUIREMENTS. RESTRICTION OF  
FERTILIZER USE WITHIN A WATERSHED OR GROUND WATER BASIN IS IN ORDER  
WHEN FACTS JUSTIFY IT BUT RESTRICTIONS SHOULD NOT BE IMPOSED UNTIL ALL  
SOURCES OF NITROGEN AND PHOSPHORUS INPUTS ARE INVENTORIED AND MOST  
EFFECTIVE AND LEAST EXPENSIVE CONTROLS IMPOSED FROM AN ESTABLISHED  
FACTUAL PRIORITY LIST. (JONES-WISCONSIN)

FIELD 05C, 05B

ACCESSION NO. W71-12084



THE NITRATE DILEMMA.

HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT NO. 1, LUBBOCK, TEX.

CROSS SECTION, VOL 16, NO 6, JUNE 1970, P 1, 3-4. 3 FIG.

DESCRIPTORS:

\*NITROGEN COMPOUNDS, \*POLLUTION IDENTIFICATION, \*WATER QUALITY,  
\*MONITORING, \*GROUNDWATER, NITRATE, NITRITES, NITROGEN-CYCLE, HISTORY,  
SOIL ANALYSIS, WATER TRANSFER, IRRIGATION PRACTICES, LEACHING, TEXAS.

IDENTIFIERS:

\*OGALLALA AQUIFER, HIGH PLAINS(TEXAS), PARMER COUNTY(TEXAS), HOLLY  
SUGAR STUDIES.

ABSTRACT:

THE HIGH PLAINS UNDERGROUND WATER CONSERVATION DISTRICT AND THE TEXAS WATER DEVELOPMENT BOARD HAVE A CONTINUING PROGRAM FOR MONITORING WATER QUALITY IN THE OGALLALA AQUIFER TO: (1) APPRAISE GROUNDWATER FOR THE LANDOWNER, (2) ESTABLISH REGIONAL WATER QUALITY, AND (3) DEVELOP A HISTORICAL DATA BASE. SOIL ANALYSIS, WATER IMPORTATION, AND INDUSTRIAL DEVELOPMENT REQUIRE THE COLLECTION OF SUCH DATA. THERE IS NO EVIDENCE THAT NITRATE, NITRITE, OR ANY OTHER NITROGEN-CYCLE ELEMENTS ARE PREVALENT WATER POLLUTERS IN THE HIGH PLAINS AREA. THE AVERAGE NITRATE CONTENT WAS 7.1 PARTS PER MILLION (PPM) FOR 99 WATER SAMPLES COLLECTED IN 1965, AND 6.8 PPM FOR 86 SAMPLES COLLECTED IN 1968 IN PARMER COUNTY. CHANGES IN NITRATE CONTENT OF ALL THE COMPARABLE SAMPLES WERE WITHIN THE RANGE OF ERROR ANALYSIS AND METHODS OF COLLECTION. GROUNDWATER IN PARMER COUNTY IS LOW IN NITRATES, AND IS NOT AFFECTED BY HIGH DENSITY FARMING AND FERTILIZATION PRACTICES, ALTHOUGH FARMERS IN THE AREA USE MORE NITROGEN FERTILIZER AND IRRIGATION THAN IN THE PAST. PLANTS USE 70% OF THE APPLIED NITROGEN; ANAEROBIC SOIL BACTERIA AND/OR DEEP SEEPAGE MAY ACCOUNT FOR 30%. THE HOLLY SUGAR STUDIES INDICATE THAT NITROGEN IS STORED IN SOIL. NITROGEN-MIGRATION RESEARCH IS NEEDED PARTICULARLY FOR IMPORTED SURFACE WATER TRANSFER, OVER IRRIGATION AND LEACHING. (POPKIN-ARIZONA)

FIELD 02K, 03F, 04B, 05A

ACCESSION NO. W71-12122

FUNDAMENTAL VARIATIONS IN THE WATER QUALITY WITH PERCOLATION IN INFILTRATION BASINS,

INSTITUTE FOR WATER RESEARCH LTD., DORTMUND (WEST GERMANY).

W. H. FRANK.

PAPER NO 7 OF ARTIFICIAL GROUNDWATER RECHARGES CONFERENCE, UNIVERSITY OF READING, ENGLAND, SEPTEMBER 21-24, 1970: THE WATER RESEARCH ASSOCIATION, MARLOW, ENGLAND. 22 P, 25 FIG.

DESCRIPTORS:

\*ARTIFICIAL RECHARGE, \*INDUCED INFILTRATION, \*PIT RECHARGE, \*WATER TREATMENT, \*FILTATION, ALLUVIA CHANNELS, SURFACE-GROUNDWATER RELATIONSHIPS, PERMEABILITY, ALGAE, DISSOLVED OXYGEN.

IDENTIFIERS:

\*RUHR VALLEY.

ABSTRACT:

THE DORTMUNDER STADTWERKE AG SUPPLIES ABOUT 100 MILLION CU M OF MUNICIAL AND INDUSTRIAL WATER PER YEAR FROM THE GROUNDWATER COLLECTED IN THE ALLUVIUM OF THE RUHR VALLEY. THE AQUIFER IS 4 TO 5 M DEEP AND IS COVERED BY A LAYER OF MEADOW LOAM 0.5 TO 2 M THICK. THE PERMEABILITY OF THE GRAVEL IS IN GENERAL VERY GOOD, ABOUT .001 TO 0.01 M/SEC. MORE THAN 90% OF THE GROUNDWATER CONSISTS OF VARYING PROPORTIONS OF BANK INFILTRATION AND ARTIFICIALLY RECHARGED GROUNDWATER. IN DRY YEARS WITH LITTLE WATER FLOW, MORE THAN 75% OF THE REQUIRED WATER MUST BE ARTIFICIALLY RECHARGED. THE INFILTRATION TAKES PLACE IN BASINS MEASURING 25 X 200 M. A LAYER OF SAND 50 TO 70 CM THICK IS LAID DOWN AS A FILTER BED. THIS SAND HAS AN EFFECTIVE PARTICLE DIAMETER (D 10%) OF 0.12 MM, AND AT (D 60%) OF 0.3 MM A COEFFICIENT OF NON-UNIFORMITY OF  $U = 2.5$ . ITS PERMEABILITY IN MOST AREAS IS LESS THAN THAT OF THE SUBSOIL. BOTH THE BANK INFILTRATION AND THE ARTIFICIALLY RECHARGED GROUNDWATER ARE RE-COLLECTED AT A DEPTH OF 7 M AFTER A PASSAGE OF AT LEAST 50 M THROUGH THE SOIL AND PASSED DIRECTLY INTO THE MAINS WITHOUT FURTHER TREATMENT AFTER A LIGHT PRECAUTIONARY CHLORINATION. SUSPENDED ORGANIC AND INORGANIC MATTER IS LARGELY RETAINED ON THE FILTER SURFACE. TOGETHER WITH THE ALGAE WHICH GROW THERE, THEY CAUSE AN OBSTRUCTION IN THE FILTER. THE DISSOLVED ORGANIC MATERIAL IN THE WATER IS MINERALIZED WITH THE HELP OF THE BACTERIA WHICH INHABIT THE FILTER, OXYGEN BEING CONSUMED AND CARBON DIOXIDE LIBERATED. IN THE WATER ABOVE AN EXPOSED SAND FILTER, ALGAE CAUSE A DISTINCT DROP IN THE PHOSPHATE ION CONCENTRATION. IN THE UPPER MOST LAYERS OF SAND MORE PHOSPHATE IONS ARE LIBERATED BY MICROBIOL DECOMPOSITION THAN THE BACTERIA NEED FOR THEIR METABOLISM. (KNAPP-USGS)

FIELD 04B, 03A, 05F

ACCESSION NO. W71-12410

WENDTLANDT V. NATIONAL CO-OPERATIVE REFINERY ASS'N (SALT WATER INTRUSION  
RESULTING FROM OIL DRILLING OPERATIONS).

215 P. 2D 209-215 (KAN. 1950).

DESCRIPTORS:

\*KANSAS, \*SALINE WATER INTRUSION, \*OIL WASTES, \*REMEDIES, WATER  
POLLUTION, JUDICIAL DECISIONS, RELATIVE RIGHTS, LEGAL ASPECTS, STATE  
GOVERNMENTS, STATE JURISDICTION, OIL INDUSTRY, SALINE WATER, SUBSURFACE  
WATERS, GROUNDWATER, PERCOLATING WATERS, DRILLING, OIL WELLS, WATER  
SUPPLY, FARMS, WATER POLLUTION EFFECTS, WATER POLLUTION SOURCES,  
DAMAGES.

ABSTRACT:

PLAINTIFF LANDOWNER SOUGHT TO RECOVER ACTUAL AND PUNITIVE DAMAGES FOR  
PERMANENT INJURY TO HER LAND CAUSED BY SALT WATER FROM DEFENDANT'S OIL  
DRILLING OPERATIONS. DEFENDANT OPERATED SEVERAL OIL WELLS ON  
PLAINTIFF'S LAND PURSUANT TO A LEASE ARRANGEMENT. THE OIL WELLS  
PRODUCED OVER 5000 BARRELS OF SALT WATER PER MONTH. DEFENDANT DISPOSED  
OF THIS BY PUMPING IT INTO A LARGE PIT WITH A CAPACITY OF 3,500  
BARRELS. DEFENDANT KNEW THE SALT WATER WAS SEEPING INTO THE SOIL, YET  
TOOK NO CORRECTIVE ACTION. PORTIONS OF PLAINTIFF'S LAND BECAME POLLUTED  
BY SALT WATER AND USELESS FOR AGRICULTURAL PURPOSES. PLAINTIFF ALLEGED  
THAT THE VALUE OF HER LAND HAD BEEN PERMANENTLY DECREASED BY \$6000.  
PLAINTIFF WAS AWARDED \$1092 IN PERMANENT DAMAGES AND \$5000 IN PUNITIVE  
DAMAGES. DEFENDANT APPEALED, CONTENDING THAT THE EVIDENCE WAS  
INSUFFICIENT TO WARRANT PUNITIVE DAMAGES. THE SUPREME COURT TO KANSAS  
AFFIRMED THE JUDGMENT ON CONDITION THAT THE PUNITIVE DAMAGES BE REDUCED  
TO \$2500. THE COURT HELD THAT PUNITIVE DAMAGES ARE PERMISSIBLE WHERE A  
DEFENDANT INTENTIONALLY EMPTIES SALT WATER ON A PLAINTIFF'S LAND,  
KNOWING IT WOULD CAUSE SERIOUS DAMAGE. (HORWITZ-FLORIDA)

FIELD 06E, 05B

ACCESSION NO. W71-13521

HAVEMAN V BEULOW (POLLUTION OF WATERWELL).

317 P. 2D 313-317 (WASH. 1950).

DESCRIPTORS:

\*WASHINGTON, \*WATER POLLUTION SOURCES, \*DAMAGES, \*WATER WELL, IMPAIRED WATER QUALITY, UNDER SEEPAGE, WATER POLLUTION, INDUSTRIAL WASTES, POLLUTANTS, INFILTRATION, GROUNDWATER MOVEMENT, SUBSURFACE MOVEMENT, CONSUMPTIVE USE, DOMESTIC WATER, POLLUTION ABATEMENT, JUDICIAL DECISIONS, LEGAL ASPECTS, REMEDIES, WELLS, DIKES, SHALLOW WELLS.

IDENTIFIERS:

INJUNCTION(PROHIBITORY).

ABSTRACT:

PLAINTIFF LANDOWNERS SOUGHT TO RECOVER DAMAGES RESULTING FROM THE POLLUTION OF HIS WATER WELL BY REFUSE MATTER FROM DEFENDANT'S DEHYDRATING PLANT OPERATION. PLAINTIFFS ALSO SOUGHT INJUNCTIVE RELIEF. THE WELL, FURNISHING WATER FOR DOMESTIC PURPOSES, WAS LOCATED ON PLAINTIFFS' LAND. THE DEFENDANT CONSTRUCTED AN OPEN SUMP, DIKED ON THE SOUTHERLY AND WESTERLY SIDES. SUCH DIKES ALLOWED REFUSE TO ACCUMULATE IN THE SUMP. SUBSEQUENTLY, PLAINTIFFS NOTICED A MARKED CHANGE IN THE QUALITY OF THEIR WELL WATER. DEFENDANT CONTENDED THAT THE REFUSE IN THE SUMP HAD NOTHING TO DO WITH THE CONTAMINATION OF THE WELL. THE SUPREME COURT OF WASHINGTON HELD THAT WHERE DAMAGES ARE SOUGHT FOR THE POLLUTION OF A WATER WELL THROUGH SEEPAGE FROM AN ADJACENT WASTE SUMP, A PLAINTIFF MUST PROVE THAT THE DEFENDANT'S CONDUCT CAUSED THE POLLUTION. WHERE INJURY RESULTING FROM THE POLLUTION OF A FARM'S WATER SUPPLY IS PERMANENT, THE PLAINTIFF CAN RECOVER THE DIFFERENCE IN FAIR MARKET VALUE BEFORE AND AFTER THE INJURY. FINDING THE MEASURE OF DAMAGES AND THE GRANTING OF INJUNCTIVE RELIEF BY THE LOWER COURT TO BE PROPER, THE COURT AFFIRMED THE JUDGEMENT FOR PLAINTIFFS. (SHELNUT-FLORIDA)

FIELD 06E, 05B

ACCESSION NO. W71-13645

## COMPREHENSIVE INDEX



## COMPREHENSIVE INDEX

E USE, DOMESTIC WATER, POLLUTION	ABATEMENT, JUDICIAL DECISIONS, LE	W71-13645
TER POLLUTION EFFECTS, POLLUTION	ABATEMENT, PATH OF POLLUTANTS, DI	W71-11724
STES, WATER POLLUTION, POLLUTION	ABATEMENT, WATER POLLUTION EFFECT	W71-11692
TER POLLUTION CONTROL, POLLUTION	ABATEMENT, SUBSURFACE WATERS, PER	W71-10446
ON, STATE GOVERNMENTS, POLLUTION	ABATEMENT, CHEMICAL WASTES, WATER	W69-05370
ER POLLUTION CONTROL, *POLLUTION	ABATEMENT, STATE GOVERNMENTS, LOC	W70-02896
S, JUDICIAL DECISIONS, POLLUTION	ABATEMENT, POTABLE WATER, STANDAR	W70-08025
S, GROUNDWATER, WATER POLLUTION,	ABSORPTION, *LEACHING, *PERCOLATI	W70-04688
ENTS, CHELATE EXTRACTION, ATOMIC	ABSORPTION ANALYSES, CARBONATE, R	W69-03197
DISPOSAL, GROUNDWATER MOVEMENT,	ABSORPTION, ADSORPTION.: / SEWAGE	W69-00652
SOILS, SEEPAGE, SOIL CHEMISTRY,	ABSORPTION, SOIL MECHANICS, WATER	W71-04121



ATE MOVEMENT, FEEDLOTS, RESIDUAL	ACCUMULATION, SOIL CORES.: / NITR	W71-10372
HYDROCHLORIC	ACID.:	W71-00194
LANDS, AMMONIA, HARDNESS(WATER),	ACIDITY, OXYGEN, ALGAE, SELF-PURI	W69-07838
MALENCLAVES, PATH OF POLLUTANTS,	ACIDS, LEACHING, CHLORIDES, GLACI	W71-00194
DICIAL DECISIONS, LEGAL ASPECTS,	ADJUDICATION PROCEDURE.: /ERS, JU	W71-01028
LLUTION TREATMENT, WELL PERMITS,	ADMINISTRATIVE AGENCIES, CONTROL,	W71-10157
TROL, WATER POLLUTION TREATMENT,	ADMINISTRATIVE AGENCIES, LEGISLAT	W71-10446
ATING WATER, WATER CONSERVATION,	ADMINISTRATION.: /LLUTION, PERCOL	W71-10157
ILLING, ADMINISTRATIVE AGENCIES,	ADMINISTRATION, GROUNDWATER, WATE	W71-04742
ULATION, WELL PERMITS, DRILLING,	ADMINISTRATIVE AGENCIES, ADMINIST	W71-04742
ILS, PESTICIDES, CHROMATOGRAPHY,	ADSORPTION, CHEMICAL ANALYSIS, AN	W71-06514
LOW, SATURATED FLOW, ADSORPTION,	ADSORPTION, ION TRANSPORT.: /ED F	W70-10058
NSATURATED FLOW, SATURATED FLOW,	ADSORPTION, ADSORPTION, ION TRANS	W70-10058
MENT, INFILTRATION, PERCOLATION,	ADSORPTION, FILTRATION.: /ER MOVE	W69-07375
ROUNDWATER MOVEMENT, ABSORPTION,	ADSORPTION.: / SEWAGE DISPOSAL, G	W69-00652
TANTS, POLLUTANT IDENTIFICATION,	ADSORPTION, WATER CHEMISTRY, DARC	W69-02611
E, OXIDATION LAGOON, IRRIGATION,	AERATION, BIOCHEMICAL OXYGEN DEMA	W71-03542
ITIES, SEWAGE TREATMENT, SEWERS,	AERATION, MONITORING, LANDFILLS,	W71-09154
OXIDATION DITCH, SLOTTED FLOORS,	AERATOR, SPREADING, LAND DISPOSAL	W71-03542
UD, BENTHOS, HYDROGEN, BACTERIA,	AEROBIC BACTERIA, METABOLISM, CAN	W69-07838
LE, SURFACE RUNOFF, FARM WASTES,	AEROBIC CONDITIONS, INCUBATION.: /	W69-09721
IFICIAL RECHARGE, LEGAL ASPECTS,	AESTHETICS, AQUIFERS, SOIL WATER	W69-08620
ERMITS, DRILLING, ADMINISTRATIVE	AGENCIES, ADMINISTRATION, GROUNDW	W71-04742
LUTION TREATMENT, ADMINISTRATIVE	AGENCIES, LEGISLATI: /, WATER POL	W71-10446
NT, WELL PERMITS, ADMINISTRATIVE	AGENCIES, CONTROL, REGULATION, AQ	W71-10157
WISCONSIN, MICHIGAN, PHOSPHORUS,	AGRICULTURAL WATERSHEDS, ORGANIC	W70-04193
IMATIC CONDITIONS, INCINERATION,	AIR POLLUTION, TEMPERATURE, WASTE	W71-07118
OTTAWA SAND,	ALDRIN INFILTRATION.:	W70-01904
UTROPHICATION, *SOIL PHOSPHORUS,	ALFALFA-BROMEGRASS, SPRING THAWS,	W69-09721
SOURCES, *CORES, FIELDS, PLANTS,	ALFALFA, CEREAL CROPS, IRRIGATED	W70-04488
TER RELATIONSHIPS, PERMEABILITY,	ALGAE, DISSOLVED OXYGEN.: /OUNDWA	W71-12410
ITROGEN, *PHOSPHORUS, NUTRIENTS,	ALGAE, NITRATES, SURFACE RUNOFF,	W71-06443
INFILTRATION, INDUSTRIAL WASTES,	ALGAE, PONDS, FARM WASTES.: /GE,	W71-06435
OPHICATION, OLIGOTROPHY, SEWAGE,	ALGAE, SCUM, WEEDS, NUTRIENTS, SE	W70-04193
ARDNESS(WATER), ACIDITY, OXYGEN,	ALGAE, SELF-PURIFICATION, BACTERI	W69-07838
E, *WATER TREATMENT, *FILTATION,	ALLUVIA CHANNELS, SURFACE-GROUNDW	W71-12410
INDUCED INFILTRATION, COLIFORMS,	ALLUVIAL CHANNELS, DREDGING, EXCA	W71-02909
URCES, LEACHING, DRAINAGE WATER,	AMMONIA, DRAINAGE EFFECTS, GROUND	W71-04548
, TEMPERATURE, NITRATES, PLANTS,	AMMONIA, HARDNESS(WATER), ACIDITY	W69-07838
IVITY, WATER LEVEL FLUCTUATIONS,	AMMONIA, NEBRASKA, SOIL CONTAMINA	W71-03543
ITROGEN, *NITRATES, GROUNDWATER,	AMMONIA, PRECIPITATION, SEDIMENTS	W71-06435
N, NUTRIENTS, EFFLUENT, AQUIFER,	AMMONIA, SOIL CONTAMINATION, WATE	W71-03542
DENITRIFICATION, NITRIFICATION,	AMMONIFICATION, LEACHING, EROSION	W71-10372
ATION, CLAY LENSES, RHINE RIVER,	AMSTERDAM RHINE, POLDERS, COMPOSI	W69-07838
AGUE, MINERAL/ *TRANSFORMATIONS,	AMSTERDAM, HAARLEM, LEYDEN, THE H	W69-07838
RY TREATMENT, *SLUDGE DIGESTION,	ANAEROBIC DIGESTION, ODORS, GROUN	W71-07118
TE EXTRACTION, ATOMIC ABSORPTION	ANALYSES, CARBONATE, BICARBONATE,	W69-03197
S.W. OHIO WATER COMPANY, NETWORK	ANALYSIS.: GREAT MIAMI RIVER,	W69-02611
ON, WELLS, METHODOLOGY, CHEMICAL	ANALYSIS.: /MPLING, DATA COLLECTI	W71-11255
S, NITROGEN-CYCLE, HISTORY, SOIL	ANALYSIS, WATER TRANSFER, IRRIGAT	W71-12122
USION, / *DISPERISON, *NUMERICAL	ANALYSIS, COMPUTER PROGRAMS, DIFF	W71-09611
ETURN FLOW, *NITRAT/ *SIMULATION	ANALYSIS, *PATH OF POLLUTANTS, *R	W71-04548
, *AQUIFER CHARACTERISTICS, SOIL	ANALYSIS, TEST PROCEDURES, CHEMIC	W71-07887
MATOGGRAPHY, ADSORPTION, CHEMICAL	ANALYSIS, ANALYTICAL TECHNIQUES,	W71-06514
ER MOVEMENT, *NUMER/ *SIMULATION	ANALYSIS, *DISPERSION, *GROUNDWAT	W71-04559
GROUNDWATER MOVEMENT, *NUMERICAL	ANALYSIS, MIXING, COMPUTER PROGRA	W71-04559
NATION, MICROORGANISMS, CHEMICAL	ANALYSIS, TEMPERATURE, NITRATES,	W69-07838
EW YORK, HYDROGRAPHS, HYDROGRAPH	ANALYSIS, STATISTICAL MODELS, STA	W70-03102
*WATER POLLUTION, INFILTRATION,	ANALYTICAL TECHNIQUES, SOIL CONTA	W70-01291
, ADSORPTION, CHEMICAL ANALYSIS,	ANALYTICAL TECHNIQUES, BIOASSAY,	W71-06514



INN), SOIL MINERALS, / *KILLING,	ANIMAL MANURES, LAKE MINNETONKA(M	W70-04193
WATER), *SOIL-WATER ENVIRONMENT,	ANIONIC SURFACTANTS, SYNTHETIC DE	W70-01291
SPOK/ DRAIN FIELDS, *TEST HOLES,	ANNUAL PRECIPITATION, LEACH BED,	W69-01076
PHOSPHORUS, PHOSPHATES, RATES OF	APPLICATION, NUTRIENTS, EFFLUENT,	W71-03542
RFACE DRAINAGE, WATER MANAGEMENT(	APPLIED).: /INAGE PROGRAMS, SUBSU	W71-01932
AMFLOW, *INDU/ *WATER MANAGEMENT(	APPLIED), *CONJUNCTIVE USE, *STRE	W70-03102
EPAGE, *SUBSURFACE WATERS, PRIOR	APPROPRIATION, GROUNDWATER, UNDER	W70-08049
CE RUNOFF, REASONABLE USE, PRIOR	APPROPRIATION, WATER POLLUTION SO	W70-08050
R, *NITRATE, AQUIFER, DISCHARGE,	AQUIFER CHARACTERISTICS, EFFLUENT	W71-03543
ON, SUSPENDED LOAD, GROUNDWATER,	AQUIFER CHARACTERISTICS.: /COLATI	W70-04504
AQUIFER SWEETENING,	AQUIFER DESALINATION.::	W71-01932
INATION.::	AQUIFER SWEETENING, AQUIFER DESAL	W71-01932
PPLICATION, NUTRIENTS, EFFLUENT,	AQUIFER, AMMONIA, SOIL CONTAMINAT	W71-03542
*CATTLE, *GROUNDWATER, *NITRATE,	AQUIFER, DISCHARGE, AQUIFER CHARA	W71-03543
ER COUNTY(TEXAS), HOL/ *OGALLALA	AQUIFER, HIGH PLAINS(TEXAS), PARM	W71-12122
CURRENTS(WATER), MASS TRANSFER,	AQUIFERS.: / MATHEMATICAL MODELS,	W69-08921
UTILIZATION, PERCOLATING WATER,	AQUIFERS, HYDROGEOLOGY, GROUNDWAT	W70-00532
ARGE, LEGAL ASPECTS, AESTHETICS,	AQUIFERS, SOIL WATER MOVEMENT, GR	W69-08620
NG WATER, PERCOLATION, LEACHING,	AQUIFERS, WATER TABLE, WATER SUPP	W70-06011
TISTICAL METHODS, WATER STORAGE,	AQUIFERS, WATER REUSE, ARTIFICIAL	W70-03102
ELS, *WATER WELLS, WATER SUPPLY,	AQUIFERS, ION EXCHANGE, POLLUTANT	W69-02611
E AGENCIES, CONTROL, REGULATION,	AQUIFERS, WELL REGULATIONS, SUBSU	W71-10157
POSAL, NITRATES, EUTROPHICATION,	AQUIFERS, GROUNDWATER MOVEMENT, M	W71-01324
CHANNELS, DREDGING, EXCAVATION,	AQUIFERS, GRAVELS, AQUITARDS, PUM	W71-02909
POSAL, NITRATES, EUTROPHICATION,	AQUIFERS, GROUNDWATER MOVEMENT, M	W71-01205
GE, GROUNDWATER, SURFACE WATERS,	AQUIFERS, FLOW RATES, LEACHING.: /	W70-09637
LIC MODELS, MATHEMATICAL MODELS,	AQUIFERS, MODEL STUDIES, DRAINAGE	W71-01932
R POLLUTION, NITROGEN, NITRITES,	AQUIFERS, COLORADO, DENITRIFICATI	W71-02036
CHING, CHLORIDES, GLACIAL DRIFT,	AQUIFERS, OHIO RIVER, KENTUCKY.: /	W71-00194
NA, INDUSTRIAL WASTES, DRAINAGE,	AQUIFERS, SINKS, CITIES, SEWAGE T	W71-09154
REENS, EXCAVATION, WATER POLICY,	AQUIFERS, PERCOLATING WATER, LEG:	W71-04742
MODELS, SALINE WATER INTRUSION,	AQUIFERS, POROUS MEDIA, DIFFUSION	W71-04559
, DOMESTIC WASTES, INFILTRATION,	AQUIFORS, SANITARY ENGINEERING.: /	W69-03178
, EXCAVATION, AQUIFERS, GRAVELS,	AQUITARDS, PUMPING, WATER WELLS,	W71-02909
PHOENIX(ARIZ), SALT RIVER(	ARIZ).:	W70-04712
PHOENIX(	ARIZ), SALT RIVER(ARIZ).:	W70-04712
LUSHING MEADOWS PROJECT, PHOENIX(	ARIZONA).: /L RECHARGE PROJECT, F	W69-05328
LUSHING MEADOWS PROJECT, PHOENIX(	ARIZONA).: /L RECHARGE PROJECT, F	W69-05327
RCES, DRAINAGE, RIPARIAN RIGHTS,	ARTESIAN WELLS, DITCHES, DRAINAGE	W69-06118
ED CONDUITS, METAL PIPES, WELLS,	ARTESIAN WELLS, WATER WELLS, INFL	W70-07632
GROUNDWATER MOVEMENT, UNDERFLOW,	ARTESIAN WELLS, STREAMS, JUDICIAL	W70-08025
ION, INSTALLATION, WELL CASINGS,	ARTESIAN WELLS, WELL SCREENS, EXC	W71-04742
STORAGE, AQUIFERS, WATER REUSE,	ARTIFICIAL RECHARGE, LOW-FLOW AUG	W70-03102
L FLOW DOCTRINE, REASONABLE USE,	ARTIFICIAL USE, RIPARIAN LANDS, G	W70-02896
ICIPAL WASTES, IRRIGATION WATER,	ARTIFICIAL RECHARGE, FILTRATION,	W69-08621
ODELS, TRACERS, INJECTION WELLS,	ARTIFICIAL RECHARGE, CONVECTION,	W69-07554
LEGISLATION, LAND TENURE, LEGAL	ASPEC: /DAMAGES, HYDROLOGIC DATA,	W71-11692
AL DECISIONS, LEGISLATION, LEGAL	ASPECTS.: /S, LAND TENURE, JUDICI	W71-08055
WELLS, SUBSURFACE WATERS, LEGAL	ASPECTS.: /FACE DRAINAGE, SHALLOW	W69-06117
E, WASTE WATER(POLLUTION), LEGAL	ASPECTS.: /DUSTRIAL WASTES, SEWAG	W70-00521
S, SEEPAGE, WASTE STORAGE, LEGAL	ASPECTS.: /TCHES, DRAINAGE EFFECT	W69-06118
TER POLLUTION, POLLUTANTS, LEGAL	ASPECTS.: /PAGE, INFILTRATION, WA	W70-07632
*DAMAGES(LEGAL	ASPECTS), HYDROCARBON POLLUTION.::	W68-00627
TES, *ARTIFICIAL RECHARGE, LEGAL	ASPECTS, AESTHETICS, AQUIFERS, SO	W69-08620
ATERS, JUDICIAL DECISIONS, LEGAL	ASPECTS, ADJUDICATION PROCEDURE.::	W71-01028
OWWATER MOVEMENT, DAMAGES, LEGAL	ASPECTS, COMPENSATION, BRINES, WA	W71-03230
URCES, JUDICIAL DECISIONS, LEGAL	ASPECTS, DEEP PERCOLATION.: /N SO	W70-08050
, WATER POLLUTION EFFECTS, LEGAL	ASPECTS, JUDICIAL DECISIONS, GROU	W70-08026
OLLUTION CONTROL, DAMAGES, LEGAL	ASPECTS, JUDICIAL DECISIONS, GROU	W71-11724
TING USES, DOMESTIC WATER, LEGAL	ASPECTS, MUNICIPAL WATER, REASONA	W70-00532

EMENT, JUDICIAL DECISIONS, LEGAL	ASPECTS, REMEDIES, WELLS, DIKES,	W71-13645
WATER, JUDICIAL DECISIONS, LEGAL	ASPECTS, RIPARIAN LAND, PERCOLATI	W71-01043
ECISIONS, RELATIVE RIGHTS, LEGAL	ASPECTS, STATE GOVERNMENTS, STATE	W71-13521
, WATER POLLUTION, PRECIPITATION(	ATMOSPHERIC), SEEPAGE, INFILTRATI	W71-05094
NTROL, RESERVOIRS, PRECIPITATION(	ATMOSPHERIC).: /OLATION, FLOOD CO	W70-06102
CE ELEMENTS, CHELATE EXTRACTION,	ATOMIC ABSORPTION ANALYSES, CARBO	W69-03197
E, ARTIFICIAL RECHARGE, LOW-FLOW	AUGMENTATION.: /IFERS, WATER REUS	W70-03102
FACIES, SEWAGE EFFLUENT, C.O.D.,	B.O.D., WASTE WATERS, HYDRAULIC L	W69-03197
MYCOBACTERIUM, BACILLUS SUBTILIS,	BACILLUS MYCOIDES, BACILLUS MESEN	W69-07838
LUS SUBTILIS, BACILLUS MYCOIDES,	BACILLUS MESENTERICUS, DIATOMEA,	W69-07838
ION, PSEUDOMONAS, MYCOBACTERIUM,	BACILLUS SUBTILIS, BACILLUS MYCOI	W69-07838
SUPPLY, MUD, BENTHOS, HYDROGEN,	BACTERIA, AEROBIC BACTERIA, METAB	W69-07838
HQS, HYDROGEN, BACTERIA, AEROBIC	BACTERIA, METABOLISM, CANALS, SAN	W69-07838
MOVEM/ *WATER REUSE, *PATHOGENIC	BACTERIA, *VIRUSES, *GROUNDWATER	W69-08621
INFILTRATION, COLIFORMS, ENTERIC	BACTERIA, NITRATES, CHLORIDES, *C	W69-01076
XYGEN, ALGAE, SELF-PURIFICATION,	BACTERIOPHAGE, RESERVOIRS, SPORES	W69-07838
UPPER RIO GRANDE, SALT	BALANCE.: /	W70-08662
PIT RECHARGE, SAFE YIELD, WATER	BALANCE, HYDROGEOLOGY, DATA COLLE	W70-05466
DISSOLVED SOLIDS, LEACHING, SALT	BALANCE, PERCOLATING WATER, POLLU	W71-06063
S, IMPERVIOUS SOILS, GROUNDWATER	BARRIERS, INFILTRATION, OIL, OIL	W71-08055
GASES, CARBON DIOXIDE, METHANE,	BARRIERS, INFILTRATI: /ER SUPPLY,	W70-06011
MOVEMENT, CAPILLARY FLOW, *LAVA,	BASALTS, WATER POLLUTION SOURCES,	W69-00979
ALGAE, NITRATES, SURFACE RUNOFF,	BASE FLOW, PERCOLATION, LEACHING,	W71-06443
NG, RUSSIAN RIVER(CALIF), YAKIMA	BASIN(PACIFIC NORTHWEST), LAKE ME	W70-04504
*SUSQUEHANNA RIVER	BASIN, (N Y).:	W70-03102
IC LOADING, INFILTRATION, TUCSON	BASIN, PROCESS-RESPONSE MODEL, IN	W69-03197
JEC/ SURFACE SPREADING, RECHARGE	BASINS, EXPERIMENTAL RECHARGE PRO	W69-05328
JEC/ SURFACE SPREADING, RECHARGE	BASINS, EXPERIMENTAL RECHARGE PRO	W69-05327
IFERS, HYDROGEOLOGY, GROUNDWATER	BASINS, HYDROLOGIC CYCLE, OVERDRA	W70-00532
TION, *PONDS, *SOIL, GROUNDWATER	BASINS, WATER SUPPLY, MUD, BENTHO	W69-07838
LES, ANNUAL PRECIPITATION, LEACH	RED, SPOKANE RIVER VALLEY.: /T HO	W69-01076
RONMENT, ANIONIC SUR/ *DETERGENT	BEHAVIOR(WATER), *SOIL-WATER ENVI	W70-01291
, INFILTRATION, DOMESTIC WASTES,	BENTHIC FAUNA, INDUSTRIAL WASTES,	W71-09154
WATER BASINS, WATER SUPPLY, MUD,	BENTHOS, HYDROGEN, BACTERIA, AERO	W69-07838
ITY, POROSITY, POROUS MATERIALS,	BIBLIOGRAPHIES, DARCY'S LAW.: /BIL	W69-00651
ABSORPTION ANALYSES, CARBONATE,	BICARBONATE, FLUORIDE, NITRATE, S	W69-03197
*SUSQUEHANNA RIVER(NY),	BINGHAMTON(NY).:	W71-02909
ANALYSIS, ANALYTICAL TECHNIQUES,	BIOASSAY, SOIL STRUCTURE, INFILTR	W71-06514
AERATION, MONITORING, LANDFILLS,	BIOCHEMICAL OXYG: /MENT, SEWERS,	W71-09154
ON LAGOON, IRRIGATION, AERATION,	BIOCHEMICAL OXYGEN DEMAND, CHEMIC	W71-03542
ENTS, DENITRIFICATION, NITRITES,	BIOCHEMICAL OXYGEN DEMAND.: /TERG	W71-12084
ER, WATER LEVELS, WATER QUALITY,	BIOCHEMICAL OXYGEN DEMAND, SUSPEN	W69-07114
S, DISPERSION, SEWAGE EFFLUENTS,	BIODEGRADATION, METHODOLOGY.: /ND	W70-01291
TION SOURCES, SELF-PURIFICATION,	BIODEGRADATION.: /TS, WATER POLLU	W70-09548
PENSATION, BRINES, WATER SUPPLY,	BOUNDARIES(SURFACES), WELL CASING	W71-03230
*HYDRAULICS LABORATORY OF	BRATISLAVA(CZECHOSLOVAKIA).:	W71-01930
ES, LEGAL ASPECTS, COMPENSATION,	BRINES, WATER SUPPLY, BOUNDARIES(	W71-03230
ATION, *SOIL PHOSPHORUS, ALFALFA-	BROMEGRASS, SPRING THAWS, FERTILI	W69-09721
) , SPRINGFIELD(MO), SEWAGE PLANT	BROOKINGS(SOUTH DAKOTA).:	W69-03178
HEMICAL FACIES, SEWAGE EFFLUENT,	BYPASSES.: /(MO), WILSON CREEK(MO	W71-09154
SAN JACINTO VALLEY(	C.O.D., B.O.D., WASTE WATERS, HYD	W69-03197
WATER POLLUTION, *CENTRAL VALLEY(	CALIF).:	W70-05466
NTS, WATER MIXING, RUSSIAN RIVER(	CALIF).: *GROUND	W71-04548
ASTE DISPOSAL, DISPOSAL, WASTES,	CALIF), YAKIMA BASIN(PACIFIC NORT	W70-04504
TICAL MODELS, COMPUTER PROGRAMS,	CALIFORNIA, PERCOLATING WATER, PE	W70-06011
*HYDRAULIC POTENTIAL,	CALIFORNIA, WATER POLLUTION SOURC	W71-04548
ING, NUCLEAR EXPLOSIONS, CANALS,	CANADA.: /	W70-07766
*VENEZUELA, *NUCLEAR	CANAL CONSTRUCTION, GROUNDWATER M	W71-04882
ENGINEERING, NUCLFAR EXPLOSIONS,	CANAL EXCAVATION.: /	W71-04882
	CANALS, CANAL CONSTRUCTION, GROUN	W71-04882



A, AEROBIC BACTERIA, METABOLISM,	CANALS, SANDS, CHLORINATION, MICR	W69-07838
MANAGEMENT, LEACHATE, INFILTRATION	CAPACITY, GROUNDWATER CONTAMINATI	W68-00058
INFILTRATION PONDS,	CAPE COD(MASS), FALMOUTH(MASS).:	W71-01324
INFILTRATION PONDS,	CAPE COD(MASS), FALMOUTH(MASS).:	W71-01205
IT FLOW, *GROUND WATER MOVEMENT,	CAPILLARY FLOW, *LAVA, BASALTS, W	W69-00979
ATER TABLE, WATER SUPPLY, GASES,	CARBON DIOXIDE, METHANE, BARRIERS	W70-06011
ORGANIC	CARBON, FEEDLOTS.:	W71-08218
ION, ATOMIC ABSORPTION ANALYSES,	CARBONATE, BICARBONATE, FLUORIDE,	W69-03197
, INSPECTION, INSTALLATION, WELL	CASINGS, ARTESIAN WELLS, WELL SCR	W71-04742
ESHWATER INTERFACES, WELLS, WELL	CASINGS, GROUNDWATER, WATER SUPPL	W71-01028
PPLY, BOUNDARIES(SURFACES), WELL	CASINGS, SALINE WATER, WELLS, SEE	W71-03230
	CATTLE WASTES, FEEDLOT WASTES.:	W70-00665
	CATTLE, HOGS, NITROGEN, NITRATE,	W71-03542
ECIPITATION, POTASSIUM, POULTRY,	CELLULOSE, HYDROGEN ION CONCENTRA	W68-01269
, LEACHING, RUNOFF, GROUNDWATER,	CEMETERIES.:	W70-08049
	CEREAL CROPS, IRRIGATED LAND, COL	W70-04488
*CORES, FIELDS, PLANTS, ALFALFA,	CESSPOOLS, SEPTIC TANKS, SULFATES	W68-01010
GRADATION, SOIL DISPOSAL FIELDS,	CESSPOOLS, SEWAGE DISPOSAL, GROUND	W69-00652
N COMPOUNDS, SOIL CONTAMINATION,	CESSPOOLS, SEWAGE DISPOSAL, DOMES	W70-08049
SOURCES, MINE WATER, OIL WASTES,	CHANGE.:	W70-06102
CLIMATIC	CHANNELS, DREDGING, EXCAVATION, A	W71-02909
INFILTRATION, COLIFORMS, ALLUVIAL	CHANNELS, SURFACE-GROUNDWATER REL	W71-12410
R TREATMENT, *FILTATION, ALLUVIA	CHARACTERISTICS, EFFLUENT STREAM,	W71-03543
ATE, AQUIFER, DISCHARGE, AQUIFER	CHARACTERISTICS, SOIL ANALYSIS, T	W71-07887
NTS, *SOILS, *LEACHING, *AQUIFER	CHARACTERISTICS.:	W70-04504
ENDED LOAD, GROUNDWATER, AQUIFER	COLATION, SUSP	W69-03197
*GROUND WATER, *TRACE ELEMENTS,	CHELATE EXTRACTION, ATOMIC ABSOPP	W70-09844
REMOVAL, *MAINE, DEICERS, ROADS,	CHEMCONTROL, SALTS, GROUNDWATER,	W71-06514
DES, CHROMATOGRAPHY, ADSORPTION,	CHEMICAL ANALYSIS, ANALYTICAL TEC	W71-11255
COLLECTION, WELLS, METHODOLOGY,	CHEMICAL ANALYSIS.:	W69-07838
S, CHLORINATION, MICROORGANISMS,	AMPLING, DATA	W71-03542
TION, BIOCHEMICAL OXYGEN DEMAND,	CHEMICAL ANALYSIS, TEMPERATURE, N	W71-07887
SOIL ANALYSIS, TEST PROCEDURES,	CHEMICAL OXYGEN DE: /GATION, AERA	W69-05370
OVERNMENTS, POLLUTION ABATEMENT,	CHEMICAL PROPERTIES, GROUNDWATER,	W69-07114
ORGANIC	CHEMICAL WASTES, WATER POLLUTION	W71-04121
CES, *GROUNDWATER, *AGRICULTURAL	CHEMICAL WASTES.:	W71-04121
LE, ENVIRONMENTAL EFFECTS, WATER	CHEMICALS, FERTILIZERS, PESTICIDE	W71-04121
SOIL WATER, SOILS, SEEPAGE, SOIL	CHEMISTRY, INFILTRATION.:	W71-08044
*HAWAII, IRRIGATION WATER, WATER	CHEMISTRY, ABSORPTION, SOIL MECHA	W69-08620
ER MOVEMENT, INFILTRATION, WATER	CHEMISTRY, SOLUTES, NITRATES, SAL	W69-02611
IDENTIFICATION, ADSORPTION, WATER	CHEMISTRY, WATER QUALITY, SOIL CO	W70-06102
TES, *LAND USE, *OKLAHOM/ *WATER	CHEMISTRY, DARCY'S LAW, PERMEABIL	W70-09844
WATER POLLUTION EFFECTS, *SODIUM	CHEMISTRY, *WATER QUALITY, *CLIMA	W71-00194
OF POLLUTANTS, ACIDS, LEACHING,	CHLORIDE, *HIGHWAY ICING, *SNOW R	W69-01076
RMS, ENTERIC BACTERIA, NITRATES,	CHLORIDES, GLACIAL DRIFT, AQUIFER	W70-01904
TORY TESTS, PERMEAMETERS, SANDS,	CHLORIDES, *CAPILLARY CONDUCTIVIT	W69-07838
ERIA, METABOLISM, CANALS, SANDS,	CHLORINATED HYDROCARBON PESTICIDE	W71-06514
ATER QUALITY, SOILS, PESTICIDES,	CHLORINATION, MICROORGANISMS, CHE	W69-07838
IATOMEA, CLADOPHORA, FLAGELLATA,	CHROMATOGRAPHY, ADSORPTION, CHEMI	W69-07838
FLAGELLATA, CILIATES, RANUNCULUS	CILIATES, RANUNCULUS CIRCINATUS,	W69-07838
STES, DRAINAGE, AQUIFERS, SINKS,	CIRCINATUS, POTAMOGETON PUSILLUS.	W71-09154
BACILLUS MESENTERICUS, DIATOMEA,	CITIES, SEWAGE TREATMENT, SEWERS,	W69-07838
YDEN, THE HAGUE, MINERALIZATION,	CLADOPHORA, FLAGELLATA, CILIATES,	W69-07838
	CLAY LENSES, RHINE RIVER, AMSTERD	W70-06102
	CLIMATIC CHANGE.:	W71-07118
ATER, EVAPORATION, INFILTRATION,	CLIMATIC CONDITIONS, INCINERATION	W69-00979
HAGAN-POISEUILLE FLOW,	CLOGGING.:	W69-00979
WATER, *PERMEABILITY, POROSITY,	CLOSED CONDUIT FLOW, *GROUND WATE	W70-07632
WATER POLLUTION SOURCES, PIPES,	CLOSED CONDUITS, METAL PIPES, WFL	W71-01324
INFILTRATION PONDS, CAPE	COD(MASS), FALMOUTH(MASS).:	W71-01205
INFILTRATION PONDS, CAPE	COD(MASS), FALMOUTH(MASS).:	W71-02909
LLUTANTS, *INDUCED INFILTRATION,	COLIFORMS, ALLUVIAL CHANNELS, DRE	

NTS, GROUNDWATER, *INFILTRATION,	COLIFORMS, ENTERIC BACTERIA, NITR	W69-01076
, DISCHARGE(WATER), ON-SITE DATA	COLLECTIONS, UNDERFLOW.: /UREMENT	W70-07766
ATER BALANCE, HYDROGEOLOGY, DATA	COLLECTIONS, HYDROLOGIC DATA, GRO	W70-05466
T, FLOW PROFILES, SAMPLING, DATA	COLLECTION, WELLS, METHODOLOGY, C	W71-11255
DRAINAGE.: STATE	COLLEGE(PENN), SANITARY LANDFILL	W71-01204
TS, CORRALS, SOUTH PLATTE VALLEY(	COLO).: NATIVE GRASSES, FEEDLO	W70-04488
A, CEREAL CROPS, IRRIGATED LAND,	COLORADO, GROUNDWATER, PERCOLATIO	W70-04488
N, NITROGEN, NITRITES, AQUIFERS,	COLORADO, DENITRIFICATION, WATER	W71-02036
OGY, GROUNDWATER, WATER QUALITY,	COMPACTION, COMPRESSIBILITY, SOLI	W71-08907
EAT MIAMI RIVER, S.W. OHIO WATER	COMPANY, NETWORK ANALYSIS.: GR	W69-02611
OVEMENT, DAMAGES, LEGAL ASPECTS,	COMPENSATION, BRINES, WATER SUPPL	W71-03230
SURFACE RUNOFF, RIPARIAN RIGHTS,	COMPETING USES, DOMESTIC WATER, L	W70-00532
RIVER, AMSTERDAM RHINE, POLDERS,	COMPOSITION, PSEUDOMONAS, MYCOBAC	W69-07838
L CONTAMINATION EFFECTS, ORGANIC	COMPOUNDS, DISPERSION, SEWAGE EFF	W70-01291
DETERGENTS, POLLUTANTS, NITROGEN	COMPOUNDS, SOIL CONTAMINATION, CE	W69-00652
, DARCY'S LAW, TIME LAG, NITROGEN	COMPOUNDS, NITRATES, DISCHARGE ME	W70-07766
ION, *WATER QUALITY, / *NITROGEN	COMPOUNDS, *POLLUTION IDENTIFICAT	W71-12122
ATER, WATER QUALITY, COMPACTION,	COMPRESSIBILITY, SOLID WASTES, IN	W71-08907
YSIS, MIXING, COMPUTER PROGRAMS,	COMPUTER MODELS, MATHEMATICAL MOD	W71-04559
DISPERSION, *NUMERICAL ANALYSIS,	COMPUTER PROGRAMS, DIFFUSION, MIX	W71-09611
*NITRATES, MATHEMATICAL MODELS,	COMPUTER PROGRAMS, CALIFORNIA, WA	W71-04548
NT, *NUMERICAL ANALYSIS, MIXING,	COMPUTER PROGRAMS, COMPUTER MODEL	W71-04559
F POLLUTANTS, DIGITAL COMPUTERS,	COMPUTER PROGRAMS.: /TION, PATH O	W69-03237
ION, PATH OF POLLUTANTS, DIGITAL	COMPUTERS, COMPUTER PROGRAMS.: /T	W69-03237
NDWATER, CELLULOSE, HYDROGEN ION	CONCENTRATION, TOXICITY.: /, GROU	W68-01269
ACE RUNOFF, FARM WASTES, AEROBIC	CONDITIONS, INCUBATION.: /E, SURF	W69-09721
PORATION, INFILTRATION, CLIMATIC	CONDITIONS, INCINERATION, AIR POL	W71-07118
M WASTES, GROUNDWATER, HYDRAULIC	CONDUCTIVITY.: /ES, LEACHING, FAR	W71-08218
NITRATES, CHLORIDES, *CAPILLARY	CONDUCTIVITY, SOIL MOISTURE.: /A,	W69-01076
INFILTRATION, WASTES, HYDRAULIC	CONDUCTIVITY, SUBSURFACE DRAINAGE	W70-07766
*PERMEABILITY, POROSITY, CLOSED	CONDUIT FLOW, *GROUND WATER MOVEM	W69-00979
POLLUTION SOURCES, PIPES, CLOSED	CONDUITS, METAL PIPES, WELLS, ART	W70-07632
SOIL WATER, SALINE WATER, WATER	CONSERVATION, IRRIGATION PRACTICE	W71-06063
LUTION, PERCOLATING WATER, WATER	CONSERVATION, ADMINISTRATION.: /L	W71-10157
ONS, *WATER WELLS, *LEGISLATION,	CONSTRUCTION, PUMPS, PUMPING, STA	W71-04742
UCLEAR EXPLOSIONS, CANALS, CANAL	CONSTRUCTION, GROUNDWATER MOVEMEN	W71-04882
R MOVEMENT, SUBSURFACE MOVEMENT,	CONSUMPTIVE USE, DOMESTIC WATER,	W71-13645
RATES, WATER/ *FARM WASTES, *SOIL	CONTAMINATION, *FERTILIZERS, *NIT	W71-02036
EFFLUENT, AQUIFER, AMMONIA, SOIL	CONTAMINATION, WATER POLLUTION, W	W71-03542
UATIONS, AMMONIA, NEBRASKA, SOIL	CONTAMINATION, OBSERVATION WELLS,	W71-03543
UTANTS, NITROGEN COMPOUNDS, SOIL	CONTAMINATION, CESSPOOLS, SEWAGE	W69-00652
FILTRATION CAPACITY, GROUNDWATER	CONTAMINATION.: /NT, LEACHATE, IN	W68-00058
R CHEMISTRY, WATER QUALITY, SOIL	CONTAMINATION.: /FILTRATION, WATE	W69-08620
TION, SOIL DISPOSAL FIELDS, SOIL	CONTAMINATION, SOIL PHYSICAL PROP	W69-08621
ION, ANALYTICAL TECHNIQUES, SOIL	CONTAMINATION EFFECTS, ORGANIC CO	W70-01291
ORAGE, SOIL PROPERTIES, MOISTURE	CONTENT, POLLUTANTS, SOIL WATER M	W68-00058
*SEEPAGE	CONTROL.: CONTROL, *POLLUTION ABATEMENT, ST	W70-06011
ATER POLLUTION, *WATER POLLUTION	CONTROL, *WATER POLLUTION SOURCES	W70-02896
LUTION EFFECTS, *WATER POLLUTION	CONTROL, DAMAGES, LEGAL ASPECTS,	W71-09154
D WATER QUALITY, WATER POLLUTION	CONTROL, DOMESTIC WASTES, INFILTR	W71-11724
CONTROL, LEACHING, WATER QUALITY	CONTROL, GROUNDWATER, SEPTIC TANK	W69-03178
ITROGEN, RUNOFF, WATER POLLUTION	CONTROL, LEACHING, WATER QUALITY	W71-10372
WASTE DILUTION, WATER POLLUTION	CONTROL, PUBLIC HEALTH, ENVIRONME	W69-03178
LLUTION SOURCES, WATER POLLUTION	CONTROL, POLLUTION ABATEMENT, SUB	W70-06011
ATER POLLUTION, *WATER POLLUTION	CONTROL, REGULATION, AQUIFERS, WE	W71-10446
ERMITTS, ADMINISTRATIVE AGENCIES,	CONTROL, RESERVOIRS, PRECIPITATIO	W71-10157
TRANSPIRATION, PERCOLATION, FLOOD	CONTROL, SURVEYS, LEACHING, GEOLO	W70-06102
, *HYDROGEOLOGY, WATER POLLUTION	CONTROL, WATER POLLUTION TREATMEN	W70-07193
SURFACE WATERS, *WATER POLLUTION	CONTROL, WATER POLLUTION TREATMEN	W71-10157
AL WASTES, SEWAGE, WATER QUALITY		W71-10446



EQUATIONS, MATHEMATICAL MODELS,	CONVECTION, NUCLEAR POWERPLANTS.:	W71-11356
UIFERS, POROUS MEDIA, DIFFUSION,	CONVECTION, DIFFUSIVITY.:	W71-04559
SPOS/ *CONTAMINATION, *AQUIFERS,	CONVECTION, *DISPERSION, WASTE DI	W69-00651
TION WELLS, ARTIFICIAL RECHARGE,	CONVECTION, MIXING, FLOW, POROUS	W69-07554
OTS, RESIDUAL ACCUMULATION, SOIL	CORES.:	W71-10372
).:	CORRALS, SOUTH PLATTE VALLEY(COLO	W70-04488
NATIVE GRASSES, FEEDLOTS,	COUNTY(OHIO).:	W70-07193
STARK	COUNTY(TEXAS), HOLLY SUGAR STUDIE	W71-12122
IFER, HIGH PLAINS(TEXAS), PARMER	CREEK(MO), SPRINGFIELD(MO), SEWAG	W71-09154
RUNOFF, JAMES RIVER(MO), WILSON	CROPS, IRRIGATED LAND, COLORADO,	W70-04488
FIELDS, PLANTS, ALFALFA, CEREAL	CURRENTS(WATER), MASS TRANSFER, A	W69-08921
POLLUTANTS, MATHEMATICAL MODELS,	CYCLE.:	W71-07118
*SUPERNATANT RE-	CYCLE, HISTORY, SOIL ANALYSIS, PA	W71-12122
TER, NITRATE, NITRITES, NITROGEN-	CYCLE, OVERDRAFT, WELLS, SURFACE-	W70-00532
, GROUNDWATER BASINS, HYDROLOGIC	CYCLE, PHOSPHORUS, REGULATION, GR	W71-12084
ES, NITROGEN, NITRATES, NITROGEN	CZECHOSLOVAKIA).:	W71-01930
RAULICS LABORATORY OF BRATISLAVA(	*HYD	W69-03197
CAL FACIES, SEWAGE EFFLUENT, C.O.	D., B.O.D., WASTE WATERS, HYDRAUL	W69-03197
ES, SEWAGE EFFLUENT, C.O.D., B.O.	D., WASTE WATERS, HYDRAULIC LOADI	W69-03197
, INSTRUMENTATION, HYDROCHEMICAL	D: /BASIN, PROCESS-RESPONSE MODEL	W70-00532
RFACE-GROUNDWATER RELATIONSHIPS,	DA: / CYCLE, OVERDRAFT, WELLS, SU	W69-03178
BROOKINGS(SOUTH	DAKOTA).:	W68-00627
S, WATER WELLS, WATER POLLUTION,	DAMAGE, JUDICIAL DECISIONS, GROUND	W71-11692
WASTES, PULP AND PAPER INDUSTRY,	DAMAGES, HYDROLOGIC DATA, LEGISLA	W71-11724
UALITY, WATER POLLUTION CONTROL,	DAMAGES, LEGAL ASPECTS, JUDICIAL	W71-03230
ILL HOLES, GROUNDWATER MOVEMENT,	DAMAGES, LEGAL ASPECTS, COMPENSAT	W71-08055
IRS, DRILLING EQUIPMENT, LEASES,	DAMAGES, LAND TENURE, JUDICIAL OF	W70-07631
UDICIAL DECISIONS, OIL, SEEPAGE,	DAMAGES, OIL INDUSTRY, STORAGE TA	W71-03230
S, SALINE WATER, WELLS, SEEPAGE,	DAMAGES, REMEDIES.:	W70-08049
BSURFACE RUNOFF, REASONABLE USE,	/ WELL CASING	W69-02611
ON, ADSORPTION, WATER CHEMISTRY,	DAMAGES, SURFACE RUNOFF, GASOLINE	W69-00651
OROUS MATERIALS, BIBLIOGRAPHIES,	DARCY'S LAW, PERMEABILITY, *RIVER	W70-07766
NAGE, TRANSMISSIVITY, HEAD LOSS,	DARCYS LAW.:	W70-05466
LD, WATER BALANCE, HYDROGEOLOGY,	/BILITY, POROSITY, P	W70-07766
EMENT, DISCHARGE(WATER), ON-SITE	DARCYS LAW, TIME LAG, NITROGEN CO	W71-11255
UMENT, FLOW PROFILES, SAMPLING,	DATA COLLECTIONS, HYDROLOGIC DATA	W70-06322
TIGATIONS, *ILLINOIS, HYDROLOGIC	DATA COLLECTIONS, UNDERFLOW.:	W70-05466
GY, DATA COLLECTIONS, HYDROLOGIC	DATA COLLECTION, WELLS, METHODOLO	W71-11692
ER INDUSTRY, DAMAGES, HYDROLOGIC	DATA, GEOLOGY, HYDROLOGY, HYDROGE	W71-03542
L OXYGEN DEMAND, CHEMICAL OXYGEN	DATA, GROUNDWATER MOVEMENT, WATER	W71-01043
, STREAMS, GROUNDWATER, JUDICIAL	DATA, LEGISLATION, LAND TENURE, L	W71-01028
TER, SUBSURFACE WATERS, JUDICIAL	DE: /GATION, AERATION, BIOCHEMICA	W70-08050
ATER POLLUTION SOURCES, JUDICIAL	DECISIONS, LEGAL ASPECTS, RIPARIA	W71-11724
DAMAGES, LEGAL ASPECTS, JUDICIAL	DECISIONS, LEGAL ASPECTS, ADJUDIC	W71-13645
R, POLLUTION ABATEMENT, JUDICIAL	DECISIONS, LEGAL ASPECTS, DEEP PE	W71-13521
EDIES, WATER POLLUTION, JUDICIAL	DECISIONS, GROUND: /TION CONTROL,	W70-08026
, DAMAGES, LAND TENURE, JUDICIAL	DECISIONS, LEGAL ASPECTS, REMEDIE	W70-07631
EFFECTS, LEGAL ASPECTS, JUDICIAL	DECISIONS, RELATIVE RIGHTS, LEGAL	W70-08025
DERSEEPAGE, *POLLUTION, JUDICIAL	DECISIONS, LEGISLATION, LEGAL ASP	W70-07632
RTESIAN WELLS, STREAMS, JUDICIAL	DECISIONS, GROUNDWATER MOVEMENT,	W68-00627
, *PIPELINES, *LEAKAGE, JUDICIAL	DECISIONS, OIL, SEEPAGE, DAMAGES,	W69-06118
ATER POLLUTION, DAMAGE, JUDICIAL	DECISIONS, POLLUTION ABATEMENT, P	W69-06117
*SALINE WATER, *WELLS, JUDICIAL	DECISIONS, OIL, OIL INDUSTRY, SUR	W70-00521
ATER POLLUTION SOURCES, JUDICIAL	DECISIONS, GROUND WATER, PATH OF	W69-00248
FACE RUNOFF, SUBSURFACE STREAMS,	DECISIONS, OIL WASTES, WATER QUAL	W70-08050
SHIPS, DRAINAGE EFFECTS, DRAINS,	DECISIONS, FUELS, WELLS, WATER PO	W70-09844
DICIAL DECISIONS, LEGAL ASPECTS,	DEEP PERCOLATION, GROUND WATER MO	W71-12084
AY ICING, *SNOW REMOVAL, *MAINE,	DEEP PERCOLATION, EVAPOTRANSPIRAT	W71-03542
ON, NITRITES, BIOCHEMICAL OXYGEN	DEEP PERCOLATION.:	W68-01269
ON, AERATION, BIOCHEMICAL OXYGEN	/N SOURCES, JU	
K, *LIGNINS, *BIOCHEMICAL OXYGEN	DEICERS, ROADS, CHEMCONTROL, SALT	
	DEMAND.:	
	/TERGENTS, DENITRIFICATI	
	DEMAND, CHEMICAL OXYGEN DE: /GATI	
	DEMAND, LEACHING, RUNOFF, GROUNDW	

ATER QUALITY, BIOCHEMICAL OXYGEN	DEMAND, SUSPENDED LOAD.: /VELS, W	W69-07114
OUND WATER RECHARGE, IRRIGATION,	DENITRIFICATION, ECONOMICS.: /*GR	W69-05327
OUND WATER RECHARGE, IRRIGATION,	DENITRIFICATION, ECONOMICS.: /*GR	W69-05328
N, NITRITES, AQUIFERS, COLORADO,	DENITRIFICATION, WATER TABLE, PER	W71-02036
R, IRRIGATION EFFECTS, LEACHING,	DENITRIFICATION, RIVER FLOW, WATE	W70-08662
N, DRAINAGE EFFECTS, DETERGENTS,	DENITRIFICATION, NITRITES, BIOCHE	W71-12084
ILIZERS, FARM WASTES, NUTRIENTS,	DENITRIFICATION, NITRIFICATION, A	W71-10372
MONIA, PRECIPITATION, SEDIMENTS,	DENITRIFICATION, RUNOFF, UREAS, F	W71-06435
AQUIFER SWEETENING, AQUIFER	DESALINATION.: /	W71-01932
UTROPHICATION, DRAINAGE EFFECTS,	DETERGENTS, DENITRIFICATION, NITR	W71-12084
, ANIONIC SURFACTANTS, SYNTHETIC	DETERGENTS.: /L-WATER ENVIRONMENT	W70-01291
PERCOLATING WATER, INFILTRATION,	DETERGENTS, POLLUTANTS, NITROGEN	W69-00652
DWATER MOVEMENT, WATER RESOURCES	DEVELOPMENT, RECLAIMED WATER.: /N	W70-04712
MYCOIDES, BACILLUS MESPENTERICUS,	DIATOMEA, CLADOPHORA, FLAGELLATA,	W69-07838
*FINITE	DIFFERENCE METHOD.: /	W71-09611
USSR, RADIAL	DIFFUSION EQUATIONS.: /	W69-03212
TEMPERATURE PROFILES, THERMAL	DIFFUSION.: /	W69-00651
ALITY, PERCOLATION, PENETRATION,	DIFFUSION, SEEPAGE.: /ED WATER QU	W70-08025
LATING WATER, SUBSURFACE WATERS,	DIFFUSION, GRAVITATIONAL WATER, S	W70-08026
TRUSION, AQUIFERS, POROUS MEDIA,	DIFFUSION, CONVECTION, DIFFUSIVIT	W71-04559
CAL ANALYSIS, COMPUTER PROGRAMS,	DIFFUSION, MIXING, GROUNDWATER MO	W71-09611
ODYNAMICS, FLOW, MASS TRANSFER,	DIFFUSION, MIXING, DISPERSION.: /	W71-11776
ENT, *DISPERSION, *ION EXCHANGE,	DIFFUSION, MIXING, RADIOACTIVITY,	W71-11356
US MEDIA, DIFFUSION, CONVECTION,	DIFFUSIVITY.: /ON, AQUIFERS, PORO	W71-04559
SPHERICAL	DIFFUSIVITY.: /	W70-10058
NS, *TERTIARY TREATMENT, *SLUDGE	DIGESTION, ANAEROBIC DIGESTION, O	W71-07118
NT, *SLUDGE DIGESTION, ANAEROBIC	DIGESTION, ODORS, GROUNDWATER, EV	W71-07118
R POLLUTION, PATH OF POLLUTANTS,	DIGITAL COMPUTERS, COMPUTER PROGR	W69-03237
LEGAL ASPECTS, REMEDIES, WELLS,	DIKES, SHALLOW WELLS.: /ECISIONS,	W71-13645
*LANDFILL, SANITARY FILL, WASTE	DILUTION, WATER POLLUTION CONTROL	W69-03178
BLE, WATER SUPPLY, GASES, CARBON	DIOXIDE, METHANE, BARRIERS, INFIL	W70-06011
G, NITROGEN COMPOUNDS, NITRATES,	DISCHARGE MEASUREMENT, DISCHARGE(	W70-07766
NITRATES, DISCHARGE MEASUREMENT,	DISCHARGE(WATER), ON-SITE DATA CO	W70-07766
TER QUALITY POLLUTION, RECHARGE,	DISCHARGE, GROUNDWATER, SURFACE W	W70-09637
*GROUNDWATER, *NITRATE, AQUIFER,	DISCHARGE, AQUIFER CHARACTERISTIC	W71-03543
ASS TRANSFER, DIFFUSION, MIXING,	DISPERSION.: /ODYNAMICS, FLOW, M	W71-11776
LONGITUDINAL	DISPERSION.: /	W71-04559
TION EFFECTS, ORGANIC COMPOUNDS,	DISPERSION, SEWAGE EFFLUENTS, BIO	W70-01291
INFILTRATION, PERCOLATION, SOIL	DISPOSAL FIELDS, SOIL CONTAMINATI	W69-08621
C LOADING, *BIODEGRADATION, SOIL	DISPOSAL FIELDS, CESSPOOLS, SEPTI	W68-01010
	DISPOSAL WELLS.: /	W69-07554
SPRAY	DISPOSAL.: /	W69-07375
FLOORS, AERATOR, SPREADING, LAND	DISPOSAL.: /ATION DITCH, SLOTTED	W71-03542
S, SEWAGE TREATMENT, WASTE WATER	DISPOSAL, NITRATES, EUTROPHICATIO	W71-01205
PREADING, *MONITORING, / *SEWAGE	DISPOSAL, *INFILTRATION, *WATER S	W71-01205
ODELS, MIXING, RADIOACTIVE WASTE	DISPOSAL, UNSATURATED FLOW, SATUR	W70-10058
S, SEWAGE TREATMENT, WASTE WATER	DISPOSAL, NITRATES, EUTROPHICATIO	W71-01324
TE TREATMENT, *UNITED ST/ *WASTE	DISPOSAL, *MUNICIPAL WASTES, *WAS	W71-08907
ANIZATION, *SOLID WASTES, *WASTE	DISPOSAL, SURFACE WASTERS, GROUND	W71-05094
T, IMPAIRED WATER QUALITY, WASTE	DISPOSAL, GARBAGE DUMPS.: /AGEMEN	W71-07194
ANTS, PERCOLATION, WASTES, WASTE	DISPOSAL, LEGISLATION, WELLS, IMP	W71-11724
UTION EFFECTS, POLLUTANTS, WASTE	DISPOSAL, GROUNDWATER, PERCOLATIN	W71-11692
WASTES, SPRINKLER / *WASTE WATER	DISPOSAL, *IRRIGATION, *CHEMICAL	W69-07114
W/ SEWAGE EFFLUENT, *WASTE WATER	DISPOSAL, WASTE WATER TREATMENT,	W69-05328
IRRIGATION, HYDRO/ *WASTE WATER	DISPOSAL, *IRRIGATION, *SPRINKLER	W69-07375
W/ SEWAGE EFFLUENT, *WASTE WATER	DISPOSAL, WASTE WATER TREATMENT,	W69-05327
GRADATION, SOIL DISPOSAL/ SEWAGE	DISPOSAL, ORGANIC LOADING, *BIODE	W68-01010
ALITY, *LANDFILL, SANITA/ *WASTE	DISPOSAL, *GROUNDWATER, *WATER QU	W69-03178
RADIOISOTOPES, RADIOACTIVE WASTE	DISPOSAL, GROUNDWATER MOVEMENT, P	W69-02681
LLUTANTS. INJECTION WELLS, WASTE	DISPOSAL, SUBSURFACE WATERS.: /PO	W69-03212



CONTAMINATION, CESSPOOLS, SEWAGE	DISPOSAL, GROUNDWATER MOVEMENT, A	W69-00652
, CONVECTION, *DISPERSION, WASTE	DISPOSAL, THERMAL PROPERTIES, MOD	W69-00651
ENVIRONMENTAL SANITATION, WASTE	DISPOSAL, DISPOSAL, WASTES, CALIF	W70-06011
R, OIL WASTES, CESSPOOLS, SEWAGE	DISPOSAL, DOMESTIC WASTES, FARM W	W70-08049
LLS, *PATH OF POLLUTANTS/ *WASTE	DISPOSAL, *GARBAGE DUMPS, *LANDFI	W70-06572
RATION, SEWAGE TREATMENT, SEWAGE	DISPOSAL, HYDROGEOLOGY, GROUNDWAT	W70-04712
NTAL SANITATION, WASTE DISPOSAL,	DISPOSAL, WASTES, CALIFORNIA, PER	W70-06011
LLUTION CONT/ *LANDFILLS, *WASTE	DISPOSAL, *HYDROGEOLOGY, WATER PO	W70-07193
, RUSSI/ *AGRICULTURAL DRAINAGE,	DISSOLVED NUTRIENTS, WATER MIXING	W70-04504
ATIONSHIPS, PERMEABILITY, ALGAE,	DISSOLVED OXYGEN.: /OUNDWATER REL	W71-12410
QUALITY, SALINITY, GROUNDWATER,	DISSOLVED SOLIDS, LEACHING, SALT	W71-06063
PREADING, / *FEEDLOTS, OXIDATION	DITCH, SLOTTED FLOORS, AERATOR, S	W71-03542
RIPARIAN RIGHTS, ARTESIAN WELLS,	DITCHES, DRAINAGE EFFECTS, SEEPAG	W69-06118
IGHTS, NATURAL USE, NATURAL FLOW	DOCTRINE, REASONABLE USE, ARTIFIC	W70-02896
ATER, PERCOLATING WATER, EMINENT	DOMAIN, PUBLIC HEALTH, DOMESTIC W	W70-02896
, EMINENT DOMAIN, PUBLIC HEALTH,	DOMESTIC WATER, INDUSTRIAL WATE: /	W70-02896
TES, CESSPOOLS, SEWAGE DISPOSAL,	DOMESTIC WASTES, FARM WASTES, MUN	W70-08049
RIPARIAN RIGHTS, COMPETING USFS,	DOMESTIC WATER, LEGAL ASPECTS, MU	W70-00532
LEACHING, WATER QUALITY CONTROL,	DOMESTIC WASTES, INFILTRATION, AQ	W69-03178
EMENT, LIMESTONES, INFILTRATION,	DOMESTIC WASTES, BENTHIC FAUNA, I	W71-09154
RFACE MOVEMENT, CONSUMPTIVE USE,	DOMESTIC WATER, POLLUTION ABATEME	W71-13645
PRECIPITATION, LEACH BED, SPOK/	DRAIN FIELDS, *TEST HOLES, ANNUAL	W69-01076
RFACE-GROUNDWATER RELATIONSHIPS,	DRAINAGE EFFECTS, DRAINS, DEEP PE	W69-00248
RIGHTS, ARTESIAN WELLS, DITCHES,	DRAINAGE EFFECTS, SEEPAGE, WASTE	W69-06118
FF, PERCOLATION, EUTROPHICATION,	DRAINAGE EFFECTS, DETERGENTS, DEN	W71-12084
ACHING, DRAINAGE WATER, AMMONIA,	DRAINAGE EFFECTS, GROUNDWATER, WA	W71-04548
MODELS, AQUIFERS, MODEL STUDIES,	DRAINAGE PROGRAMS, SUBSURFACE DRA	W71-01932
SYSTEMS, *GROUNDWATER MOVEMENT,	DRAINAGE SYSTEMS, HYDRAULIC MODEL	W71-01932
TER POLLUTION SOURCES, LEACHING,	DRAINAGE WATER, AMMONIA, DRAINAGE	W71-04548
IO GRANDE, *SUBSURFACE DRAINAGE,	DRAINAGE WATER, SALINITY, FERTILI	W70-08662
ION, RUNOFF, UREAS, FERTILIZERS,	DRAINAGE WATER, IRRIGATION, RETUR	W71-06435
, WATER POLLUTION, SNOW, RUNOFF,	DRAINAGE WATER, GRASSLANDS, SOIL,	W70-04193
COLLEGE(PENN), SANITARY LANDFILL	DRAINAGE.: STATE	W71-01204
TROGEN, *RIO GRANDE, *SUBSURFACE	DRAINAGE, DRAINAGE WATER, SALINIT	W70-08662
NSPORT, PENNSYLVANIA, SUBSURFACE	DRAINAGE, WATER QUALITY, WATER PO	W71-01204
S, DRAINAGE PROGRAMS, SUBSURFACE	DRAINAGE, WATER MANAGEMENT(APPLIE	W71-01932
TY, PARTICULATE F/ *AGRICULTURAL	DRAINAGE, LAKE METABOLISM, MORILI	W71-06443
ASE FLOW, PERCOLATION, LEACHING,	DRAINAGE, FARM WASTES, SOIL MANAG	W71-06443
ENTHIC FAUNA, INDUSTRIAL WASTES,	DRAINAGE, AQUIFERS, SINKS, CITIES	W71-09154
RS, WELL REGULATIONS, SUBSURFACE	DRAINAGE, WASTE TREATMENT, WASTE	W71-10157
ICULTURAL WATERSHED, *SUBSURFACE	DRAINAGE, *DRAINAGE, *EUTROPHICAT	W70-04504
DRAULIC CONDUCTIVITY, SUBSURFACE	DRAINAGE, TRANSMISSIVITY, HEAD LO	W70-07766
TER MIXING, RUSSI/ *AGRICULTURAL	DRAINAGE, DISSOLVED NUTRIENTS, WA	W70-04504
S, OIL, OIL INDUSTRY, SUBSURFACE	DRAINAGE, WATER POLLUTION SOURCES	W70-07632
USTRY, STORAGE TANKS, SUBSURFACE	DRAINAGE, UNDERFLOW, UNDERGROUND	W70-07631
LLS, GROUNDWATER, WATER SOURCES,	DRAINAGE, RIPARIAN RIGHTS, ARTESI	W69-06118
LATIONS, PERCOLATION, SUBSURFACE	DRAINAGE, SHALLOW WELLS, SUBSURFA	W69-06117
EVAPOTRANSPIRATION, *LANDFILLS,	DRAINAGE, SANITARY ENGINEERING, *	W68-00058
RELATIONSHIPS, DRAINAGE EFFECTS,	DRAINS, DEEP PERCOLATION, EVAPOTR	W69-00248
N, COLIFORMS, ALLUVIAL CHANNELS,	DREDGING, EXCAVATION, AQUIFERS, G	W71-02909
DS, LEACHING, CHLORIDES, GLACIAL	DRIFT, AQUIFERS, OHIO RIVER, KENT	W71-00194
INTERFACES, MIXING, PENETRATION,	DRILL HOLES, GROUNDWATER MOVEMENT	W71-03230
L WELLS, *GROUNDWATER, *SEEPAGE,	DRILL HOLES, OILY WATER, GROUNDWA	W71-08055
FILTRATION, OIL, OIL RESERVOIRS,	DRILLING EQUIPMENT, LEASES, DAMAG	W71-08055
DARDS, REGULATION, WELL PERMITS,	DRILLING, ADMINISTRATIVE AGENCIES	W71-04742
USTRY, PUBLIC HEALTH, OIL WELLS,	DRILLING, OIL FIELDS, SALINE WATE	W71-01028
GROUNDWATER, PERCOLATING WATERS,	DRILLING, OIL WELLS, WATER SUPPLY	W71-13521
TRITIATED WATER(TRACER), MINE	DUMP LEACHING.: /AGEMENT, IMPAIRED WATER	W71-11255
QUALITY, WASTE DISPOSAL, GARBAGE	DUMPS.: /AGEMENT, IMPAIRED WATER	W71-07194
*LEACHING, *LANDFILLS, *GARBAGE	DUMPS, *GROUNDWATER MOVEMENT, KAR	W71-01204

TANTS/ *WASTE DISPOSAL, *GARBAGE	DUMPS, *LANDFILLS, *PATH OF POLLU	W70-06572
DFILLS, *WATER POLLUTION, *WASTE	DUMPS, *SOLID WASTES, *LEACHING,	W71-07194
CE WASTERS, GROUNDWATER, GARBAGE	DUMPS, LANDFILLS, WASTE DUMPS, WA	W71-05094
CERS, *LEACHING, *COPPER, *WASTE	DUMPS, MINE WASTES, MINING, GROUND	W71-11255
ES, WASTES, GARBAGE DUMPS, WASTE	DUMPS, WASTE STORAGE, SOIL PROPER	W68-00058
S, SOLID WASTES, WASTES, GARBAGE	DUMPS, WASTE DUMPS, WASTE STORAGE	W68-00058
GARBAGE DUMPS, LANDFILLS, WASTE	DUMPS, WATER POLLUTION, PRECIPITA	W71-05094
GE, IRRIGATION, DENITRIFICATION,	ECONOMICS.: /*GROUND WATER RECHAR	W69-05327
GE, IRRIGATION, DENITRIFICATION,	ECONOMICS.: /*GROUND WATER RECHAR	W69-05328
TR/ *LAKES, STREAMS, FISH, LAND,	ECOSYSTEMS, EUTROPHICATION, OLIGO	W70-04193
ER POLLUTION, LANDFILL POLLUTION	EFFECTS.: *GROUNDWAT	W71-07194
LUTION SOURCES, *WATER POLLUTION	EFFECTS, *RETURN FLOW, *SALINE WA	W71-08044
, *WATER POLLU/ *WATER POLLUTION	EFFECTS, *WATER POLLUTION CONTROL	W71-09154
AY ICING, *SNO/ *WATER POLLUTION	EFFECTS, *SODIUM CHLORIDE, *HIGHW	W70-09844
*SOIL INVESTI/ *WATER POLLUTION	EFFECTS, *ON-SITE INVESTIGATIONS,	W70-06322
UNDWATER RELATIONSHIPS, DRAINAGE	EFFECTS, DRAINS, DEEP PERCOLATION	W69-00248
LATION, EUTROPHICATION, DRAINAGE	EFFECTS, DETERGENTS, DENITRIFICAT	W71-12084
RAINAGE WATER, AMMONIA, DRAINAGE	EFFECTS, GROUNDWATER, WATER QUALI	W71-04548
ATER, STANDARDS, WATER POLLUTION	EFFECTS, IMPAIRED WATER QUALITY,	W70-08025
ES, GROUNDWATER, WATER POLLUTION	EFFECTS, LEGAL ASPECTS, JUDICIAL	W70-08026
ILIZERS, GROUNDWATER, IRRIGATION	EFFECTS, LEACHING, DENITRIFICATIO	W70-08662
R, *SATURATED SOILS, *IRRIGATION	EFFECTS, LEACHING, WATER LEVEL FL	W71-08073
H OF POLLUTANTS, WATER POLLUTION	EFFECTS, NUTRIENTS, GROUNDWATER M	W70-00665
L TECHNIQUES, SOIL CONTAMINATION	EFFECTS, ORGANIC COMPOUNDS, DISPE	W70-01291
WATER POLLUTION, WATER POLLUTION	EFFECTS, POLLUTION ABATEMENT, PAT	W71-11724
UTION ABATEMENT, WATER POLLUTION	EFFECTS, POLLUTANTS, WASTE DISPOS	W71-11692
RELATIVE RIGHTS, WATER POLLUTION	EFFECTS, STREAMS, GROUNDWATER, JU	W71-01043
RTESIAN WELLS, DITCHES, DRAINAGE	EFFECTS, SEEPAGE, WASTE STORAGE,	W69-06118
ELLS, WATER TABLE, ENVIRONMENTAL	EFFECTS, WATER CHEMISTRY, INFILTR	W71-04121
R SUPPLY, FARMS, WATER POLLUTION	EFFECTS, WATER POLLUTION SOURCES,	W71-13521
*DETERIORATION, *WATER POLLUTION	EFFECTS, WATER QUALITY, SALINITY,	W71-06063
NGE, *WATER QUALITY, *IRRIGATION	EFFICIENCY, SIMULATION, GROUNDWAT	W71-09936
CHARGE, AQUIFER CHARACTERISTICS,	EFFLUENT STREAM, GROUNDWATER RECH	W71-03543
RATES OF APPLICATION, NUTRIENTS,	EFFLUENT, AQUIFER, AMMONIA, SOIL	W71-03542
WASTE WATER TREATMENT, W/ SEWAGE	EFFLUENT, *WASTE WATER DISPOSAL,	W69-05328
WASTE WATER TREATMENT, W/ SEWAGE	EFFLUENT, *WASTE WATER DISPOSAL,	W69-05327
GE, HYDROCHEMICAL FACIES, SEWAGE	EFFLUENT, C.O.D., B.O.D., WASTE W	W69-03197
IC COMPOUNDS, DISPERSION, SEWAGE	EFFLUENTS, BIODEGRADATION, METHOD	W70-01291
WEEDS, NUTRIENTS, SEPTIC TANKS,	EFFLUENTS, SWAMPS, FOREST SOILS,	W70-04193
MIC ABSOR/ *GROUND WATER, *TRACE	ELEMENTS, CHELATE EXTRACTION, ATO	W69-03197
GROUNDWATER, PERCOLATING WATER,	EMINENT DOMAIN, PUBLIC HEALTH, DO	W70-02896
MENTAL SANITATION, ENVIRONMENTAL	ENGINEERING, WATER POLLUTION SOUR	W70-06572
INFILTRATION, AQUIFORS, SANITARY	ENGINEERING.: / DOMESTIC WASTES,	W69-03178
, *LANDFILLS, DRAINAGE, SANITARY	ENGINEERING, *LEACHING, WATER POL	W68-00058
G, *PATH OF POLLUTANTS, *NUCLEAR	ENGINEERING, NUCLEAR EXPLOSIONS,	W71-04882
*REVIEWS, METHODOLOGY, SANITARY	ENGINEERING, LANDFILLS, HYDROLOGY	W71-08907
WATER, *INFILTRATION, COLIFORMS,	ENTERIC BACTERIA, NITRATES, CHLOR	W69-01076
ER MOVEMENT, PATH OF POLLUTANTS,	ENVIRONMENT.: /AMPLING, GROUNDWAT	W70-06322
LEACHING, GROUNDWATER MOVEMENT,	ENVIRONMENTAL SANITATION, ENVIRON	W70-06572
POLLUTION CONTROL, PUBLIC HEALTH,	ENVIRONMENTAL SANITATION, WASTE D	W70-06011
EMENT, ENVIRONMENTAL SANITATION,	ENVIRONMENTAL ENGINEERING, WATER	W70-06572
	ENVIRONMENTAL GEOLOGY.: TES	W70-06572
T HOLES, UNIVERSITY OF ILLINOIS,	ENVIRONMENTAL POLLUTION.: TES	W70-06322
ENT BEHAVIOR(WATER), *SOIL-WATER	ENVIRONMENT, ANIONIC SURFACTANTS,	W70-01291
RTIES, WATER WELLS, WATER TABLE,	ENVIRONMENTAL EFFECTS, WATER CHEM	W71-04121
USSR, RADIAL DIFFUSION	EQUATIONS.: EQUATIONS, GROUNDWATER MOVEMENT,	W69-03212
R MOVEMENT, *RADIOACTIVE WASTES,	EQUATIONS, PATH OF POLLUTANTS, FO	W70-10058
ION, MODEL STUDIES, MATHEMATICS,	EQUATIONS, MATHEMATICAL MODELS.: /	W71-01930
MOVEMENT, SEEPAGE, POROUS MEDIA,	EQUATIONS, MATHEMATICAL MODELS, C	W71-09611
ATION, RADIOACTIVE WASTES, IONS,		W71-11356



N, OIL, OIL RESERVOIRS, DRILLING	EQUIPMENT, LEASES, DAMAGES, LAND	W71-08055
ATION, AMMONIFICATION, LEACHING,	EROSION, NITROGEN, RUNOFF, WATER	W71-10372
DRAINAGE WATER, GRASSLANDS, SOIL	EROSION,: /LUTION, SNOW, RUNOFF,	W70-04193
STREAMS, FISH, LAND, ECOSYSTEMS,	EUTROPHICATION, OLIGOTROPHY, SEWA	W70-04193
ALFALFA-BROMEGRASS, SPRI/ *LAKF	EUTROPHICATION, *SOIL PHOSPHORUS,	W69-09721
GROUNDWATER, RUNOFF, PERCOLATION,	EUTROPHICATION, DRAINAGE EFFECTS,	W71-12084
WASTE WATER DISPOSAL, NITRATES,	EUTROPHICATION, AQUIFERS, GROUNDW	W71-01324
WASTE WATER DISPOSAL, NITRATES,	EUTROPHICATION, AQUIFERS, GROUNDW	W71-01205
OIL TYPES, PERMEABILITY, FLOODS,	EVALUATION, PLANNING.: /TREAMS, S	W71-05094
C DIGESTION, ODORS, GROUNDWATER,	EVAPORATION, INFILTRATION, CLIMAT	W71-07118
TER RELATIONSHIPS, INFILTRATION,	EVAPOTRANSPIRATION, PERCOLATION,	W70-06102
ECTS, DRAINS, DEEP PERCOLATION,	EVAPOTRANSPIRATION.: /DRAINAGE EF	W69-00248
WATER, *SEEPAGE, *SOIL MOISTURE,	EVAPOTRANSPIRATION, *LANDFILLS, D	W68-00058
S, ARTESIAN WELLS, WELL SCRFENS,	EXCAVATION, WATER POLICY, AQUIFER	W71-04742
*VENEZUELA, *NUCLEAR CANAL	EXCAVATION.: :	W71-04882
MS, ALLUVIAL CHANNELS, DREDGING,	EXCAVATION, AQUIFERS, GRAVELS, AQ	W71-02909
T/ WATER POLLUTION SOURCES, *ION	EXCHANGE, *WATER QUALITY, *IRRIGA	W71-09936
ATER MOVEMENT, *DISPERSION, *ION	EXCHANGE, DIFFUSION, MIXING, RADI	W71-11356
LLS, WATER SUPPLY, AQUIFERS, ION	EXCHANGE, POLLUTANTS, POLLUTANT I	W69-02611
FACE SPREADING, RECHARGE BASINS,	EXPERIMENTAL RECHARGE PROJECT, FL	W69-05328
FACE SPREADING, RECHARGE BASINS,	EXPERIMENTAL RECHARGE PROJECT, FL	W69-05327
S, *NUCLEAR ENGINEERING, NUCLEAR	EXPLOSIONS, CANALS, CANAL CONSTRU	W71-04882
WATER, *TRACE ELEMENTS, CHEFLATE	EXTRACTION, ATOMIC ABSORPTION ANA	W69-03197
ND WATER RECHARGE, HYDROCHEMICAL	FACIFS, SEWAGE EFFLUENT, C.O.D.,	W69-03197
ILTRATION PONDS, CAPE COD(MASS),	FALMOUTH(MASS).: INF	W71-01205
ILTRATION PONDS, CAPE COD(MASS),	FALMOUTH(MASS).: INF	W71-01324
INDUSTRIAL WASTES, ALGAE, PONDS,	FARM WASTES.: /GE, INFILTRATION,	W71-06435
PERCOLATION, LEACHING, DRAINAGE,	FARM WASTES, SOIL MANAGEMENT, GRO	W71-06443
TER POLLUTION SOURCES, LEACHING,	FARM WASTES, GROUNDWATER, HYDRAUL	W71-08218
C/ *EUTROPHICATION, FERTILIZERS,	FARM WASTES, NUTRIENTS, DENITRIFI	W71-10372
ES, WATER TABLE, SURFACE RUNOFF,	FARM WASTES, AEROBIC CONDITIONS,	W69-09721
EWAGE DISPOSAL, DOMESTIC WASTES,	FARM WASTES, MUNICIPAL WASTES, NA	W70-08049
ILLING, OIL WELLS, WATER SUPPLY,	FARMS, WATER POLLUTION EFFECTS, W	W71-13521
RATION, DOMESTIC WASTES, BENTHIC	FAUNA, INDUSTRIAL WASTES, DRAINAG	W71-09154
CATTLE WASTES,	FEEDLOT WASTES.: :	W70-00665
ORGANIC CARBON,	FEEDLOTS.: :	W71-08218
N, NITROGEN SOURCES, WELL WATER,	FEEDLOTS.: /OURCES, MINERALIZATIO	W71-06435
ISM, MOBILITY, PARTICULATE FORM,	FEEDLOTS, NUTRIENT SOURCES.: /BOL	W71-06443
METHEMOGLOBIN, NITRATE MOVEMENT,	FEEDLOTS, RESIDUAL ACCUMULATION,	W71-10372
ALLEY(COLO).: NATIVE GRASSES,	FEEDLOTS, CORRALS, SOUTH PLATTE V	W70-04488
LLUTION SOURCES, MICROORGANISMS,	FERROBACILLUS, FLOW RESISTANCE, R	W69-00979
HEDS, ORGANIC MATTER, SEDIMENTS,	FERTILIZERS, WATER POLLUTION, SNO	W70-04193
LFALFA-BROMEGRASS, SPRING THAWS,	FERTILIZER-NITROGEN.: /SPHORUS, A	W69-09721
TS, DENITRIFIC/ *EUTROPHICATION,	FERTILIZERS, FARM WASTES, NUTRIEN	W71-10372
DENITRIFICATION, RUNOFF, UREAS,	FERTILIZERS, DRAINAGE WATER, IRRI	W71-06435
INAGE, DRAINAGE WATER, SALINITY,	FERTILIZERS, GROUNDWATER, IRRIGAT	W70-08662
DWATER, *AGRICULTURAL CHEMICALS,	FFERTILIZERS, PESTICIDES, NUTRIENT	W71-04121
PITATION, LEACH BED, SPOK/ DRAIN	FIELDS, *TEST HOLES, ANNUAL PRECI	W69-01076
, *BIODEGRADATION, SOIL DISPOSAL	FIELDS, CESSPOOLS, SEPTIC TANKS,	W68-01010
WATER POLLUTION SOURCES, *CORES,	FIELDS, PLANTS, ALFALFA, CEREAL C	W70-04488
HEALTH, OIL WELLS, DRILLING, OIL	FIELDS, SALINE WATER, SALINE WATE	W71-01028
TION, PERCOLATION, SOIL DISPOSAL	FIELDS, SOIL CONTAMINATION, SOIL	W69-08621
TER QUALITY, *LANDFILL, SANITARY	FILL, WASTE DILUTION, WATER POLLU	W69-03178
TION WATER, ARTIFICIAL RECHARGE,	FILTRATION, SORPTION, INFILTRATIO	W69-08621
RATION, PERCOLATION, ADSORPTION,	FILTRATION.: /ER MOVEMENT, INFILT	W69-07375
ERTIARY TREATMENT, INFILTRATION,	FILTRATION, SEWAGE TREATMENT, SEW	W70-04712
ATION, OLIGOTR/ *LAKES, STREAMS,	FISH, LAND, ECOSYSTEMS, EUTROPHIC	W70-04193
ENTERICUS, DIATOMEA, CLADOPHORA,	FLAGELLATA, CILIATES, RANUNCULUS	W69-07838
EVAPOTRANSPIRATION, PERCOLATION,	FLOOD CONTROL, RESERVOIRS, PRECIP	W70-06102
REAMS, SOIL TYPES, PERMEABILITY,	FLOODS, EVALUATION, PLANNING.: /T	W71-05094

EDLOTS, OXIDATION DITCH, SLOTTED	FLOORS, AERATOR, SPREADING, LAND	W71-03542
REUSE, ARTIFICIAL RECHARGE, LOW-	FLOW AUGMENTATION.: /IFERS, WATER	W70-03102
IAN RIGHTS, NATURAL USE, NATURAL	FLOW DOCTRINE, REASONABLE USE, AR	W70-02896
S, MINING, GROUNDWATER MOVEMENT,	FLOW PROFILES, SAMPLING, DATA COL	W71-11255
WATER, SURFACE WATERS, AQUIFERS,	FLOW RATES, LEACHING.: /E, GROUND	W70-09637
, MICROORGANISMS, FERROBACILLUS,	FLOW RESISTANCE, RETENTION, HAWAI	W69-00979
*MULTIPHASE	FLOW.: /PTION, WATER CHEMISTRY, D	W71-11776
ARCY'S LAW, PERMEABILITY, *RIVER	FLOW, *DIFFUSION, POROUS MATERIAL	W69-02611
A, GROUNDWATER, WASTES, *UNIFORM	FLOW, *DIFFUSION, *DISPERSION, *C	W69-01238
ONVECTION, *GROUNDWA/ *SATURATED	FLOW, *DRAINAGE WATER, *DETERIORA	W69-08921
TION/ *IRRIGATION WATER, *RETURN	FLOW, *GROUNDWATER, *SATURATED SO	W71-06063
ILS, *I/ *WATER QUALITY, *RETURN	FLOW, *GROUND WATER MOVEMENT, CAP	W71-08073
BILITY, POROSITY, CLOSED CONDUIT	FLOW, *IRRIGATION, *SURFACE-GROUN	W69-00979
DWATER RELATIONSHIPS, D/ *RETURN	FLOW, *LAVA, BASALTS, WATER POLLU	W69-00248
GROUND WATER MOVEMENT, CAPILLARY	FLOW, *MOISTURE ROUTING, LANDFILL	W69-00979
MANAGEMENT, LEACH/ *UNSATURATED	FLOW, *NITRATES, MATHEMATICAL MOD	W68-00058
IS, *PATH OF POLLUTANTS, *RETURN	FLOW, *SALINE WATER INTRUSION, *H	W71-04548
WATER POLLUTION EFFECTS, *RETURN	FLOW, ADSORPTION, ADSORPTION, ION	W71-08044
SAL, UNSATURATED FLOW, SATURATED	FLOW, CLOGGING.: /PTION, WATER CHEMISTRY, D	W70-10058
HAGAN-POISEUILLE	FLOW, GASOLINE, WATER LAW, WELLS,	W69-00979
, PATH OF POLLUTANTS, SUBSURFACE	FLOW, HYDROLOGIC-QUALITY MODEL.: /PTION, WATER CHEMISTRY, D	W68-00627
*IRRIGATION RETURN	FLOW, MASS TRANSFER, DIFFUSION, M	W71-09936
LS, PROBABILITY, THERMODYNAMICS,	FLOW, MODEL STUDIES, SATURATED SO	W71-11776
PERCOLATION, SEEPAGE, UNSATURATED	FLOW, PERCOLATION, LEACHING, DRAI	W69-02681
, NITRATES, SURFACE RUNOFF, BASE	FLOW, POROUS MEDIA, GROUNDWATER,	W71-06443
WASTES, *UNIFORM F/ *DISPERSION,	FLOW, POROUS MEDIA.: /S, ARTIFICI	W69-01238
AL RECHARGE, CONVECTION, MIXING,	FLOW, SATURATED FLOW, ADSORPTION,	W69-07554
TIVE WASTE DISPOSAL, UNSATURATED	FLOW, WATER POLLUTION SOURCES.: /	W70-10058
LEACHING, DENITRIFICATION, RIVER	FLOW, WATER SUPPLY, LIVESTOCK, SE	W70-08662
AINAGE WATER, IRRIGATION, RETURN	FLUCTUATIONS, SALINE SOILS, LAND	W71-06435
N EFFECTS, LEACHING, WATER LEVEL	FLUCTUATIONS, AMMONIA, NEBRASKA,	W71-08073
RGE, TRANSMISSIVITY, WATER LEVEL	FLUORIDE, NITRATE, SULFATE, SILIC	W71-03543
ANALYSES, CARBONATE, BICARBONATE,	FLUSHING MEADOWS PROJECT, PHOENIX	W69-03197
, EXPERIMENTAL RECHARGE PROJECT,	FLUSHING MEADOWS PROJECT, PHOENIX	W69-05327
, EXPERIMENTAL RECHARGE PROJECT,	FOREIGN PROJECTS.: /, MATHEMATICS	W69-05328
, EQUATIONS, PATH OF POLLUTANTS,	FOREST SOILS, MINNESOTA, WISCONSI	W71-01930
SEPTIC TANKS, EFFLUENTS, SWAMPS,	FORM, FEEDLOTS, NUTRIENT SOURCES.	W70-04193
METABOLISM, MOBILITY, PARTICULATE	FRESH WATER INTERFACES, MIXING, P	W71-06443
WELLS, GROUNDWATER, SALINE WATER-	FRESH-WATER INTERFACES, *LEACHING	W71-03230
, *SALINE WATER S/ *SALINE WATER-	FRESHWATER INTERFACES, WELLS, WEL	W71-01932
ELDS, SALINE WATER, SALINE WATER-	FUELS, WELLS, WATER POLLUTION, SE	W71-01028
ION SOURCES, JUDICIAL DECISIONS,	GARBAGE DUMPS, WASTE DUMPS, WASTE	W69-06117
N SOURCES, SOLID WASTES, WASTES,	GARBAGE DUMPS.: /AGEMENT, IMPAIRE	W68-00058
D WATER QUALITY, WASTE DISPOSAL,	GARBAGE DUMPS, LANDFILLS, WASTE D	W71-07194
L, SURFACE WASTES, GROUNDWATER,	GAS, SALINE: /STIC WASTES, FARM W	W71-05094
WASTES, MUNICIPAL WASTES, NATURAL	GASES, CARBON DIOXIDE, METHANE, B	W70-08049
FERS, WATER TABLE, WATER SUPPLY,	GASES, POLLUTANTS, PERCOLATION, W	W70-06011
F POLLUTANTS, OIL INDUSTRY, OIL,	GASOLINE, WATER POLLUTION SOURCES	W71-11724
LE USE, DAMAGES, SURFACE RUNOFF,	GASOLINE, WATER LAW, WELLS, GROUN	W70-08049
OF POLLUTANTS, SUBSURFACE FLOW,	GEOLOGICAL SOURCES, MINERALIZATIO	W68-00627
N, NITROGEN SO/ *SURFACE WATERS,	GEOLOGY.: /PTION, WATER CHEMISTRY, D	W71-06435
ENVIRONMENTAL	GEOLOGY, GROUNDWATER MOVEMENT.: /	W70-06572
TION CONTROL, SURVEYS, LEACHING,	GEOLOGY, GROUNDWATER, WATER QUALI	W70-07193
PATH OF POLLUTANTS, MINE WASTES,	GEOLOGY, HYDROLOGY, HYDROGEOLOGY,	W71-08907
ONS, *ILLINOIS, HYDROLOGIC DATA,	GEOPHYSICS.: /R LEVELS, WATER SUP	W70-06322
PLY, WATER UTILIZATION, SURVEYS,	GLACIAL DRIFT, AQUIFERS, OHIO RIV	W70-05466
ENTS, ACIDS, LEACHING, CHLORIDES,	GOVERNMENTS, STATE JURISDICTION,	W71-00194
IVE RIGHTS, LEGAL ASPECTS, STATE	GOVERNMENTS, LEGISLATION, WATER R	W71-13521
TEMENT, STATE GOVERNMENTS, LOCAL	GOVERNMENTS, POLLUTION ABATEMENT,	W70-02896
WASTES, *OIL, LEGISLATION, STATE		W69-05370



ROL, *POLLUTION ABATEMENT, STATE	GOVERNMENTS, LOCAL GOVERNMENTS, L	W70-02896
THERMAL	GRADIENTS.:	W69-08921
INAG/ *NITRATES, *NITROGEN, *RIO	GRANDE, *SUBSURFACE DRAINAGE, DRA	W70-08662
UPPER RIO	GRANDE, SALT BALANCE.:	W70-08662
TRANSIENT STORAGE,	GRAPHICAL SOLUTIONS.:	W69-00248
PLATTE VALLEY(COLO).: NATIVE	GRASSES, FEEDLOTS, CORRALS, SOUTH	W70-04488
N, SNOW, RUNOFF, DRAINAGE WATER,	GRASSLANDS, SOIL EROSION,: /LUTIO	W70-04193
DREDGING, EXCAVATION, AQUIFERS,	GRAVELS, AQUITARDS, PUMPING, WATE	W71-02909
R, SUBSURFACE WATERS, DIFFUSION,	GRAVITATIONAL WATER, SALTS, SALIN	W70-08026
R COMPANY, NETWORK ANALYSIS.:	GREAT MIAMI RIVER, S.W. OHIO WATE	W69-02611
GAL ASPECTS, JUDICIAL DECISIONS,	GROUN: /TION CONTROL, DAMAGES, LE	W71-11724
IDF, NITRATE, SULFATE, SILICATE,	GROUND WATER RECHARGE, HYDROCHEMI	W69-03197
ION, DAMAGE, JUDICIAL DECISIONS,	GROUND WATER, PATH OF POLLUTANTS,	W68-00627
LOW, GASOLINE, WATER LAW, WELLS,	GROUND WATER MOVEMENT.:/URFACE F	W68-00627
SITY, CLOSED CONDU/ PERCOLATION,	GROUND WATER, *PERMEABILITY, PORO	W69-00979
RFACE STREAMS, DEEP PERCOLATION,	GROUND WATER MOVEMENT, INFILTRATI	W70-00521
ER, *RELATIVE RIGHTS, WATER LAW,	GROUND WATER, SUBSURFACE WATER, P	W70-00521
ES, *BACTERIOPHAGE, PERCOLATION,	GROUND-WATER, WATER POLLUTION.:/	W69-00225
TURN FLOW, *IRRIGATION, *SURFACE-	GROUNDWATER RELATIONSHIPS, DRAINA	W69-00248
ION, CESSPOOLS, SEWAGE DISPOSAL,	GROUNDWATER MOVEMENT, ABSORPTION,	W69-00652
*DISPERSION, FLOW, POROUS MEDIA,	GROUNDWATER, WASTES, *UNIFORM FLO	W69-01238
ORMS, ENTERIC BACT/ *POLLUTANTS,	GROUNDWATER, *INFILTRATION, COLIF	W69-01076
PERCOLATING WATER, INFILTRATION,	GROUNDWATER MOVEMENT.:/ULFIDES,	W68-01010
OXYGEN DEMAND, LEACHING, RUNOFF,	GROUNDWATER, CELLULOSE, HYDROGEN	W68-01269
PES, RADIOACTIVE WASTE DISPOSAL,	GROUNDWATER MOVEMENT, PERCOLATION	W69-02681
INFILTRATION, RECHARGE, *SURFACE-	GROUNDWATER RELATIONSHIPS, OBSERV	W69-02611
LEACHATE, INFILTRATION CAPACITY,	GROUNDWATER CONTAMINATION.:/NT,	W68-00058
POLLUTION, *GROUNDWATER RECHARGE,	GROUNDWATER, *SEEPAGE, *SOIL MOIS	W68-00058
, AQUIFERS, SOIL WATER MOVEMENT,	GROUNDWATER MOVEMENT, INFILTRATIO	W69-08620
/ *INFILTRATION, *PONDS, *SOIL,	GROUNDWATER BASINS, WATER SUPPLY,	W69-07838
ARTIFICIAL USE, RIPARIAN LANDS,	GROUNDWATER, PERCOLATING WATER, E	W70-02896
CYCLE, OVERDRAFT, WELLS, SURFACE-	GROUNDWATER RELATIONSHIPS, DA: /	W70-00532
ER, WELL SPACING, SHALLOW WELLS,	GROUNDWATER, WATER SOURCES, DRAIN	W69-06118
G WATER, AQUIFERS, HYDROGEOLOGY,	GROUNDWATER BASINS, HYDROLOGIC CY	W70-00532
*PUBLIC HEALTH, *SOIL LEACHING,	GROUNDWATER, SOIL PROFILES, WATER	W69-09721
, SOILS, POROSITY, PERMEABILITY,	GROUNDWATER MOVEMENT, SOIL WATER	W69-07375
KES, PONDS, TIDAL WATERS, WELLS,	GROUNDWATER, SURFACE WATERS, SEEP	W69-05370
INKLER IRRIGATION, INFILTRATION,	GROUNDWATER, WATER LEVELS, WATER	W69-07114
ER POLLUTION EFFECTS, NUTRIENTS,	GROUNDWATER MOVEMENT, NITROGEN, W	W70-00665
WELLS, WATER POLLUTION, SEEPAGE,	GROUNDWATER, PERCOLATING WATER, W	W69-06117
ORPTION, *LEACHING, */ *VIRUSES,	GROUNDWATER, WATER POLLUTION, ABS	W70-04688
, SEWAGE DISPOSAL, HYDROGEOLOGY,	GROUNDWATER MOVEMENT, WATER RESOU	W70-04712
ACE WATERS, PRIOR APPROPRIATION,	GROUNDWATER, UNDERGROUND STREAMS,	W70-08049
A, SALINITY, STREAMFLOW, SURFACE-	GROUNDWATER RELATIONSHIPS, INFILT	W70-06102
GE WATER, SALINITY, FERTILIZERS,	GROUNDWATER, IRRIGATION EFFECTS,	W70-08662
RS, PERCOLATION, SUSPENDED LOAD,	GROUNDWATER, AQUIFER CHARACTERIST	W70-04504
RIGHTS, WATER POLLUTION SOURCES,	GROUNDWATER, GROUNDWATER MOVEMENT	W70-07631
GAL ASPECTS, JUDICIAL DECISIONS,	GROUNDWATER MOVEMENT, PERCOLATING	W70-08026
ATER WELLS, INFLOW, UNDERGROUND,	GROUNDWATER, WATER SUPPLY, SEEPAG	W70-07632
TA COLLECTIONS, HYDROLOGIC DATA,	GROUNDWATER MOVEMENT, WATER QUALI	W70-05466
EZOMETRY, *WATER TABLE, *SURFACE-	GROUNDWATER RELATIONSHIPS, *WATER	W70-07766
DIS, MUNICIPAL WASTES, LEACHING,	GROUNDWATER MOVEMENT, ENVIRONMENT	W70-06572
INE, *PERCOLATING WATER, *WELLS,	GROUNDWATER, OILY WATER, OIL INDU	W70-08025
CROPS, IRRIGATED LAND, COLORADO,	GROUNDWATER, PERCOLATION.:/REAL	W70-04488
POLLUTION SOURCES, GROUNDWATER,	GROUNDWATER MOVEMENT, PERMEABILIT	W70-07631
N, *SEEPAGE, *SUBSURFACE WATERS,	GROUNDWATER, UNDERGROUND STREAMS,	W70-08050
, POLLUTANTS, INDUSTRIAL WASTES,	GROUNDWATER, WATER POLLUTION EFFE	W70-08026
ROL, SURVEYS, LEACHING, GEOLOGY,	GROUNDWATER MOVEMENT.:/TION CONT	W70-07193
DUSTRY, WATER POLLUTION SOURCES,	GROUNDWATER MOVEMENT, UNDERFLOW,	W70-08025
TRATION, PERMEABILITY, SAMPLING,	GROUNDWATER MOVEMENT, PATH OF POL	W70-06322

ASTE DUMPS, MINE WASTES, MINING,	GROUNDWATER MOVEMENT, FLOW PROFIL	W71-11255
N CYCLE, PHOSPHORUS, REGULATION,	GROUNDWATER, RUNOFF, PERCOLATION,	W71-12084
ATION, ALLUVIA CHANNELS, SURFACE-	GROUNDWATER RELATIONSHIPS, PERMEA	W71-12410
ASTES, POLLUTANTS, INFILTRATION,	GROUNDWATER MOVEMENT, SUBSURFACE	W71-13645
CTS, POLLUTANTS, WASTE DISPOSAL,	GROUNDWATER, PERCOLATING WATER, P	W71-11692
SALINE WATER, SURSURFACE WATERS,	GROUNDWATER, PERCOLATING WATERS,	W71-13521
ACE WATERS, UNDERGROUND STREAMS,	GROUNDWATER MOVEMENT, PATH OF POL	W71-01043
ATER POLLUTION EFFECTS, STREAMS,	GROUNDWATER, JUDICIAL DECISIONS,	W71-01043
POLLUTION, RECHARGE, DISCHARGE,	GROUNDWATER, SURFACE WATERS, AQUI	W70-09637
INTERFACES, WELLS, WELL CASINGS,	GROUNDWATER, WATER SUPPLY, PERCOL	W71-01028
RFACE-GROUNDWATER RELATIONSHIPS,	GROUNDWATER MOVEMENT.: /WATER, SU	W71-02909
*RADIOACTIVE WASTES, EQUATIONS,	GROUNDWATER MOVEMENT, LEACHING, M	W70-10058
HARACTERISTICS, EFFLUENT STREAM,	GROUNDWATER RECHARGE, TRANSMISSIV	W71-03543
ILS, *FARM WASTES, *FERTILIZERS,	GROUNDWATER, PRECIPITATION, POTAS	W71-03542
CERS, ROADS, CHEMCONTROL, SALTS,	GROUNDWATER, LEACHING, SALINE SOI	W70-09844
USION, *OIL WELLS, *WATER WELLS,	GROUNDWATER, SALINE WATER-FRESH W	W71-03230
RATES, EUTROPHICATION, AQUIFERS,	GROUNDWATER MOVEMENT, MASSACHUSET	W71-01205
ER MOVEMENT, *RECHARGE, *SURFACE-	GROUNDWATER RELATIONSHIPS, MALENC	W71-00194
ATER, AMMONIA, DRAINAGE EFFECTS,	GROUNDWATER, WATER QUALITY, SOIL	W71-04548
RATES, EUTROPHICATION, AQUIFERS,	GROUNDWATER MOVEMENT, MASSACHUSET	W71-01324
WELLS, MUNICIPAL WATER, SURFACE-	GROUNDWATER RELATIONSHIPS, GROUND	W71-02909
RATIVE AGENCIES, ADMINISTRATION,	GROUNDWATER, WATER QUALITY, INSPE	W71-04742
IXING, PENETRATION, DRILL HOLES,	GROUNDWATER MOVEMENT, DAMAGES, LE	W71-03230
E, FARM WASTES, SOIL MANAGEMENT,	GROUNDWATER, WISCONSIN, WATER SUP	W71-06443
ONS, CANALS, CANAL CONSTRUCTION,	GROUNDWATER MOVEMENT, INFILTRATIO	W71-04882
SPHERIC), SEEPAGE, INFILTRATION,	GROUNDWATER MOVEMENT, HYDRAULICS,	W71-05094
RIGATION EFFICIENCY, SIMULATION,	GROUNDWATER, PLANNING, MANAGEMENT	W71-09936
RUNOFF, WATER POLLUTION CONTROL,	GROUNDWATER, SEPTIC TANKS, MANAGE	W71-10372
SOURCES, LEACHING, FARM WASTES,	GROUNDWATER, HYDRAULIC CONDUCTIVI	W71-08218
LINITY, WITHDRAWAL, GROUNDWATER,	GROUNDWATER MOVEMENT, LEACHING, I	W71-08044
NITRATES, SALINITY, WITHDRAWAL,	GROUNDWATER, GROUNDWATER MOVEMENT	W71-08044
ER INTERFACES, IMPERVIOUS SOILS,	GROUNDWATER BARRIERS, INFILTRATIO	W71-08055
FFECTS, WATER QUALITY, SALINITY,	GROUNDWATER, DISSOLVED SOLIDS, LE	W71-06063
OLLUTANTS, MINE WASTES, GEOLOGY,	GROUNDWATER, WATER QUALITY, COMPA	W71-08907
ION, ANAEROBIC DIGESTION, ODORS,	GROUNDWATER, EVAPORATION, INFILTR	W71-07118
PROCEDURES, CHEMICAL PROPERTIES,	GROUNDWATER, SOIL WATER, SOLUBILI	W71-07887
EEPAGE, DRILL HOLES, OILY WATER,	GROUNDWATER MOVEMENT, OIL-WATER I	W71-08055
TER PROGRAMS, DIFFUSION, MIXING,	GROUNDWATER MOVEMENT, SEEPAGE, PO	W71-09611
RUNOFF, ODOR, SURSURFACE RUNOFF,	GROUNDWATER MOVEMENT, LIMESTONES,	W71-09154
EOLGY, WATER POLLUTION SOURCES,	GROUNDWATER MOVEMENT, PERCOLATION	W71-07194
WASTE DISPOSAL, SURFACE WASTERS,	GROUNDWATER, GARBAGE DUMPS, LANDF	W71-05094
EW MEXICO, *SOIL WATER MOVEMENT,	GROUNDWATER, SURFACE WATERS, TEST	W71-06514
ON, SEDIM/ *NITROGEN, *NITRATES,	GROUNDWATER, AMMONIA, PRECIPITATI	W71-06435
AL/ *TRANSFORMATIONS, AMSTERDAM,	HAARLEM, LEYDEN, THE HAGUE, MINER	W69-07838
	HAGAN-POISEUILLE FLOW, CLOGGING.:	W69-00979
AMSTERDAM, HAARLEM, LEYDEN, THE	HAGUE, MINERALIZATION, CLAY LENSE	W69-07838
TURE, NITRATES, PLANTS, AMMONIA,	HARDNESS(WATER), ACIDITY, OXYGEN,	W69-07838
LUS, FLOW RESISTANCE, RETENTION,	HAWAII.: /ROORGANISMS, FERROBACIL	W69-00979
OAHU(HAWAII), MAUI(	HAWAII).:	W71-08044
OAHU(	HAWAII), MAUI(HAWAII).:	W71-08044
URFACE DRAINAGE, TRANSMISSIVITY,	HEAD LOSS, DARCY'S LAW, TIME LAG,	W70-07766
ICATION, *SOIL NITROGEN, *PUBLIC	HEALTH, *SOIL LEACHING, GROUNDWAT	W69-09721
WELLS, *LEGISLATION, C/ *PUBLIC	HEALTH, *WELL REGULATIONS, *WATER	W71-04742
NG WATER, EMINENT DOMAIN, PUBLIC	HEALTH, DOMESTIC WATER, INDUSTRIA	W70-02896
WATER POLLUTION CONTROL, PUBLIC	HEALTH, ENVIRONMENTAL SANITATION,	W70-06011
ATER WELLS, OIL INDUSTRY, PUBLIC	HEALTH, OIL WELLS, DRILLING, OIL	W71-01028
(TEXAS), HOL/ *OGALLALA AQUIFER,	HIGH PLAINS(TEXAS), PARKER COUNTY	W71-12122
	HIGHWAY ICE REMOVAL.:	W70-09844
TRATE, NITRITES, NITROGEN-CYCLE,	HISTORY, SOIL ANALYSIS, WATER TRA	W71-12122
ION, POTASSIUM, POULTRY, CATTLE,	HOGS, NITROGEN, NITRATE, PHOSPHOR	W71-03542



H RED, SPOK/ DRAIN FIELDS, *TEST	HOLES, ANNUAL PRECIPITATION, LEAC	W69-01076
ACES, MIXING, PENETRATION, DRILL	HOLES, GROUNDWATER MOVEMENT, DAMA	W71-03230
S, *GROUNDWATER, *SEEPAGE, DRILL	HOLES, OILY WATER, GROUNDWATER MO	W71-08055
VIRONMENTAL POLLUTION.: TEST	HOLES, UNIVERSITY OF ILLINOIS, EN	W70-06322
NS(TEXAS), PARMER COUNTY(TEXAS),	HOLLY SUGAR STUDIES.: / HIGH PLAI	W71-12122
IL.:	HOMOGENEOUS MEDIA, UNSATURATED SO	W69-02681
T, C.O.D., B.O.D., WASTE WATERS,	HYDRAULIC LOADING, INFILTRATION,	W69-03197
N SOURCES, INFILTRATION, WASTES,	HYDRAULIC CONDUCTIVITY, SUBSURFAC	W70-07766
HEMATICAL MODELS, MODEL STUDIES,	HYDRAULIC MODELS, TRACERS, INJECT	W69-07554
CHING, FARM WASTES, GROUNDWATER,	HYDRAULIC CONDUCTIVITY.: /ES, LEA	W71-08218
NDWATER RECHARGE, MODEL STUDIES,	HYDRAULIC MODELS, OIL WASTES, WAT	W71-10325
ATER MOVEMENT, DRAINAGE SYSTEMS,	HYDRAULIC MODELS, MATHEMATICAL MO	W71-01932
ILTRATION, GROUNDWATER MOVEMENT,	HYDRAULICS, SURFACE RUNOFF, STREA	W71-05094
PERMEAMETERS, SANDS, CHLORINATED	HYDROCARBON PESTICIDES, INSECTICI	W70-01904
*DAMAGES(LEGAL ASPECTS),	HYDROCARBON POLLUTION.:	W68-00627
RESPONSE MODEL, INSTRUMENTATION,	HYDROCHEMICAL D: /BASIN, PROCESS-	W69-03197
SILICATE, GROUND WATER RECHARGE,	HYDROCHEMICAL FACIES, SEWAGE EFFL.	W69-03197
	HYDROCHLORIC ACID.:	W71-00194
RUNOFF, GROUNDWATER, CELLULOSE,	HYDROGEN ION CONCENTRATION, TOXIC	W68-01269
INS, WATER SUPPLY, MUD, BENTHOS,	HYDROGEN, BACTERIA, AEROBIC BACTE	W69-07838
RIGATION, *SPRINKLER IRRIGATION,	HYDROGEOLOGY, SOILS, POROSITY, PE	W69-07375
ON, PERCOLATING WATER, AQUIFERS,	HYDROGEOLOGY, GROUNDWATER BASINS,	W70-00532
WAGE TREATMENT, SEWAGE DISPOSAL,	HYDROGEOLOGY, GROUNDWATER MOVEMEN	W70-04712
OLOGIC DATA, GEOLOGY, HYDROLOGY,	HYDROGEOLOGY, INFILTRATION, PERME	W70-06322
ARGE, SAFE YIELD, WATER BALANCE,	HYDROGEOLOGY, DATA COLLECTIONS, H	W70-05466
WASTES, *LEACHING, *GROUNDWATER,	HYDROGEOLOGY, WATER POLLUTION SOU	W71-07194
TRATION, *NEW YORK, HYDROGRAPHS,	HYDROGRAPH ANALYSIS, STATISTICAL	W70-03102
INDUCED INFILTRATION, *NEW YORK,	HYDROGRAPHS, HYDROGRAPH ANALYSIS,	W70-03102
YDROGEOLOGY, GROUNDWATER BASINS,	HYDROLOGIC CYCLE, OVERDRAFT, WELL	W70-00532
HYDROGEOLOGY, DATA COLLECTIONS,	HYDROLOGIC DATA, GROUNDWATER MOVE	W70-05466
LOGIC INVESTIGATIONS, *ILLINOIS,	HYDROLOGIC DATA, GEOLOGY, HYDROLO	W70-06322
*IKRIGATION RETURN FLOW,	HYDROLOGIC-QUALITY MODEL.:	W71-09936
ULP AND PAPER INDUSTRY, DAMAGES,	HYDROLOGIC DATA, LEGISLATION, LAN	W71-11692
*LANDFILL	HYDROLOGY.:	W71-08907
*URBAN	HYDROLOGY.:	W71-05094
SANITARY ENGINEERING, LANDFILLS,	HYDROLOGY, WATER POLLUTION, PATH	W71-08907
INDIS, HYDROLOGIC DATA, GEOLOGY,	HYDROLOGY, HYDROGEOLOGY, INFILTRA	W70-06322
HIGHWAY	ICE REMOVAL.:	W70-09844
ECTS, *SODIUM CHLORIDE, *HIGHWAY	ICING, *SNOW REMOVAL, *MAINE, DEI	W70-09844
CE, PERCOLATING WATER, POLLUTION	IDENTIFICATION, SOIL WATER, SALIN	W71-06063
*NITROGEN COMPOUNDS, *POLLUTION	IDENTIFICATION, *WATER QUALITY, *	W71-12122
EXCHANGE, POLLUTANTS, POLLUTANT	IDENTIFICATION, ADSORPTION, WATER	W69-02611
NORTHEASTERN	ILLINOIS.:	W70-09637
.: TEST HOLES, UNIVERSITY OF	ILLINOIS, ENVIRONMENTAL POLLUTION	W70-06322
ATER INTRUSION, WATER POLLUTION,	IMPAIRED WATER QUALITY, POLLUTANT	W70-08026
NDARDS, WATER POLLUTION EFFECTS,	IMPAIRED WATER QUALITY, PERCOLATI	W70-08025
SOURCES, *DAMAGES, *WATER WELL,	IMPAIRED WATER QUALITY, UNDER SEE	W71-13645
TE DISPOSAL, LEGISLATION, WELLS,	IMPAIRED WATER QUALITY, WATER POL	W71-11724
, PERCOLATION, WATER MANAGEMENT,	IMPAIRED WATER QUALITY, WASTE DIS	W71-07194
MOVEMENT, OIL-WATER INTERFACES,	IMPERVIOUS SOILS, GROUNDWATER BAR	W71-08055
, COMPRESSIBILITY, SOLID WASTES,	INCINERATION, PERCOLATION, SEEPAG	W71-08907
FILTRATION, CLIMATIC CONDITIONS,	INCINERATION, AIR POLLUTION, TEMP	W71-07118
FARM WASTES, AEROBIC CONDITIONS,	INCURATION.:/E, SURFACE RUNOFF,	W69-09721
R QUALITY, *MATHEMATICAL MODELS,	INDUCED INFILTRATION, RECHARGE, *	W69-02611
ATION, *WASTE WATER RECLAMATION,	INDUCED INFILTRATION, *GROUND WAT	W69-05327
ATION, *WASTE WATER RECLAMATION,	INDUCED INFILTRATION, *GROUND WAT	W69-05328
OLLUTANTS, SEEPAGE, PENETRATION,	INDUSTRIAL WASTES, SEWAGE, WASTE	W70-00521
, PUBLIC HEALTH, DOMESTIC WATER,	INDUSTRIAL WATE:/ EMINENT DOMAIN	W70-02896
WASTES, WATER POLLUTION SOURCES,	INDUSTRIAL WASTES, RIVERS, STREAM	W69-05370
AIRED WATER QUALITY, POLLUTANTS,	INDUSTRIAL WASTES, GROUNDWATER, W	W70-08026

DOMESTIC WASTES, BENTHIC FAUNA,	INDUSTRIAL WASTES, DRAINAGE, AQUI	W71-09154
LIVESTOCK, SEWAGE, INFILTRATION,	INDUSTRIAL WASTES, ALGAE, PONDS,	W71-06435
R POLLUTION SOURCES, MINERALOGY,	INDUSTRIAL WASTES, MUNICIPAL WAST	W71-10446
UNDER SEEPAGE, WATER POLLUTION,	INDUSTRIAL WASTES, POLLUTANTS, IN	W71-13645
SOURCES, *WATER WELLS, *REMEDIES,	INDUSTRIAL WASTES, WATER POLLUTIO	W71-11692
NTS, WOOD WASTES, PULP AND PAPER	INDUSTRY, DAMAGES, HYDROLOGIC DAT	W71-11692
RNMENTS, STATE JURISDICTION, OIL	INDUSTRY, SALINE WATER, SUBSURFAC	W71-13521
ATEMENT, PATH OF POLLUTANTS, OIL	INDUSTRY, OIL, GASES, POLLUTANTS,	W71-11724
TER INTRUSION, *WATER WELLS, OIL	INDUSTRY, PUBLIC HEALTH, OIL WELL	W71-01028
LS, GROUNDWATER, OILY WATER, OIL	INDUSTRY, WATER POLLUTION SOURCES	W70-08025
GE, JUDICIAL DECISIONS, OIL, OIL	INDUSTRY, SUBSURFACE DRAINAGE, WA	W70-07632
IONS, OIL, SEEPAGE, DAMAGES, OIL	INDUSTRY, STORAGE TANKS, SUBSURFA	W70-07631
SHIPS, *WATER POLLUTION SOURCES,	INFILTRATION, WASTES, HYDRAULIC C	W70-07766
RFACE-GROUNDWATER RELATIONSHIPS,	INFILTRATION, EVAPOTRANSPIRATION,	W70-06102
RBON DIOXIDE, METHANE, BARRIERS,	INFILTRATI: /ER SUPPLY, GASES, CA	W70-06011
REUSE, *CALIFORNIA, WATER YIELD,	INFILTRATION, WATER SPREADING, PI	W70-05466
UNDWATER, WATER SUPPLY, SEEPAGE,	INFILTRATION, WATER POLLUTION, PO	W70-07632
EOLOGY, HYDROLOGY, HYDROGEOLOGY,	INFILTRATION, PERMEABILITY, SAMPL	W70-06322
ATER REUSE, *TERTIARY TREATMENT,	INFILTRATION, FILTRATION, SEWAGE	W70-04712
CTIVE USE, *STREAMFLOW, *INDUCED	INFILTRATION, *NEW YORK, HYDROGRA	W70-03102
AL WASTES, SPRINKLER IRRIGATION,	INFILTRATION, GROUNDWATER, WATER	W69-07114
OTTAWA SAND, ALDRIN	INFILTRATION.:	W70-01904
MOVEMENT, GROUNDWATER MOVEMENT,	INFILTRATION, WATER CHEMISTRY, WA	W69-08620
R MOVEMENT, SOIL WATER MOVEMENT,	INFILTRATION, PERCOLATION, ADSORP	W69-07375
NSECTICIDES, PESTICIDE RESIDUES,	INFILTRATION.: /BON PESTICIDES, I	W70-01904
ATER MOVEMENT, *WATER POLLUTION,	INFILTRATION, ANALYTICAL TECHNIQU	W70-01291
COLATION, GROUND WATER MOVEMENT,	INFILTRATION, PATH OF POLLUTANTS,	W70-00521
RECHARGE, FILTRATION, SORPTION,	INFILTRATION, PERCOLATION, SOIL D	W69-08621
WASTE WATER RECLAMATION, INDUCED	INFILTRATION, *GROUND WATER RECHA	W69-05327
WASTE WATER RECLAMATION, INDUCED	INFILTRATION, *GROUND WATER RECHA	W69-05328
Y, *MATHEMATICAL MODELS, INDUCED	INFILTRATION, RECHARGE, *SURFACE-	W69-02611
, LANDFILL MANAGEMENT, LEACHATE,	INFILTRATION CAPACITY, GROUNDWATE	W68-00058
UALITY CONTROL, DOMESTIC WASTES,	INFILTRATION, AQUIFORS, SANITARY	W69-03178
WASTE WATERS, HYDRAULIC LOADING,	INFILTRATION, TUCSON BASIN, PROCE	W69-03197
ES, SULFIDES, PERCOLATING WATER,	INFILTRATION, GROUNDWATER MOVEMEN	W68-01010
NTS, NITROGE/ PERCOLATING WATER,	INFILTRATION, DETERGENTS, POLLUTA	W69-00652
), FALMOUTH(MASS).:	INFILTRATION PONDS, CAPE COD(MASS	W71-01324
/ *PATH OF POLLUTANTS, *INDUCED	INFILTRATION, COLIFORMS, ALLUVIAL	W71-02909
MENTAL EFFECTS, WATER CHEMISTRY,	INFILTRATION.: /ER TABLE, ENVIRON	W71-04121
OBSERVATION WELLS, WATER TABLE,	INFILTRATION.: /IL CONTAMINATION,	W71-03543
S, *GROUNDWATER MOVEMENT, KARST,	INFILTRATION, ION TRANSPORT, PENN	W71-01204
WASTES, *SEPARATION TECHNIQUES,	INFILTRATION, MODEL STUDIES, MATH	W71-01930
), FALMOUTH(MASS).:	INFILTRATION PONDS, CAPE COD(MASS	W71-01205
*ARTIFICIAL RECHARGE, *INDUCED	INFILTRATION, *PIT RECHARGE, *WAT	W71-12410
, INDUSTRIAL WASTES, POLLUTANTS,	INFILTRATION, GROUNDWATER MOVEMEN	W71-13645
ROUNDWATER MOVEMENT, LIMESTONES,	INFILTRATION, DOMESTIC WASTES, BE	W71-09154
STRUCTION, GROUNDWATER MOVEMENT,	INFILTRATION, NAVIGATION, SEEPAGE	W71-04882
OUS SOILS, GROUNDWATER BARRIERS,	INFILTRATION, OIL, OIL RESERVOIRS	W71-08055
IOUES, BIOASSAY, SOIL STRUCTURE,	INFILTRATION, SOIL PROPERTIES, LE	W71-06514
WATER SUPPLY, LIVESTOCK, SEWAGE,	INFILTRATION, INDUSTRIAL WASTES,	W71-06435
ODORS, GROUNDWATER, EVAPORATION,	INFILTRATION, CLIMATIC CONDITIONS	W71-07118
GROUNDWATER MOVEMENT, LEACHING,	INFILTRATION, WATER QUALITY.: /R,	W71-08044
IPITATION(ATMOSPHERIC), SEEPAGE,	INFILTRATION, GROUNDWATER MOVEMEN	W71-05094
LS, ARTESIAN WELLS, WATER WELLS,	INFLOW, UNDERGROUND, GROUNDWATER,	W70-07632
R MOVEMENT, *PATH OF POLLUTANTS,	INJECTION WELLS, WASTE DISPOSAL,	W69-03212
DIES, HYDRAULIC MODELS, TRACERS,	INJECTION WELLS, ARTIFICIAL RECHA	W69-07554
E.:	INJUNCTIONS(PROHIBITORY), NUISANC	W69-06117
TRESPASS,	INJUNCTION(PROHIBITORY).:	W71-13645
ORINATED HYDROCARBON PESTICIDES,	INSECTICIDES, PESTICIDE RESIDUES,	W70-01904
ION, GROUNDWATER, WATER QUALITY,	INSPECTION, INSTALLATION, WELL CA	W71-04742



ATER, WATER QUALITY, INSPECTION,	INSTALLATION, WELL CASINGS, ARTES	W71-04742
N BASIN, PROCESS-RESPONSE MODEL,	INSTRUMENTATION, HYDROCHEMICAL D:	W69-03197
DWATER, SALINE WATER-FRESH WATER	INTERFACES, MIXING, PENETRATION,	W71-03230
TER S/ *SALINE WATER-FRESH-WATER	INTERFACES, *LEACHING, *SALINE WA	W71-01932
E WATER, SALINE WATER-FRESHWATER	INTERFACES, WELLS, WELL CASINGS,	W71-01028
GROUNDWATER MOVEMENT, OIL-WATER	INTERFACES, IMPERVIOUS SOILS, GRO	W71-08055
UNDERGROUND, WELLS, SALINE WATER	INTRUSION, WATER POLLUTION SOURCE	W71-10446
CTS, *RETURN FLOW, *SALINE WATER	INTRUSION, *HAWAII, IRRIGATION WA	W71-08044
*WATER POLLUTION, *SALINE WATER	INTRUSION, *WATER WELLS, OIL INDU	W71-01028
LS/ *PENNSYLVANIA, *SALINE WATER	INTRUSION, *OIL WELLS, *WATER WEL	W71-03230
ATHEMATICAL MODELS, SALINE WATER	INTRUSION, AQUIFERS, POROUS MEDIA	W71-04559
, WATER / *KANSAS, *SALINE WATER	INTRUSION, *OIL WASTES, *REMEDIES	W71-13521
ATH OF POLLUTANTS, *SALINE WATER	INTRUSION, WATER POLLUTION, IMPAI	W70-08026
, *ON-SITE INVESTIGATIONS, *SOIL	INVESTIGATIONS, *GEOLOGIC INVESTI	W70-06322
ATER POLLUTION EFFECTS, *ON-SITE	INVESTIGATIONS, *SOIL INVESTIGATI	W70-06322
*SOIL INVESTIGATIONS, *GEOLOGIC	INVESTIGATIONS, *ILLINOIS, HYDROL	W70-06322
GROUNDWATER, CELLULOSE, HYDROGEN	ION CONCENTRATION, TOXICITY.: /,	W68-01269
R WELLS, WATER SUPPLY, AQUIFERS,	ION EXCHANGE, POLLUTANTS, POLLUTA	W69-02611
R MOVEMENT, KARST, INFILTRATION,	ION TRANSPORT, PENNSYLVANIA, SURS	W71-01204
ED FLOW, ADSORPTION, ADSORPTION,	ION TRANSPORT.: /ED FLOW, SATURAT	W70-10058
, RADIATION, RADIOACTIVE WASTES,	IONS, EQUATIONS, MATHEMATICAL MOD	W71-11356
, PLANTS, ALFALFA, CEREAL CROPS,	IRRIGATED LAND, COLORADO, GROUNDW	W70-04488
INITY, FERTILIZERS, GROUNDWATER,	IRRIGATION EFFECTS, LEACHING, DEN	W70-08662
TRATION, *GROUND WATER RECHARGE,	IRRIGATION, DENITRIFICATION, ECON	W69-05327
TRATION, *GROUND WATER RECHARGE,	IRRIGATION, DENITRIFICATION, ECON	W69-05328
ATER MOVEMENT, MUNICIPAL WASTES,	IRRIGATION WATER, ARTIFICIAL RECH	W69-08621
ISPOSAL, *IRRIGATION, *SPRINKLER	IRRIGATION, HYDROGEOLOGY, SOILS,	W69-07375
ION, *CHEMICAL WASTES, SPRINKLER	IRRIGATION, INFILTRATION, GROUNDW	W69-07114
, SOIL ANALYSIS, WATER TRANSFER,	IRRIGATION PRACTICES, LEACHING, T	W71-12122
, WATER TABLE, OXIDATION LAGOON,	IRRIGATION, AERATION, BIOCHEMICAL	W71-03542
ALINE WATER, WATER CONSERVATION,	IRRIGATION PRACTICES.: / WATER, S	W71-06063
*SALT WATER	IRRIGATION, SALT TRANSPORT.::	W71-06063
SALINE WATER INTRUSION, *HAWAII,	IRRIGATION WATER, WATER CHEMISTRY	W71-08044
AS, FERTILIZERS, DRAINAGE WATER,	IRRIGATION, RETURN FLOW, WATER SU	W71-06435
ATER, *WELLS, GROUNDWATER/ *RHODE	ISLAND, *GASOLINE, *PERCOLATING W	W70-08025
N, *PERCOLATING WATER, R/ *RHODE	ISLAND, *SEEPAGE, *WATER POLLUTIO	W71-01043
SAN	JACINTO VALLEY(CALIF).:	W70-05466
, SPRINGFI/ *URBAN STORM RUNOFF,	JAMES RIVER(MO), WILSON CREEK(MO)	W71-09154
T, LEASES, DAMAGES, LAND TENURE,	JUDICIAL DECISIONS, LEGISLATION,	W71-08055
LATING WATER, SUBSURFACE WATERS,	JUDICIAL DECISIONS, LEGAL ASPECTS	W71-01028
N EFFECTS, STREAMS, GROUNDWATER,	JUDICIAL DECISIONS, LEGAL ASPECTS	W71-01043
STIC WATER, POLLUTION ABATEMENT,	JUDICIAL DECISIONS, LEGAL ASPECTS	W71-13645
TES, *REMEDIES, WATER POLLUTION,	JUDICIAL DECISIONS, RELATIVE RIGH	W71-13521
CONTROL, DAMAGES, LEGAL ASPECTS,	JUDICIAL DECISIONS, GROUN: /TION	W71-11724
IATION, WATER POLLUTION SOURCES,	JUDICIAL DECISIONS, LEGAL ASPECTS	W70-08050
ERFLOW, ARTESIAN WELLS, STREAMS,	JUDICIAL DECISIONS, POLLUTION ABA	W70-08025
OLLUTION EFFECTS, LEGAL ASPECTS,	JUDICIAL DECISIONS, GROUNDWATER M	W70-08026
ATER, *UNDERSEEPAGE, *POLLUTION,	JUDICIAL DECISIONS, OIL, SEEPAGE,	W70-07631
ILY WATER, *PIPELINES, *LEAKAGE,	JUDICIAL DECISIONS, OIL, OIL INDU	W70-07632
ILLINOIS, *SALINE WATER, *WELLS,	JUDICIAL DECISIONS, OIL WASTES, W	W69-06118
OLINE, *WATER POLLUTION SOURCES,	JUDICIAL DECISIONS, FUELS, WELLS,	W69-06117
WELLS, WATER POLLUTION, DAMAGE,	JUDICIAL DECISIONS, GROUND WATER,	W68-00627
SPECTS, STATE GOVERNMENTS, STATE	JURISDICTION, OIL INDUSTRY, SALIN	W71-13521
GE DUMPS, *GROUNDWATER MOVEMENT,	KARST, INFILTRATION, ION TRANSPOR	W71-01204
IAL DRIFT, AQUIFERS, OHIO RIVER,	KENTUCKY.: /HING, CHLORIDES, GLAC	W71-00194
OVAKIA).:	LABORATORY OF BRATISLAVA(CZECHOSL	W71-01930
*HYDRAULICS	LABORATORY TESTS, PERMEABILITY, P	W69-00651
ONES, SEEPAGE, NUMERICAL METHOD,	LABORATORY TESTS, PERMEAMETERS, S	W70-01904
*ALDRIN, *GROUNDWATER MOVEMENT,	LABORATORY TESTS, PATH OF POLLUTA	W70-09548
NDWATER MOVEMENT, MODEL STUDIES,	LAG, NITROGEN COMPOUNDS, NITRATES	W70-07766
ITY, HEAD LOSS, DARCY'S LAW, TIME		

POLLUTION, WATER TABLE, OXIDATION	LAGOON, IRRIGATION, AERATION, BIO	W71-03542
UDGE DIGESTION, ANAEROBIC/ *OXIDATION	LAGOONS, *TERTIARY TREATMENT, *SL	W71-07118
YAKIMA BASIN(PACIFIC NORTHWEST),	LAKE MENDOTA(WIS).: /VER(CALIF),	W70-04504
ULATE F/ *AGRICULTURAL DRAINAGE,	LAKE METABOLISM, MOBILITY, PARTIC	W71-06443
ALS, / *KILLING, ANIMAL MANURES,	LAKE MINNETONKA(MINN), SOIL MINER	W70-04193
USTRIAL WASTES, RIVERS, STREAMS,	LAKES, PONDS, TIDAL WATERS, WELLS	W69-05370
TTED FLOORS, AERATOR, SPREADING,	LAND DISPOSAL.: /ATION DITCH, SLO	W71-03542
EVEL FLUCTUATIONS, SALINE SOILS,	LAND RECLAMATION, PATH OF POLLUTA	W71-08073
LING EQUIPMENT, LEASES, DAMAGES,	LAND TENURE, JUDICIAL DECISIONS,	W71-08055
S, HYDROLOGIC DATA, LEGISLATION,	LAND TENURE, LEGAL ASPEC: /DAMAGE	W71-11692
ALFALFA, CEREAL CROPS, IRRIGATED	LAND, COLORADO, GROUNDWATER, PERC	W70-04488
OLIGOTR/ *LAKES, STREAMS, FISH,	LAND, ECOSYSTEMS, EUTROPHICATION,	W70-04193
CISIONS, LEGAL ASPECTS, RIPARIAN	LAND, PERCOLATION, SUBSURFACE WAT	W71-01043
STATE COLLEGE(PENN), SANITARY	LANDFILL DRAINAGE.:	W71-01204
TURATED FLOW, *MOISTURE ROUTING,	LANDFILL MANAGEMENT, LEACHATE, IN	W68-00058
*GROUNDWATER POLLUTION,	LANDFILL POLLUTION EFFECTS.:	W71-07194
SIMULATED	LANDFILL.:	W70-09548
T, SEWERS, AERATION, MONITORING,	LANDFILLS, BIOCHEMICAL OXYG: /MEN	W71-09154
ERS, GROUNDWATER, GARBAGE DUMPS,	LANDFILLS, WASTE DUMPS, WATER POL	W71-05094
THODOLOGY, SANITARY ENGINEERING,	LANDFILLS, HYDROLOGY, WATER POLLU	W71-08907
LE USE, ARTIFICIAL USE, RIPARIAN	LANDS, GROUNDWATER, PERCOLATING W	W70-02896
ATERIALS, BIBLIOGRAPHIES, DARCY'S	LAW.: /BILITY, POROSITY, POROUS M	W69-00651
G WATER, *RELATIVE RIGHTS, WATER	LAW, GROUND WATER, SUBSURFACE WAT	W70-00521
RPTION, WATER CHEMISTRY, DARCY'S	LAW, PERMEABILITY, *RIVER FLOW.: /	W69-02611
RANSMISSIVITY, HEAD LOSS, DARCY'S	LAW, TIME LAG, NITROGEN COMPOUNDS	W70-07766
SUBSURFACE FLOW, GASOLINE, WATER	LAW, WELLS, GROUND WATER MOVEMENT	W68-00627
EST HOLES, ANNUAL PRECIPITATION,	LEACH BED, SPOKANE RIVER VALLEY.:	W69-01076
RE ROUTING, LANDFILL MANAGEMENT,	LEACHATE, INFILTRATION CAPACITY,	W68-00058
CE WATERS, AQUIFERS, FLOW RATES,	LEACHING.: /E, GROUNDWATER, SURFA	W70-09637
ITIATED WATER(TRACER), MINE DUMP	LEACHING.:	W71-11255
TRANSFER, IRRIGATION PRACTICES,	LEACHING, TEXAS.: /NALYSIS, WATER	W71-12122
, NITRIFICATION, AMMONIFICATION,	LEACHING, EROSION, NITROGEN, RUNO	W71-10372
RATES, *WATER POLLUTION SOURCES,	LEACHING, FARM WASTES, GROUNDWATE	W71-08218
RUNOFF, BASE FLOW, PERCOLATION,	LEACHING, DRAINAGE, FARM WASTES,	W71-06443
ATED SOILS, *IRRIGATION EFFECTS,	LEACHING, WATER LEVEL FLUCTUATION	W71-08073
, INFILTRATION, SOIL PROPERTIES,	LEACHING, PATH OF POLLUTANTS.: /E	W71-06514
OUNDWATER, GROUNDWATER MOVEMENT,	LEACHING, INFILTRATION, WATER QUA	W71-08044
, GROUNDWATER, DISSOLVED SOLIDS,	LEACHING, SALT BALANCE, PERCOLATI	W71-06063
AVES, PATH OF POLLUTANTS, ACIDS,	LEACHING, CHLORIDES, GLACIAL DRIF	W71-00194
ORNIA, WATER POLLUTION SOURCES,	LEACHING, DRAINAGE WATER, AMMONIA	W71-04548
EQUATIONS, GROUNDWATER MOVEMENT,	LEACHING, MATHEMATICAL MODELS, MI	W70-10058
ATER POLLUTION CONTROL, SURVEYS,	LEACHING, GEOLOGY, GROUNDWATER MO	W70-07193
GROUNDWATER, IRRIGATION EFFECTS,	LEACHING, DENITRIFICATION, RIVER	W70-08662
CHEMCONTROL, SALTS, GROUNDWATER,	LEACHING, SALINE SOILS, SALINE WA	W70-09844
PERCOLATING WATER, PERCOLATION,	LEACHING, AQUIFERS, WATER TABLE,	W70-06011
GY, *ILLINOIS, MUNICIPAL WASTES,	LEACHING, GROUNDWATER MOVEMENT, E	W70-06572
LUTION, WATER POLLUTION CONTROL,	LEACHING, WATER QUALITY CONTROL,	W69-03178
INS, *BIOCHEMICAL OXYGEN DEMAND,	LEACHING, RUNOFF, GROUNDWATER, CE	W68-01269
NITROGEN, *PUBLIC HEALTH, *SOIL	LEACHING, GROUNDWATER, SOIL PROFI	W69-09721
SUBSURFACE WATERS, UNDERGROUND,	LEAKAGE, PERCOLATION, WATER RIGHT	W70-07631
RESERVOIRS, DRILLING EQUIPMENT,	LEASES, DAMAGES, LAND TENURE, JUD	W71-08055
CY, AQUIFERS, PERCOLATING WATER,	LEG: /ENS, EXCAVATION, WATER POLI	W71-04742
FACE WATERS, JUDICIAL DECISIONS,	LEGAL ASPECTS, ADJUDICATION PROCE	W71-01028
, GROUNDWATER MOVEMENT, DAMAGES,	LEGAL ASPECTS, COMPENSATION, BRIN	W71-03230
GROUNDWATER, JUDICIAL DECISIONS,	LEGAL ASPECTS, RIPARIAN LAND, PER	W71-01043
JUDICIAL DECISIONS, LEGISLATION,	LEGAL ASPECTS.:/S, LAND TENURE,	W71-08055
ATER POLLUTION CONTROL, DAMAGES,	LEGAL ASPECTS, JUDICIAL DECISIONS	W71-11724
N ABATEMENT, JUDICIAL DECISIONS,	LEGAL ASPECTS, REMEDIES, WELLS, D	W71-13645
DATA, LEGISLATION, LAND TENURE,	LEGAL ASPEC: /DAMAGES, HYDROLOGIC	W71-11692
CIAL DECISIONS, RELATIVE RIGHTS,	LEGAL ASPECTS, STATE GOVERNMENTS,	W71-13521



ON, WATER POLLUTION, POLLUTANTS,	LEGAL ASPECTS.: /PAGE, INFILTRATI	W70-07632
ION SOURCES, JUDICIAL DECISIONS,	LEGAL ASPECTS, DEEP PERCOLATION.:	W70-08050
DWATER, WATER POLLUTION EFFECTS,	LEGAL ASPECTS, JUDICIAL DECISIONS	W70-08026
AL WASTES, *ARTIFICIAL RECHARGE,	LEGAL ASPECTS, AESTHETICS, AQUIFE	W69-08620
SEWAGE, WASTE WATER(POLLUTION),	LEGAL ASPECTS.: /DUSTRIAL WASTES,	W70-00521
COMPETING USES, DOMESTIC WATER,	LEGAL ASPECTS, MUNICIPAL WATER, R	W70-00532
HALLOW WELLS, SUBSURFACE WATERS,	LEGAL ASPECTS.: /FACE DRAINAGE, S	W69-06117
EFFECTS, SEEPAGE, WASTE STORAGE,	LEGAL ASPECTS.: /TCHES, DRAINAGE	W69-06118
TION.:	LEGAL ASPECTS), HYDROCARBON POLLU	W68-00627
*DAMAGES(	LEGISLATI: /, WATER POLLUTION TRE	W71-10446
ATMENT, ADMINISTRATIVE AGENCIES,	LEGISLATION, LEGAL ASPECTS.: /S,	W71-08055
LAND TENURE, JUDICIAL DECISIONS,	LEGISLATION, WELLS, IMPAIRED WATE	W71-11724
OLATION, WASTES, WASTE DISPOSAL,	LEGISLATION, LAND TENURE, LEGAL A	W71-11692
USTRY, DAMAGES, HYDROLOGIC DATA,	LEGISLATION, STATE GOVERNMENTS, P	W69-05370
ER POLLUTION, *OIL WASTES, *OIL,	LEGISLATION, WATER RIGHTS, RIPARI	W70-02896
GOVERNMENTS, LOCAL GOVERNMENTS,	LENSES, RHINE RIVER, AMSTERDAM RH	W69-07838
THE HAGUE, MINERALIZATION, CLAY	LEVEL FLUCTUATIONS, SALINE SOILS,	W71-08073
IGATION EFFECTS, LEACHING, WATER	LEVEL FLUCTUATIONS, AMMONIA, NEBR	W71-03543
RECHARGE, TRANSMISSIVITY, WATER	LEVELS, *WATER WELLS, WATER SUPPL	W69-02611
NSHIPS, OBSERVATION WELLS, WATER	LEVELS, WATER QUALITY, BIOCHEMICA	W69-07114
INFILTRATION, GROUNDWATER, WATER	LEVELS, WATER SUPPLY, WATER UTILI	W70-05466
R MOVEMENT, WATER QUALITY, WATER	LEYDEN, THE HAGUE, MINERALIZATION	W69-07838
SFORMATIONS, AMSTERDAM, HAARLEM,	LIABILITY.:	W70-00521
SS, NEGLIGENCE, NUISANCE, STRICT	TRESPA	W71-09154
CE RUNOFF, GROUNDWATER MOVEMENT,	LIMESTONES, INFILTRATION, DOMESTI	W71-07887
	LITHUANIA(USSR).:	W71-06435
	LIVESTOCK, SEWAGE, INFILTRATION,	W69-07114
	LOAD.:	W70-04504
	/VELS, WATER QUALITY, BIOG	W68-01010
	LOAD, GROUNDWATER, AQUIFER CHARAC	W69-03197
	LOADING, *BIODEGRADATION, SOIL DI	W70-02896
	LOADING, INFILTRATION, TUCSON BAS	W71-04559
	LOCAL GOVERNMENTS, LEGISLATION, W	W70-07766
	LONGITUDINAL DISPERSION.:	W70-03102
	LOSS, DARCY'S LAW, TIME LAG, NITRO	W71-01204
	LOW-FLOW AUGMENTATION.:	W71-00194
	/IFERS, W	W71-01932
	LYSIMETERS.:	W71-10372
	/E DRAINAGE, WATER Q	W71-06443
	MALENCLAVES, PATH OF POLLUTANTS,	W71-09936
	MANAGEMENT(APPLIED).:	W71-07194
	/INAGE PROG	W70-03102
	MANAGEMENT.:	W68-00058
	/WATER POLLUTION CON	W70-04193
	MANAGEMENT, GROUNDWATER, WISCONSI	W69-08921
	MANAGEMENT, PERCOLATION, *MODEL S	W71-11776
	MANAGEMENT, IMPAIRED WATER QUALIT	W71-01205
	MANAGEMENT(APPLIED), *CONJUNCTIVE	W71-01324
	MANAGEMENT, LEACHATE, INFILTRATIO	W71-01205
	MANURES, LAKE MINNETONKA(MINN), S	W71-01324
	MASS TRANSFER, AQUIFERS.:	W71-01324
	/ MATHE	W71-01205
	MASS TRANSFER, DIFFUSION, MIXING,	W69-00651
	MASS).:	W69-01238
	INFILTRATION	W69-08921
	MASS).:	W70-10058
	INFILTRATION	W71-01932
	MASS), FALMOUTH(MASS).:	W71-04559
	MASS), FALMOUTH(MASS).:	W71-01930
	MASS), FALMOUTH(MASS).:	W71-04548
	MASSACHUSETTS.:	
	/ EUTROPHICATION,	
	MASSACHUSETTS.:	
	/ EUTROPHICATION,	
	MATERIALS, BIBLIOGRAPHIES, DARCY'S	
	MATERIALS, *ENGINEERING MECHANICS	
	MATHEMATICAL MODELS, CURRENTS(WAT	
	MATHEMATICAL MODELS, MIXING, RADI	
	MATHEMATICAL MODELS, AQUIFERS, MO	
	MATHEMATICAL MODELS, SALINE WATER	
	MATHEMATICS, EQUATIONS, PATH OF P	
	MATHEMATICAL MODELS, COMPUTER PRO	

CAL MODELS, *PATH OF POLLUTANTS,	MATHEMATICAL MODELS, PROBABILITY,	W71-11776
QACTIVE WASTES, IONS, EQUATIONS,	MATHEMATICAL MODELS, CONVECTION,	W71-11356
SEEPAGE, POROUS MEDIA, EQUATIONS,	MATHEMATICAL MODELS.: /MOVEMENT, S	W71-09611
AGRICULTURAL WATERSHEDS, ORGANIC	MATTER, SEDIMENTS, FERTILIZERS, W	W70-04193
OAHU(HAWAII),	MAUI(HAWAII).:	W71-08044
ENTAL RECHARGE PROJECT, FLUSHING	MEADOWS PROJECT, PHOENIX(ARIZONA)	W69-05327
ENTAL RECHARGE PROJECT, FLUSHING	MEADOWS PROJECT, PHOENIX(ARIZONA)	W69-05328
N COMPOUNDS, NITRATES, DISCHARGE	MEASUREMENT, DISCHARGE(WATER), ON	W70-07766
, POROUS MATERIALS, *ENGINEERING	MECHANICS.: /FORM FLOW, *DIFFUSION	W69-01238
SOIL CHEMISTRY, ABSORPTION, SOIL	MECHANICS, WATER QUALITY, SOIL PR	W71-04121
CONVECTION, MIXING, FLOW, POROUS	MEDIA.: /S, ARTIFICIAL RECHARGE,	W69-07554
ADIOISOT/ *INFILTRATION, *POROUS	MEDIA, *ALLUVIUM, *LYSIMETERS, *R	W69-02681
TH OF POLLU/ *DIFFUSION, *POROUS	MEDIA, *GROUNDWATER MOVEMENT, *PA	W69-03212
*DISPERSION, *DIFFUSION, *POROUS	MEDIA, *GROUNDWATER MOVEMENT, *WA	W69-03237
*STOCHASTIC PROCESSES, *POROUS	MEDIA, *GROUNDWATER MOVEMENT, *ST	W71-11776
ATER INTRUSION, AQUIFERS, POROUS	MEDIA, DIFFUSION, CONVECTION, DIF	W71-04559
DWATER MOVEMENT, SEEPAGE, POROUS	MEDIA, EQUATIONS, MATHEMATICAL MO	W71-09611
FORM F/ *DISPERSION, FLOW, POROUS	MEDIA, GROUNDWATER, WASTES, *UNIF	W69-01238
HOMOGENEOUS	MEDIA, UNSATURATED SOIL.:	W69-02681
A BASIN(PACIFIC NORTHWEST), LAKE	MENDOTA(WIS).: /VER(CALIF), YAKIM	W70-04504
LIS, BACILLUS MYCOIDES, BACILLUS	MESENTERICUS, DIATOMEA, CLADOPHOR	W69-07838
GEN, BACTERIA, AEROBIC BACTERIA,	METABOLISM, CANALS, SANDS, CHLORI	W69-07838
F/ *AGRICULTURAL DRAINAGE, LAKE	METABOLISM, MOBILITY, PARTICULATE	W71-06443
SOURCES, PIPES, CLOSED CONDUITS,	METAL PIPES, WELLS, ARTESIAN WELL	W70-07632
R SUPPLY, GASES, CARBON DIOXIDE,	METHANE, BARRIERS, INFILTRATI: /E	W70-06011
*FINITE DIFFERENCE	METHOD.:	W71-09611
RATION ZONES, SEEPAGE, NUMERICAL	METHOD, LABORATORY TESTS, PERMEAB	W69-00651
EWAGE EFFLUENTS, BIODEGRADATION,	METHODOLOGY.: /NDS, DISPERSION, S	W70-01291
ATERS, TESTING, TEST PROCEDURES,	METHODOLOGY, WATER QUALITY, SOILS	W71-06514
AMPLING, DATA COLLECTION, WELLS,	METHODOLOGY, CHEMICAL ANALYSIS.: /	W71-11255
TMENT, *UNITED STATES, *REVIEWS,	METHODOLOGY, SANITARY ENGINEERING	W71-08907
NUMERICAL	METHODS.:	W69-03237
STATISTICAL MODELS, STATISTICAL	METHODS, WATER STORAGE, AQUIFERS,	W70-03102
UTION SOURCES, *HERBICIDES, *NEW	MEXICO, *SOIL WATER MOVEMENT, GRO	W71-06514
ANY, NETWORK ANALYSIS.: GREAT	MIAMI RIVER, S.W. OHIO WATER COMP	W69-02611
EST SOILS, MINNESOTA, WISCONSIN,	MICHIGAN, PHOSPHORUS, AGRICULTURA	W70-04193
SM, CANALS, SANDS, CHLORINATION,	MICROORGANISMS, CHEMICAL ANALYSIS	W69-07838
ASALTS, WATER POLLUTION SOURCES,	MICROORGANISMS, FERROBACILLUS, FL	W69-00979
TRITIATED WATER(TRACER),	MINE DUMP LEACHING.:	W71-11255
R POLLUTION, PATH OF POLLUTANTS,	MINE WASTES, GEOLOGY, GROUNDWATER	W71-08907
LEACHING, *COPPER, *WASTE DUMPS,	MINE WASTES, MINING, GROUNDWATER	W71-11255
SOLINE, WATER POLLUTION SOURCES,	MINE WATER, OIL WASTES, CESSPOOLS	W70-08049
DAM, HAARLEM, LEYDEN, THE HAGUE,	MINERALIZATION, CLAY LENSES, RHIN	W69-07838
FACE WATERS, GEOLOGICAL SOURCES,	MINERALIZATION, NITROGEN SOURCES,	W71-06435
RUSION, WATER POLLUTION SOURCES,	MINERALOGY, INDUSTRIAL WASTES, MU	W71-10446
RES, LAKE MINNETONKA(MINN), SOIL	MINERALS, PLANT RESIDUES, MORRIS(	W70-04193
PPER, *WASTE DUMPS, MINE WASTES,	MINING, GROUNDWATER MOVEMENT, FLO	W71-11255
ANIMAL MANURES, LAKE MINNETONKA(	MINN), SOIL MINERALS, PLANT RESID	W70-04193
MINERALS, PLANT RESIDUES, MORRIS(	MINN), SOIL PERCOLATION.: / SOIL	W70-04193
EFFLUENTS, SWAMPS, FOREST SOILS,	MINNESOTA, WISCONSIN, MICHIGAN, P	W70-04193
*KILLING, ANIMAL MANURES, LAKE	MINNETONKA(MINN), SOIL MINERALS,	W70-04193
R MOVEMENT, *NUMERICAL ANALYSIS,	MIXING, COMPUTER PROGRAMS, COMPUT	W71-04559
FLOW, MASS TRANSFER, DIFFUSION,	MIXING, DISPERSION.:	W71-11776
ARTIFICIAL RECHARGE, CONVECTION,	MIXING, FLOW, POROUS MEDIA.: /S,	W69-07554
S, COMPUTER PROGRAMS, DIFFUSION,	MIXING, GROUNDWATER MOVEMENT, SFE	W71-09611
NE WATER-FRESH WATER INTERFACES,	MIXING, PENETRATION, DRILL HOLES,	W71-03230
, LEACHING, MATHEMATICAL MODELS,	MIXING, RADIOACTIVE WASTE DISPOSA	W70-10058
RSION, *ION EXCHANGE, DIFFUSION,	MIXING, RADIOACTIVITY, RADIATION,	W71-11356
NAGE, DISSOLVED NUTRIENTS, WATER	MIXING, RUSSIAN RIVER(CALIF), YAK	W70-04504
), WILSON CREEK(MO), SPRINGFIELD(	MO), SEWAGE PLANT BYPASSES.: /(MO	W71-09154



F, JAMES RIVER(MO), WILSON CREEK(MO), SPRINGFIELD(MO), SEWAGE PLANT	W71-09154
*URBAN STORM RUNOFF, JAMES RIVER(MO), WILSON CREEK(MO), SPRINGFIELD	W71-09154
TURAL DRAINAGE, LAKE METABOLISM, MOBILITY, PARTICULATE FORM, FEEDL	W71-06443
LY WATER, *GROUNDWATER RECHARGE, MODEL STUDIES, HYDRAULIC MODELS,	W71-10325
, MATHEMATICAL MODELS, AQUIFERS, MODEL STUDIES, DRAINAGE PROGRAMS,	W71-01932
RATION TECHNIQUES, INFILTRATION, MODEL STUDIES, MATHEMATICS, EQUAT	W71-01930
COLATION, *GROUNDWATER MOVEMENT, MODEL STUDIES, LABORATORY TESTS,	W70-09548
DISPERSION, *MATHEMATICAL MODELS, MODEL STUDIES, HYDRAULIC MODELS,	W69-07554
TION, SEEPAGE, UNSATURATED FLOW, MODEL STUDIES, SATURATED SOILS.: /	W69-02681
TE DISPOSAL, THERMAL PROPERTIES, MODEL TESTS, SATURATION ZONES, SE	W69-00651
RETURN FLOW, HYDROLOGIC-QUALITY MODEL.: *IRRIGATION	W71-09936
, TUCSON BASIN, PROCESS-RESPONSE MODEL, INSTRUMENTATION, HYDROCHEM	W69-03197
S MEDIA, EQUATIONS, MATHEMATICAL MODELS.: /MOVEMENT, SEEPAGE, POROU	W71-09611
GROUNDWATER MOVEMENT, *STATISTICAL MODELS, *PATH OF POLLUTANTS, MATH	W71-11776
, HYDRAULIC MODELS, MATHEMATICAL MODELS, AQUIFERS, MODEL STUDIES,	W71-01932
RN FLOW, *NITRATES, MATHEMATICAL MODELS, COMPUTER PROGRAMS, CALIFO	W71-04548
S, IONS, EQUATIONS, MATHEMATICAL MODELS, CONVECTION, NUCLEAR POWER	W71-11356
PATH OF POLLUTANTS, MATHEMATICAL MODELS. CURRENTS(WATER), MASS TRA	W69-08921
H/ *WATER QUALITY, *MATHEMATICAL MODELS, INDUCED INFILTRATION, REC	W69-02611
ING, COMPUTER PROGRAMS, COMPUTER MODELS, MATHEMATICAL MODELS, SALI	W71-04559
ENT, DRAINAGE SYSTEMS, HYDRAULIC MODELS, MATHEMATICAL MODELS, AQUI	W71-01932
MOVEMENT, LEACHING, MATHEMATICAL MODELS, MIXING, RADIOACTIVE WASTE	W70-10058
SION, *DISPERSION, *MATHEMATICAL MODELS, MODEL STUDIES, HYDRAULIC	W69-07554
CHARGE, MODEL STUDIES, HYDRAULIC MODELS, OIL WASTES, WATER POLLUTI	W71-10325
PATH OF POLLUTANTS, MATHEMATICAL MODELS, PROBABILITY, THERMODYNAMI	W71-11776
S, COMPUTER MODELS, MATHEMATICAL MODELS, SALINE WATER INTRUSION, A	W71-04559
HYDROGRAPH ANALYSIS, STATISTICAL MODELS, STATISTICAL METHODS, WATE	W70-03102
MODELS, MODEL STUDIES, HYDRAULIC MODELS, TRACERS, INJECTION WELLS,	W69-07554
WASTE STORAGE, SOIL PROPERTIES, MOISTURE CONTENT, POLLUTANTS, SOI	W68-00058
S, *CAPILLARY CONDUCTIVITY, SOIL MOISTURE.: /A, NITRATES, CHLORIDE	W69-01076
GE, GROUNDWATER, *SEEPAGE, *SOIL MOISTURE, EVAPOTRANSPIRATION, *LA	W68-00058
AGE TREATMENT, SEWERS, AERATION, MONITORING, LANDFILLS, BIOCHEMICA	W71-09154
, SOIL MINERALS, PLANT RESIDUES, MORRIS(MINN), SOIL PERCOLATION.: /	W70-04193
CONTENT, POLLUTANTS, SOIL WATER MOVEMENT.: / PROPERTIES, MOISTURE	W68-00058
WATER, INFILTRATION, GROUNDWATER MOVEMENT.: /SULFIDES, PERCOLATING	W68-01010
, WATER LAW, WELLS, GROUND WATER MOVEMENT.: /SURFACE FLOW, GASOLINE	W68-00627
, LEACHING, GEOLOGY, GROUNDWATER MOVEMENT.: /TION CONTROL, SURVEYS	W70-07193
WATER RELATIONSHIPS, GROUNDWATER MOVEMENT.: /WATER, SURFACE-GROUND	W71-02909
LINE WATER SYSTEMS, *GROUNDWATER MOVEMENT, DRAINAGE SYSTEMS, HYDRA	W71-01932
RATION, DRILL HOLES, GROUNDWATER MOVEMENT, DAMAGES, LEGAL ASPECTS,	W71-03230
EPAGE, INFILTRATION, GROUNDWATER MOVEMENT, HYDRAULICS, SURFACE RUN	W71-05094
LS, *GARBAGE DUMPS, *GROUNDWATER MOVEMENT, KARST, INFILTRATION, IO	W71-01204
CANAL CONSTRUCTION, GROUNDWATER MOVEMENT, INFILTRATION, NAVIGATIO	W71-04882
LYSIS, *DISPERSION, *GROUNDWATER MOVEMENT, *NUMERICAL ANALYSIS, MI	W71-04559
*INDUSTRIAL WASTES, *GROUNDWATER MOVEMENT, *RECHARGE, *SURFACE-GRO	W71-00194
, PATH OF POLLUTANTS, SOIL WATER MOVEMENT, OILY WATER, OIL WASTES,	W71-01043
UNDERGROUND STREAMS, GROUNDWATER MOVEMENT, PATH OF POLLUTANTS, SOI	W71-01043
PHICATION, AQUIFERS, GROUNDWATER MOVEMENT, MASSACHUSETTS.: / EUTRO	W71-01205
PHICATION, AQUIFERS, GROUNDWATER MOVEMENT, MASSACHUSETTS.: / EUTRO	W71-01324
LLUTANTS, *LEACHING, *SOIL WATER MOVEMENT, *OILY WATER, *GROUNDWAT	W71-10325
MULATION/ *METHEMOGLOBIN, NITRATE MOVEMENT, FEEDLOTS, RESIDUAL ACCU	W71-10372
TS, *RADIOISOTOPES, *GROUNDWATER MOVEMENT, *DISPERSION, *ION EXCHA	W71-11356
DRAWAL, GROUNDWATER, GROUNDWATER MOVEMENT, LEACHING, INFILTRATION,	W71-08044
MINE WASTES, MINING, GROUNDWATER MOVEMENT, FLOW PROFILES, SAMPLING	W71-11255
ICIDES, *NEW MEXICO, *SOIL WATER MOVEMENT, GROUNDWATER, SURFACE WA	W71-06514
, SUBSURFACE RUNOFF, GROUNDWATER MOVEMENT, LIMESTONES, INFILTRATIO	W71-09154
R POLLUTION SOURCES, GROUNDWATER MOVEMENT, PERCOLATION, WATER MANA	W71-07194
L HOLES, OILY WATER, GROUNDWATER MOVEMENT, OIL-WATER INTERFACES, I	W71-08055
, DIFFUSION, MIXING, GROUNDWATER MOVEMENT, SEEPAGE, POROUS MEDIA,	W71-09611
TANTS, INFILTRATION, GROUNDWATER MOVEMENT, SUBSURFACE MOVEMENT, CO	W71-13645

SES, *POROUS MEDIA, *GROUNDWATER	MOVEMENT, *STATISTICAL MODELS, *P	W71-11776
GROUNDWATER MOVEMENT, SURFACE	MOVEMENT, CONSUMPTIVE USE, DOMEST	W71-13645
LUTANTS, *DIFFUSION, *SOIL WATER	MOVEMENT, *RADIOACTIVE WASTES, EQ	W70-10058
POSAL, HYDROGEOLOGY, GROUNDWATER	MOVEMENT, WATER RESOURCES DEVELOP	W70-04712
ILLS, *PERCOLATION, *GROUNDWATER	MOVEMENT, MODEL STUDIES, LABORATO	W70-09548
SOURCES, GROUNDWATER, GROUNDWATER	MOVEMENT, PERMEABILITY: /LLUTION S	W70-07631
NS, HYDROLOGIC DATA, GROUNDWATER	MOVEMENT, WATER QUALITY, WATER LE	W70-05466
E WASTES, EQUATIONS, GROUNDWATER	MOVEMENT, LEACHING, MATHEMATICAL	W70-10058
JUDICIAL DECISIONS, GROUNDWATER	MOVEMENT, PERCOLATING WATER, SURS	W70-08026
R POLLUTION SOURCES, GROUNDWATER	MOVEMENT, UNDERFLOW, ARTESIAN WEL	W70-08025
AL WASTES, LEACHING, GROUNDWATER	MOVEMENT, ENVIRONMENTAL SANITATIO	W70-06572
PERMEABILITY, SAMPLING, GROUNDWATER	MOVEMENT, PATH OF POLLUTANTS, ENV	W70-06322
USED CONDUIT FLOW, *GROUND WATER	MOVEMENT, CAPILLARY FLOW, *LAVA,	W69-00979
TIVE WASTE DISPOSAL, GROUNDWATER	MOVEMENT, PERCOLATION, SEEPAGE, U	W69-02681
ION, *POROUS MEDIA, *GROUNDWATER	MOVEMENT, *WATER POLLUTION, PATH	W69-03237
LS, SEWAGE DISPOSAL, GROUNDWATER	MOVEMENT, ABSORPTION, ADSORPTION.	W69-00652
ION, *POROUS MEDIA, *GROUNDWATER	MOVEMENT, *PATH OF POLLUTANTS, IN	W69-03212
POLLUTANTS, *ALDRIN, *GROUNDWATER	MOVEMENT, LABORATORY TESTS, PERME	W70-01904
GROUNDWATER MOVEMENT, SOIL WATER	MOVEMENT, INFILTRATION, PERCOLATI	W69-07375
AESTHETICS, AQUIFERS, SOIL WATER	MOVEMENT, GROUNDWATER MOVEMENT, I	W69-08620
NATES, *DETERGENTS, *GROUNDWATER	MOVEMENT, *WATER POLLUTION, INFIL	W70-01291
BACTERIA, *VIRUSES, *GROUNDWATER	MOVEMENT, MUNICIPAL WASTES, IRRIG	W69-08621
OSITY, PERMEABILITY, GROUNDWATER	MOVEMENT, SOIL WATER MOVEMENT, IN	W69-07375
, DEEP PERCOLATION, GROUND WATER	MOVEMENT, INFILTRATION, PATH OF P	W70-00521
PATH OF POLLUTANTS, *GROUNDWATER	MOVEMENT, *DIFFUSION, *DISPERSION	W69-07554
RSION, *CONVECTION, *GROUNDWATER	MOVEMENT, SOLUTES, WASTES, PATH O	W69-08921
SOIL WATER MOVEMENT, GROUNDWATER	MOVEMENT, INFILTRATION, WATER CHE	W69-08620
EFFECTS, NUTRIENTS, GROUNDWATER	MOVEMENT, NITROGEN, WASTE WATER(P	W70-00665
GROUNDWATER BASINS, WATER SUPPLY,	MUD, BENTHOS, HYDROGEN, BACTERIA,	W69-07838
, DOMESTIC WATER, LEGAL ASPECTS,	MUNICIPAL WATER, REASONABLE USE,	W70-00532
*VIRUSES, *GROUNDWATER MOVEMENT,	MUNICIPAL WASTES, IRRIGATION WATE	W69-08621
	MUNICIPAL WASTE RECHARGE.:	W69-08621
L, DOMESTIC WASTES, FARM WASTES,	MUNICIPAL WASTES, NATURAL GAS, SA	W70-08049
TANTS, *HYDROGEOLOGY, *ILLINOIS,	MUNICIPAL WASTES, LEACHING, GROUND	W70-06572
, MINERALOGY, INDUSTRIAL WASTES,	MUNICIPAL WASTES, SEWAGE, WATER Q	W71-10446
AQUITARDS, PUMPING, WATER WELLS,	MUNICIPAL WATER, SURFACE-GROUNDWA	W71-02909
LDERS, COMPOSITION, PSEUDOMONAS,	MYCOBACTERIUM, BACILLUS SUBTILIS,	W69-07838
IUM, BACILLUS SUBTILIS, BACILLUS	MYCOIDES, BACILLUS MESPENTERICUS,	W69-07838
*SUSQUEHANNA RIVER BASIN, (	(N.Y.).:	W70-03102
, SOUTH PLATTE VALLEY(COLO).:	NATIVE GRASSES, FEEDLOTS, CORRALS	W70-04488
S, RIPARIAN RIGHTS, NATURAL USE,	NATURAL FLOW DOCTRINE, REASONABLE	W70-02896
, FARM WASTES, MUNICIPAL WASTES,	NATURAL GAS, SALINE: /STIC WASTES	W70-08049
, WATER RIGHTS, RIPARIAN RIGHTS,	NATURAL USE, NATURAL FLOW DOCTRIN	W70-02896
UNDWATER MOVEMENT, INFILTRATION,	NAVIGATION, SEEPAGE.:	W71-04882
TER LEVEL FLUCTUATIONS, AMMONIA,	NEBRASKA, SOIL CONTAMINATION, OBS	W71-03543
ILITY.:	NEGLIGENCE, NUISANCE, STRICT LIAB	W70-00521
TRESPASS,	NETWORK ANALYSIS.:	W69-02611
RIVER, S.W. OHIO WATER COMPANY,	GREAT MIAMI	W71-10372
UAL ACCUMULATION/ *METHEMOGLOBIN,	NITRATE MOVEMENT, FEEDLOTS, RESID	W71-12122
LITY, *MONITORING, *GROUNDWATER,	NITRATE, NITRITES, NITROGEN-CYCLE	W71-03542
POULTRY, CATTLE, HOGS, NITROGEN,	NITRATE, PHOSPHORUS, PHOSPHATES,	W69-03197
ARBONATE, BICARBONATE, FLUORIDE,	NITRATE, SULFATE, SILICATE, GROUND	W69-01076
ON, COLIFORMS, ENTERIC BACTERIA,	NITRATES, CHLORIDES, *CAPILLARY C	W69-07838
CHEMICAL ANALYSIS, TEMPERATURE,	NITRATES, PLANTS, AMMONIA, HARDNE	W70-07766
W, TIME LAG, NITROGEN COMPOUNDS,	NITRATES, DISCHARGE MEASUREMENT,	W71-01205
TREATMENT, WASTE WATER DISPOSAL,	NITRATES, EUTROPHICATION, AQUIFER	W71-01324
TREATMENT, WASTE WATER DISPOSAL,	NITRATES, EUTROPHICATION, AQUIFER	W71-12084
TER POLLUTION SOURCES, NITROGEN,	NITRATES, NITROGEN CYCLE, PHOSPHO	W71-06443
, *PHOSPHORUS, NUTRIENTS, ALGAE,	NITRATES, SURFACE RUNOFF, BASE FL	W71-08044
WATER, WATER CHEMISTRY, SOLUTES,	NITRATES, SALINITY, WITHDRAWAL, G	W71-10372
TES, NUTRIENTS, DENITRIFICATION,	NITRIFICATION, AMMONIFICATION, LE	



NITORING, *GROUNDWATER, NITRATE,	NITRITES, NITROGEN-CYCLE, HISTORY	W71-12122
TS, DETERGENTS, DENITRIFICATION,	NITRITES, BIOCHEMICAL OXYGEN DEMAN	W71-12084
ATES, WATER POLLUTION, NITROGEN,	NITRITES, AQUIFERS, COLORADO, DEN	W71-02036
CTERIOPHAGE, RESERVOIRS, SPORES,	NITRITES,: /SELF-PURIFICATION, RA	W69-07838
HEAD LOSS, DARCYS LAW, TIME LAG,	NITROGEN COMPOUNDS, NITRATES, DIS	W70-07766
TRATION, DETERGENTS, POLLUTANTS,	NITROGEN COMPOUNDS, SOIL CONTAMIN	W69-00652
ION SOURCES, NITROGEN, NITRATES,	NITROGEN CYCLE, PHOSPHORUS, REGUL	W71-12084
LOGICAL SOURCES, MINERALIZATION,	NITROGEN SOURCES, WELL WATER, FEE	W71-06435
EGRASS, SPRING THAWS, FERTILIZER-	NITROGEN.: /SPHORUS, ALFALFA-BROM	W69-09721
*GROUNDWATER, NITRATE, NITRITES,	NITROGEN-CYCLE, HISTORY, SOIL ANA	W71-12122
IZERS, *WATER POLLUTION SOURCES,	NITROGEN, NITRATES, NITROGEN CYCL	W71-12084
MONIFICATION, LEACHING, EROSION,	NITROGEN, RUNOFF, WATER POLLUTION	W71-10372
OTASSIUM, POULTRY, CATTLE, HOGS,	NITROGEN, NITRATE, PHOSPHORUS, PH	W71-03542
ERS, *NITRATES, WATER POLLUTION,	NITROGEN, NITRITES, AQUIFERS, COL	W71-02036
NUTRIENTS, GROUNDWATER MOVEMENT,	NITROGEN, WASTE WATER(POLLUTION).	W70-00665
AGE, *DRAINAGE, *EUTROPHICATION,	NITROGEN, PHOSPHORUS, SURFACE WAT	W70-04504
EACHING, / *NITRIFICATION, *SOIL	NITROGEN, *PUBLIC HEALTH, *SOIL L	W69-09721
VER(CALIF), YAKIMA BASIN(PACIFIC	NORTHEASTERN ILLINOIS.: /	W70-09637
OLLUTANTS, *NUCLEAR ENGINEERING,	NORTHWEST), LAKE MENDOTA(WIS).: /	W70-04504
MATHEMATICAL MODELS, CONVECTION,	NUCLEAR EXPLOSIONS, CANALS, CANAL	W71-04882
SPASS, INJUNCTIONS(PROHIBITORY),	NUCLEAR POWERPLANTS.: /QUATIONS,	W71-11356
TRESPASS, NEGLIGENCE,	NUISANCE.: TRE	W69-06117
ESTS, SATURATION ZONES, SEEPAGE,	NUISANCE, STRICT LIABILITY.: /	W70-00521
	NUMERICAL METHOD, LABORATORY TEST	W69-00651
	NUMERICAL METHODS.: /	W69-03237
ITY, PARTICULATE FORM, FEEDLOTS,	NUTRIENT SOURCES.: /BOLISM, MOBIL	W71-06443
ICATION, *NITROGEN, *PHOSPHORUS,	NUTRIENTS, ALGAE, NITRATES, SURFA	W71-06443
ATION, FERTILIZERS, FARM WASTES,	NUTRIENTS, DENITRIFICATION, NITRI	W71-10372
HOSPHATES, RATES OF APPLICATION,	NUTRIENTS, EFFLUENT, AQUIFER, AMM	W71-03542
MICALS, FERTILIZERS, PESTICIDES,	NUTRIENTS, SOIL WATER, SOILS, SEE	W71-04121
UTANTS, WATER POLLUTION EFFECTS,	NUTRIENTS, GROUNDWATER MOVEMENT,	W70-00665
AGRICULTURAL DRAINAGE, DISSOLVED	NUTRIENTS, WATER MIXING, RUSSIAN	W70-04504
PHY, SEWAGE, ALGAE, SCUM, WEEDS,	NUTRIENTS, SEPTIC TANKS, EFFLUENT	W70-04193
USQUEHANNA RIVER(NY), BINGHAMTON(	NY).: *S	W71-02909
*SUSQUEHANNA RIVER(	NY), BINGHAMTON(NY).:	W71-02909
MICAL FACIES, SEWAGE EFFLUENT, C.	O.D., B.O.D., WASTE WATERS, HYDRA	W69-03197
CIES, SEWAGE EFFLUENT, C.O.D., B.	O.D., WASTE WATERS, HYDRAULIC LOA	W69-03197
	OAHU(HAWAII), MAUI(HAWAII).:	W71-08044
A, NEBRASKA, SOIL CONTAMINATION,	OBSERVATION WELLS, WATER TABLE, I	W71-03543
RFACE-GROUNDWATER RELATIONSHIPS,	OBSERVATION WELLS, WATER LEVELS,	W69-02611
OURCES, *FISHKILL, STORM RUNOFF,	ODOR, SUBSURFACE RUNOFF, GROUNDWA	W71-09154
DIGESTION, ANAEROBIC DIGESTION,	ODORS, GROUNDWATER, EVAPORATION,	W71-07118
ORIDES, GLACIAL DRIFT, AQUIFERS,	OHIO RIVER, KENTUCKY.: /HING, CHL	W71-00194
SIS.: GREAT MIAMI RIVER, S.W.	OHIO WATER COMPANY, NETWORK ANALY	W69-02611
PERATURE, WASTE WATER TREATMENT,	OHIO.: /ATION, AIR POLLUTION, TEM	W71-07118
STARK COUNTY(	OHIO).:	W70-07193
LIC HEALTH, OIL WELLS, DRILLING,	OIL FIELDS, SALINE WATER, SALINE	W71-01028
E WATER INTRUSION, *WATER WELLS,	OIL INDUSTRY, PUBLIC HEALTH, OIL	W71-01028
N ABATEMENT, PATH OF POLLUTANTS,	OIL INDUSTRY, OIL, GASES, POLLUTA	W71-11724
GOVERNMENTS, STATE JURISDICTION,	OIL INDUSTRY, SALINE WATER, SUBSU	W71-13521
*WELLS, GROUNDWATER, OILY WATER,	OIL INDUSTRY, WATER POLLUTION SOU	W70-08025
EAKAGE, JUDICIAL DECISIONS, OIL,	OIL INDUSTRY, SUBSURFACE DRAINAGE	W70-07632
ECISIONS, OIL, SEEPAGE, DAMAGES,	OIL INDUSTRY, STORAGE TANKS, SURS	W70-07631
TER BARRIERS, INFILTRATION, OIL,	OIL RESERVOIRS, DRILLING EQUIPMEN	W71-08055
MODEL STUDIES, HYDRAULIC MODELS,	OIL WASTES, WATER POLLUTION SOURC	W71-10325
SOIL WATER MOVEMENT, OILY WATER,	OIL WASTES, WAT: /OF POLLUTANTS,	W71-01043
R POLLUTION SOURCES, MINE WATER,	OIL WASTES, CESSPOOLS, SEWAGE DIS	W70-08049
TER, *WELLS, JUDICIAL DECISIONS,	OIL WASTES, WATER QUALITY, SALINI	W69-06118
LS, OIL INDUSTRY, PUBLIC HEALTH,	OIL WELLS, DRILLING, OIL FIELDS,	W71-01028
R, PERCOLATING WATERS, DRILLING,	OIL WELLS, WATER SUPPLY, FARMS, W	W71-13521

ILY WATER, GROUNDWATER MOVEMENT,	OIL-WATER INTERFACES, IMPERVIOUS	W71-08055
ATH OF POLLUTANTS, OIL INDUSTRY,	OIL, GASES, POLLUTANTS, PERCOLATI	W71-11724
S, *LEAKAGE, JUDICIAL DECISIONS,	OIL, OIL INDUSTRY, SURSURFACE DRA	W70-07632
UNDWATER BARRIERS, INFILTRATION,	OIL, OIL RESERVOIRS, DRILLING EQU	W71-08055
*POLLUTION, JUDICIAL DECISIONS,	OIL, SEEPAGE, DAMAGES, OIL INDUST	W70-07631
TING WATER, *WELLS, GROUNDWATER,	OILY WATER, OIL INDUSTRY, WATER P	W70-08025
UNDWATER, *SEEPAGE, DRILL HOLES,	OILY WATER, GROUNDWATER MOVEMENT,	W71-08055
POLLUTANTS, SOIL WATER MOVEMENT,	OILY WATER, OIL WASTES, WAT: /OF	W71-01043
AND, ECOSYSTEMS, EUTROPHICATION,	OLIGOTROPHY, SEWAGE, ALGAE, SCUM,	W70-04193
	ORGANIC CARBON, FEEDLOTS.:	W71-08218
	ORGANIC CHEMICAL WASTES.:	W69-07114
UES, SOIL CONTAMINATION EFFECTS,	ORGANIC COMPOUNDS, DISPERSION, SE	W70-01291
SOIL DISPOSAL/ SEWAGE DISPOSAL,	ORGANIC LOADING, *BIODEGRADATION,	W68-01010
PHORUS, AGRICULTURAL WATERSHEDS,	ORGANIC MATTER, SEDIMENTS, FERTIL	W70-04193
:	OTTAWA SAND, ALDRIN INFILTRATION.	W70-01904
DWATER BASINS, HYDROLOGIC CYCLE,	OVERDRAFT, WELLS, SURFACE-GROUNDW	W70-00532
N, WATER POLLUTION, WATER TABLE,	OXIDATION LAGOON, IRRIGATION, AER	W71-03542
AERATOR, SPREADING, / *FEEDLOTS,	OXIDATION DITCH, SLOTTED FLOORS,	W71-03542
NITORING, LANDFILLS, BIOCHEMICAL	OXYG: /MENT, SEWERS, AERATION, MO	W71-09154
CHEMICAL OXYGEN DEMAND, CHEMICAL	OXYGEN DE: /GATION, AERATION, BIO	W71-03542
RRIGATION, AERATION, BIOCHEMICAL	OXYGEN DEMAND, CHEMICAL OXYGEN DE	W71-03542
IFICATION, NITRITES, BIOCHEMICAL	OXYGEN DEMAND.: /TERGENTS, DENITR	W71-12084
VELS, WATER QUALITY, BIOCHEMICAL	OXYGEN DEMAND, SUSPENDED LOAD.: /	W69-07114
S, *BARK, *LIGNINS, *BIOCHEMICAL	OXYGEN DEMAND, LEACHING, RUNOFF,	W68-01269
, PERMEABILITY, ALGAE, DISSOLVED	OXYGEN.: /GROUNDWATER RELATIONSHIPS	W71-12410
MONIA, HARDNESS(WATER), ACIDITY,	OXYGEN, ALGAE, SELF-PURIFICATION,	W69-07838
SSIAN RIVER(CALIF), YAKIMA BASIN(	PACIFIC NORTHWEST), LAKE MENDOTA(	W70-04504
POLLUTANTS, WOOD WASTES, PULP AND	PAPER INDUSTRY, DAMAGES, HYDROLOG	W71-11692
ALA AQUIFER, HIGH PLAINS(TEXAS),	PARMER COUNTY(TEXAS), HOLLY SUGAR	W71-12122
NAGE, LAKE METABOLISM, MOBILITY,	PARTICULATE FORM, FEEDLOTS, NUTRI	W71-06443
TION, SOIL PROPERTIES, LEACHING,	PATH OF POLLUTANTS.: /E, INFILTRA	W71-06514
SALINE SOILS, LAND RECLAMATION,	PATH OF POLLUTANTS.: /UCTUATIONS,	W71-08073
LLS, HYDROLOGY, WATER POLLUTION,	PATH OF POLLUTANTS, MINE WASTES,	W71-08907
PERCOLATING WATER, PERCOLATION,	PATH OF POLLUTANTS, WOOD WASTES,	W71-11692
ON EFFECTS, POLLUTION ABATEMENT,	PATH OF POLLUTANTS, OIL INDUSTRY,	W71-11724
STUDIES, MATHEMATICS, EQUATIONS,	PATH OF POLLUTANTS, FOREIGN PROJE	W71-01930
D STREAMS, GROUNDWATER MOVEMENT,	PATH OF POLLUTANTS, SOIL WATER MO	W71-01043
CHING, *WATER POLLUTION SOURCES,	PATH OF POLLUTANTS, WATER POLLUTI	W70-00665
ND WATER MOVEMENT, INFILTRATION.	PATH OF POLLUTANTS, SEEPAGE, PENE	W70-00521
WATER MOVEMENT, SOLUTES, WASTES,	PATH OF POLLUTANTS, MATHEMATICAL	W69-08921
ATER MOVEMENT, *WATER POLLUTION,	PATH OF POLLUTANTS, DIGITAL COMPU	W69-03237
JUDICIAL DECISIONS, GROUND WATER,	PATH OF POLLUTANTS, SURSURFACE FL	W68-00627
ATER RELATIONSHIPS, MALENCLES,	PATH OF POLLUTANTS, ACIDS, LEACHI	W71-00194
MODEL STUDIES, LABORATORY TESTS,	PATH OF POLLUTANTS, WATER POLLUTI	W70-09548
SAMPLING, GROUNDWATER MOVEMENT,	PATH OF POLLUTANTS, ENVIRONMENT.:	W70-06322
URED WATER QUALITY, PERCOLATION,	PENETRATION, DIFFUSION, SEEPAGE,:	W70-08025
ON, PATH OF POLLUTANTS, SEEPAGE,	PENETRATION, INDUSTRIAL WASTES, S	W70-00521
-FRESH WATER INTERFACES, MIXING,	PENETRATION, DRILL HOLES, GROUNDW	W71-03230
..	PENNI), SANITARY LANDFILL DRAINAGE	W71-01204
ST, INFILTRATION, ION TRANSPORT,	PENNSYLVANIA, SURSURFACE DRAINAGE	W71-01204
INGS, GROUNDWATER, WATER SUPPLY,	PERCOLATING WATER, SURSURFACE WAT	W71-01028
SOLIDS, LEACHING, SALT BALANCE,	PERCOLATING WATER, POLLUTION IDEN	W71-06063
AVATION, WATER POLICY, AQUIFERS,	PERCOLATING WATER, LEG: /ENS, EYC	W71-04742
SURSURFACE WATERS, GROUNDWATER,	PERCOLATING WATERS, DRILLING, OIL	W71-13521
ON ABATEMENT, SURSURFACE WATERS,	PERCOLATING WATER, UNDERGROUND, W	W71-10446
ATER TREATMENT, WATER POLLUTION,	PERCOLATING WATER, WATER CONSERVA	W71-10157
TS, WASTE DISPOSAL, GROUNDWATER,	PERCOLATING WATER, PERCOLATION, P	W71-11692
WASTES, WATER QUALITY, SALINITY,	PERCOLATING WATER, WELL SPACING,	W69-06118
SE, RIPARIAN LANDS, GROUNDWATER,	PERCOLATING WATER, EMINENT DOMAIN	W70-02896
SE, REMEDIES, WATER UTILIZATION,	PERCOLATING WATER, AQUIFERS, HYDR	W70-00532



UNDERFLOW, UNDERGROUND STREAMS, DECISIONS, GROUNDWATER MOVEMENT, L, DISPOSAL, WASTES, CALIFORNIA, EPTIC TANKS, SULFATES, SULFIDES, DETERGENTS, POLLUTANTS, NITROGE/ POLLUTION, SEEPAGE, GROUNDWATER, , DRAINAGE EFFECTS, DRAINS, DEEP DISPOSAL, GROUNDWATER MOVEMENT, POLLU/ \*VIRUSES, \*BACTERIOPHAGE, OLATING WATER, WELL REGULATIONS, ION, \*SOIL WASTE TREATMENT, SOIL ION, \*SOIL WASTE TREATMENT, SOIL ABILITY, POROSITY, CLOSED CONDU/ DWATER, SURFACE WATERS, SEEPAGE, CE WATERS, UNDERGROUND, LEAKAGE, EFFECTS, IMPAIRED WATER QUALITY, L DECISIONS, LEGAL ASPECTS, DEEP INFILTRATION, EVAPOTRANSPIRATION, , CALIFORNIA, PERCOLATING WATER, ANT RESIDUES, MORRIS(MINN), SOIL IL WATER MOVEMENT, INFILTRATION, GROUND WATER, SUBSURFACE WATER, TRATION, SORPTION, INFILTRATION, RUNOFF, SUBSURFACE STREAMS, DEEP TED LAND, COLORADO, GROUNDWATER, GEN, PHOSPHORUS, SURFACE WATERS, GROUNDWATER, PERCOLATING WATER, N SOURCES, GROUNDWATER MOVEMENT, ATES, SURFACE RUNOFF, BASE FLOW, OUNDWATER, PLANNING, MANAGEMENT, ITY, SOLID WASTES, INCINERATION, REGULATION, GROUNDWATER, RUNOFF, NDUSTRY, OIL, GASES, POLLUTANTS, S, LEGAL ASPECTS, RIPARIAN LAND, O, DENITRIFICATION, WATER TABLE, ACE RUNOFF, STREAMS, SOIL TYPES, RFACE-GROUNDWATER RELATIONSHIPS, , HYDROGEOLOGY, SOILS, POROSITY, OGY, HYDROGEOLOGY, INFILTRATION, OUNDWATER, GROUNDWATER MOVEMENT, N, WATER CHEMISTRY, DARCY'S LAW, ERICAL METHOD, LABORATORY TESTS, ATER MOVEMENT, LABORATORY TESTS, WATER POLLUTION TREATMENT, WELL ING, STANDARDS, REGULATION, WELL CARBON PESTICIDES, INSECTICIDES, , SANDS, CHLORINATED HYDROCARBON CULTURAL CHEMICALS, FERTILIZERS, THODOLOGY, WATER QUALITY, SOILS, OJECT, FLUSHING MEADOWS PROJECT, OJECT, FLUSHING MEADOWS PROJECT,

, NITROGEN, NITRATE, PHOSPHORUS, CATTLE, HOGS, NITROGEN, NITRATE, ROGEN, NITRATES, NITROGEN CYCLE, PRI/ \*LAKE EUTROPHICATION, \*SOIL NAGE, \*EUTROPHICATION, NITROGEN, MINNESOTA, WISCONSIN, MICHIGAN. FIELDS, SOIL CONTAMINATION, SOIL AINAGE, WATER POLLUTION SOURCES,

PERCOLATING WATER, SUBSURFACE WAT W70-07631  
 PERCOLATING WATER, SUBSURFACE WAT W70-08026  
 PERCOLATING WATER, PERCOLATION, L W70-06011  
 PERCOLATING WATER, INFILTRATION, W68-01010  
 PERCOLATING WATER, INFILTRATION, W69-00652  
 PERCOLATING WATER, WELL REGULATIO W69-06117  
 PERCOLATION, EVAPOTRANSPIRATION.: W69-00248  
 PERCOLATION, SEEPAGE, UNSATURATED W69-02681  
 PERCOLATION, GROUND-WATER, WATER W69-00225  
 PERCOLATION, SUBSURFACE DRAINAGE, W69-06117  
 PERCOLATION, \*WASTE WATER RECLAMA W69-05327  
 PERCOLATION, \*WASTE WATER RECLAMA W69-05328  
 PERCOLATION, GROUND WATER, \*PERME W69-00979  
 PERCOLATION.: /TERS, WELLS, GROUND W69-05370  
 PERCOLATION, WATER RIGHTS, WATER W70-07631  
 PERCOLATION, PENETRATION, DIFFUSI W70-08025  
 PERCOLATION.: /N SOURCES, JUDICIA W70-08050  
 PERCOLATION, FLOOD CONTROL, RESER W70-06102  
 PERCOLATION, LEACHING, AQUIFERS, W70-06011  
 PERCOLATION.: / SOIL MINERALS, PL W70-04193  
 PERCOLATION, ADSORPTION, FILTRATI W69-07375  
 PERCOLATION, SUBSURFACE RUNOFF, S W70-00521  
 PERCOLATION, SOIL DISPOSAL FIELDS W69-08621  
 PERCOLATION, GROUND WATER MOVEMEN W70-00521  
 PERCOLATION.: /REAL CROPS, IRRIGA W70-04488  
 PERCOLATION, SUSPENDED LOAD, GROU W70-04504  
 PERCOLATION, PATH OF POLLUTANTS, W71-11692  
 PERCOLATION, WATER MANAGEMENT, IN W71-07194  
 PERCOLATION, LEACHING, DRAINAGE, W71-06443  
 PERCOLATION, \*MODEL STUDIES, \*COM W71-09936  
 PERCOLATION, SEEPAGE.: /PRESSIBIL W71-08907  
 PERCOLATION, EUTROPHICATION, DRAI W71-12084  
 PERCOLATION, WASTES, WASTE DISPOS W71-11724  
 PERCOLATION, SUBSURFACE WATERS, U W71-01043  
 PERCOLATION.: / AQUIFERS, COLORAD W71-02036  
 PERMEABILITY, FLOODS, EVALUATION, W71-05094  
 PERMEABILITY, ALGAE, DISSOLVED OX W71-12410  
 PERMEABILITY, GROUNDWATER MOVEMEN W69-07375  
 PERMEABILITY, SAMPLING, GROUNDWAT W70-06322  
 PERMEABILIT: /LLUTION SOURCES, GR W70-07631  
 PERMEABILITY, \*RIVER FLOW.: /PTIO W69-02611  
 PERMEABILITY, POROSITY, POROUS MA W69-00651  
 PERMEAMETERS, SANDS, CHLORINATED W70-01904  
 PERMITS, ADMINISTRATIVE AGENCIES, W71-10157  
 PERMITS, DRILLING, ADMINISTRATIVE W71-04742  
 PESTICIDE RESIDUES, INFILTRATION. W70-01904  
 PESTICIDES, INSECTICIDES, PESTICI W70-01904  
 PESTICIDES, NUTRIENTS, SOIL WATER W71-04121  
 PESTICIDES, CHROMATOGRAPHY, ADSOR W71-06514  
 PHOENIX(ARIZONA).: /L RECHARGE PR W69-05328  
 PHOENIX(ARIZONA).: /L RECHARGE PR W69-05327  
 PHOENIX(ARIZ), SALT RIVER(ARIZ).: W70-04712  
 PHOSPHATES, RATES OF APPLICATION, W71-03542  
 PHOSPHORUS, PHOSPHATES, RATES OF W71-03542  
 PHOSPHORUS, REGULATION, GROUNDWAT W71-12084  
 PHOSPHORUS, ALFALFA-BROMEGRASS, S W69-09721  
 PHOSPHORUS, SURFACE WATERS, PERCO W70-04504  
 PHOSPHORUS, AGRICULTURAL WATERSHE W70-04193  
 PHYSICAL PROPERTIES.: / DISPOSAL W69-08621  
 PIPES, CLOSED CONDUITS, METAL PIP W70-07632

S, PIPES, CLOSED CONDUITS, METAL	PIPES, WELLS, ARTESIAN WELLS, WAT	W70-07632
, INFILTRATION, WATER SPREADING,	PIT RECHARGE, SAFE YIELD, WATER R	W70-05466
S), HOL/ *OGALLALA AQUIFER, HIGH	PLAINS(TEXAS), PARKER COUNTY(TEXA	W71-12122
PERMEABILITY, FLOODS, EVALUATION,	PLANNING.: /TREAMS, SOIL TYPES, P	W71-05094
CIENCY, SIMULATION, GROUNDWATER,	PLANNING, MANAGEMENT, PERCOLATION	W71-09936
EEK(MO), SPRINGFIELD(MO), SEWAGE	PLANT BYPASSES.: /(MO), WILSON CR	W71-09154
MINNETONKA(MINN), SOIL MINERALS,	PLANT RESIDUES, MORRIS(MINN), SOI	W70-04193
LLUTION SOURCES, *CORES, FIELDS,	PLANTS, ALFALFA, CEREAL CROPS, IR	W70-04488
ANALYSIS, TEMPERATURE, NITRATES,	PLANTS, AMMONIA, HARDNESS(WATER),	W69-07838
*FEEDLOT,	PLATTE RIVER VALLEY.:	W71-03543
*FEEDLOTS, SOUTH	PLATTE RIVER VALLEY.:	W71-02036
RASSES, FEEDLOTS, CORRALS, SOUTH	PLATTE VALLEY(COLO).: NATIVE G	W70-04488
HAGAN-	POISEUILLE FLOW, CLOGGING.:	W69-00979
S, RHINE RIVER, AMSTERDAM RHINE,	POLDERS, COMPOSITION, PSEUDOMONAS	W69-07838
WELL SCREENS, EXCAVATION, WATER	POLICY, AQUIFERS, PERCOLATING WAT	W71-04742
IFERS, ION EXCHANGE, POLLUTANTS,	POLLUTANT IDENTIFICATION, ADSORPT	W69-02611
SUPPLY, AQUIFERS, ION EXCHANGE,	POLLUTANTS, POLLUTANT IDENTIFICAT	W69-02611
EMENT, *WATER POLLUTION, PATH OF	POLLUTANTS, DIGITAL COMPUTERS, CO	W69-03237
*GROUNDWATER MOVEMENT, *PATH OF	POLLUTANTS, INJECTION WELLS, WAST	W69-03212
IL PROPERTIES, MOISTURE CONTENT,	POLLUTANTS, SOIL WATER MOVEMENT.:	W68-00058
DECISIONS, GROUND WATER, PATH OF	POLLUTANTS, SUBSURFACE FLOW, GASO	W68-00627
WATER, INFILTRATION, DETERGENTS,	POLLUTANTS, NITROGEN COMPOUNDS, S	W69-00652
, *DIFFUSION, *DISPERS/ *PATH OF	POLLUTANTS, *GROUNDWATER MOVEMENT	W69-07554
WATER POLLUTION SOURCES, PATH OF	POLLUTANTS, WATER POLLUTION EFFEC	W70-00665
VEMENT, SOLUTES, WASTES, PATH OF	POLLUTANTS, MATHEMATICAL MODELS,	W69-08921
MOVEMENT, INFILTRATION, PATH OF	POLLUTANTS, SEEPAGE, PENETRATION,	W70-00521
MOVEMENT, LABORATORY / *PATH OF	POLLUTANTS, *ALDRIN, *GROUNDWATER	W70-01904
UDIFS, LABORATORY TESTS, PATH OF	POLLUTANTS, WATER POLLUTION SOURC	W70-09548
ATER POLLUTION SOURCES, *PATH OF	POLLUTANTS, *DIFFUSION, *SOIL WAT	W70-10058
G, GROUNDWATER MOVEMENT, PATH OF	POLLUTANTS, ENVIRONMENT.: /AMPLIN	W70-06322
ATIONSHIPS, MALENCLAVES, PATH OF	POLLUTANTS, ACIDS, LEACHING, CHLO	W71-00194
BAGE DUMPS, *LANDFILLS, *PATH OF	POLLUTANTS, *HYDROGEOLOGY, *ILLIN	W70-06572
, INFILTRATION, WATER POLLUTION,	POLLUTANTS, LEGAL ASPECTS.: /PAGE	W70-07632
LLUTION, IMPAIRED WATER QUALITY,	POLLUTANTS, INDUSTRIAL WASTES, GR	W70-08026
*MICHIGAN, *OIL WASTES, *PATH OF	POLLUTANTS, *SALINE WATER INTRUSI	W70-08026
*AGRICULTURAL	POLLUTANTS.:	W71-04121
POLLUTION SOURCES, *GR/ *PATH OF	POLLUTANTS, *FARM WASTES, *WATER	W71-04121
, *GARBAGE DUMPS, *GRO/ *PATH OF	POLLUTANTS, *LEACHING, *LANDFILLS	W71-01204
S, GROUNDWATER MOVEMENT, PATH OF	POLLUTANTS, SOIL WATER MOVEMENT,	W71-01043
*SIMULATION ANALYSIS, *PATH OF	POLLUTANTS, *RETURN FLOW, *NITRAT	W71-04548
MATHEMATICS, EQUATIONS, PATH OF	POLLUTANTS, FOREIGN PROJECTS.: /,	W71-01930
, COLIFORMS, ALLUVIAL / *PATH OF	POLLUTANTS, *INDUCED INFILTRATION	W71-02909
Y, *FALLOUT, *LEACHING, *PATH OF	POLLUTANTS, *NUCLEAR ENGINEERING,	W71-04882
TANTS, OIL INDUSTRY, OIL, GASES,	POLLUTANTS, PERCOLATION, WASTES,	W71-11724
SOILS, LAND RECLAMATION, PATH OF	POLLUTANTS.:	W71-08073
ROLOGY, WATER POLLUTION, PATH OF	POLLUTANTS, MINE WASTES, GEOLOGY,	W71-08907
TS, POLLUTION ABATEMENT, PATH OF	POLLUTANTS, OIL INDUSTRY, OIL, GA	W71-11724
NDWATER MOVEMENT, *DIS/ *PATH OF	POLLUTANTS, *RADIOISOTOPES, *GROU	W71-11356
R MOVEMENT, *OILY WATER/ *PATH OF	POLLUTANTS, *LEACHING, *SOIL WATE	W71-10325
TEMENT, WATER POLLUTION EFFECTS,	POLLUTANTS, WASTE DISPOSAL, GROUND	W71-11692
TING WATER, PERCOLATION, PATH OF	POLLUTANTS, WOOD WASTES, PULP AND	W71-11692
IL PROPERTIES, LEACHING, PATH OF	POLLUTANTS.:	W71-06514
T, *STATISTICAL MODELS, *PATH OF	POLLUTANTS, /E, INFILTRATION, SO	W71-11776
ER POLLUTION, INDUSTRIAL WASTES,	POLLUTANTS, MATHEMATICAL MODELS,	W71-13645
ER WELL, IM/ *WASHINGTON, *WATER	POLLUTANTS, INFILTRATION, GROUNDW	W71-13645
PRODUCTION, *FERTILIZERS, *WATER	POLLUTION SOURCES, *DAMAGES, *WAT	W71-13645
, WATER POLLUTION EFFECTS, WATER	POLLUTION SOURCES, NITROGEN, NITR	W71-12084
ELLS, WATER SUPPLY, FARMS, WATER	POLLUTION SOURCES.: /UPPLY, FARMS	W71-13521
CONSUMPTIVE USE, DOMESTIC WATER,	POLLUTION EFFECTS, WATER POLLUTIO	W71-13521
*REMEDIATION, IND/ *MONTANA, *WATER	POLLUTION ABATEMENT, JUDICIAL DEC	W71-13645
	POLLUTION SOURCES, *WATER WELLS,	W71-11692



GE, WATER QUALITY CONTROL, WATER	POLLUTION TREATMENT, ADMINISTRATI	W71-10446
EROSION, NITROGEN, RUNOFF, WATER	POLLUTION CONTROL, GROUNDWATER, S	W71-10372
GROUNDWATER, HYDROGEOLOGY, WATER	POLLUTION SOURCES, GROUNDWATER MO	W71-07194
S, IMPAIRED WATER QUALITY, WATER	POLLUTION CONTROL, DAMAGES, LEGAL	W71-11724
*GROUNDWATER POLLUTION, LANDFILL	POLLUTION EFFECTS.:	W71-07194
S, SALINE WATER INTRUSION, WATER	POLLUTION SOURCES, MINERALOGY, IN	W71-10446
USTRIAL WASTES, WATER POLLUTION,	POLLUTION ABATEMENT, WATER POLLUT	W71-11692
*WATER POLLUTION EFFECTS, *WATER	POLLUTION CONTROL, *WATER POLLUTI	W71-09154
NEW MEXICO, *SOIL WATER / *WATER	POLLUTION SOURCES, *HERBICIDES, *	W71-06514
REMEDIES, WATER POLLUTION, WATER	POLLUTION EFFECTS, POLLUTION ABAT	W71-11724
TION, POLLUTION ABATEMENT, WATER	POLLUTION EFFECTS, POLLUTANTS, WA	W71-11692
*WATER POLLUTION CONTROL, WATER	POLLUTION TREATMENT, WELL PERMITS	W71-10157
REMEDIES, WAT/ *OKLAHOMA, *WATER	POLLUTION SOURCES, *OIL WASTES, *	W71-11724
WASTES, GROU/ *NITRATES, *WATER	POLLUTION SOURCES, LEACHING, FARM	W71-08218
ON EFFECTS, *RETURN FLOW/ *WATER	POLLUTION SOURCES, *WATER POLLUTI	W71-08044
*WATER POLLUTION SOURCES, *WATER	POLLUTION EFFECTS, *RETURN FLOW,	W71-08044
ON CONTROL, *WATER POLLU/ *WATER	POLLUTION EFFECTS, *WATER POLLUTI	W71-09154
*WATER POLLUTION CONTROL, *WATER	POLLUTION SOURCES, *FISHKILL, STO	W71-09154
DWATER, *WATER POLLUTION, *WATER	POLLUTION CONTROL, POLLUTION ABAT	W71-10446
LUTION, WATER POLLUTION EFFECTS.	POLLUTION ABATEMENT, PATH OF POLL	W71-11724
RAULIC MODELS, OIL WASTES, WATER	POLLUTION SOURCES.:/STUDIES, HYD	W71-10325
UTION, *WATER POLLUTION CONTROL,	POLLUTION ABATEMENT, SUBSURFACE W	W71-10446
*WATER QUALITY, *IRRIGAT/ WATER	POLLUTION SOURCES, *ION EXCHANGE,	W71-09936
MITTS, *SUBSURFACE WATERS, *WATER	POLLUTION CONTROL, WATER POLLUTIO	W71-10157
UTER PROGRAMS, CALIFORNIA, WATER	POLLUTION SOURCES, LEACHING, DRAI	W71-04548
ER SPREADING, *MONITORING, WATER	POLLUTION SOURCES, SEWAGE TREATME	W71-01205
GE WATER, *DETERIORATION, *WATER	POLLUTION EFFECTS, WATER QUALITY,	W71-06063
ER SPREADING, *MONITORING, WATER	POLLUTION SOURCES, SEWAGE TREATME	W71-01324
SALT BALANCE, PERCOLATING WATER,	POLLUTION IDENTIFICATION, SOIL WA	W71-06063
POLLUTANTS, *FARM WASTES, *WATER	POLLUTION SOURCES, *GROUNDWATER,	W71-04121
N RIGHTS, RELATIVE RIGHTS, WATER	POLLUTION EFFECTS, STREAMS, GROUN	W71-01043
E DRAINAGE, WATER QUALITY, WATER	POLLUTION SOURCES, LYSIMETERS.:/	W71-01204
*SOLID WASTES, *WASTE D/ *WATER	POLLUTION SOURCES, *URBANIZATION,	W71-05094
E DISPOSAL, *HYDROGEOLOGY, WATER	POLLUTION CONTROL, SURVEYS, LEACH	W70-07193
TANTS, *DIFFUSION, *SOIL/ *WATER	POLLUTION SOURCES, *PATH OF POLLU	W70-10058
USE, PRIOR APPROPRIATION, WATER	POLLUTION SOURCES, JUDICIAL DECIS	W70-08050
PERCOLATION, WATER RIGHTS, WATER	POLLUTION SOURCES, GROUNDWATER, G	W70-07631
, WATER POLLUTION SOURCES, WATER	POLLUTION CONTROL, PUBLIC HEALTH,	W70-06011
OILY WATER, OIL INDUSTRY, WATER	POLLUTION SOURCES, GROUNDWATER MO	W70-08025
STRY, SUBSURFACE DRAINAGE, WATER	POLLUTION SOURCES, PIPES, CLOSED	W70-07632
TIGATIONS, *SOIL INVESTI/ *WATER	POLLUTION EFFECTS, *ON-SITE INVES	W70-06322
*LANDFILLS, *SOLID WASTES, WATER	POLLUTION SOURCES, WATER POLLUTIO	W70-06011
NITRIFICATION, RIVER FLOW, WATER	POLLUTION SOURCES.:/LEACHING, DE	W70-08662
ENVIRONMENTAL ENGINEERING, WATER	POLLUTION SOURCES.:/SANITATION,	W70-06572
POTABLE WATER, STANDARDS, WATER	POLLUTION EFFECTS, IMPAIRED WATER	W70-08025
SURFACE RUNOFF, GASOLINE, WATER	POLLUTION SOURCES, MINE WATER, OI	W70-08049
ROUNDWATER RELATIONSHIPS, *WATER	POLLUTION SOURCES, INFILTRATION,	W70-07766
STES, *GROUNDWATER MOVEM/ *WATER	POLLUTION SOURCES, *INDUSTRIAL WA	W71-00194
TRIAL WASTES, GROUNDWATER, WATER	POLLUTION EFFECTS, LEGAL ASPECTS,	W70-08026
LS, STREAMS, JUDICIAL DECISIONS,	POLLUTION ABATEMENT, POTABLE WATE	W70-08025
DE, *HIGHWAY ICING, *SNO/ *WATER	POLLUTION EFFECTS, *SODIUM CHLORI	W70-09844
TESTS, PATH OF POLLUTANTS, WATER	POLLUTION SOURCES, SELF-PURIFICAT	W70-09548
URCES, PATH OF POLLUTANTS, WATER	POLLUTION EFFECTS, NUTRIENTS, GRO	W70-00665
, P/ *NITRATES, *AMMONIA, *WATER	POLLUTION SOURCES, *CORES, FIELDS	W70-04488
STES, *CATTLE, *LEACHING, *WATER	POLLUTION SOURCES, PATH OF POLLUT	W70-00665
LINOIS, *WATER POLLUTION, *WATER	POLLUTION CONTROL, *POLLUTION ABA	W70-02896
*WATER WELLS, *GASOLINE, *WATER	POLLUTION SOURCES, JUDICIAL DECIS	W69-06117
BATEMENT, CHEMICAL WASTES, WATER	POLLUTION SOURCES, INDUSTRIAL WAS	W69-05370
LEGISLATION, STATE GOVERNMENTS,	POLLUTION ABATEMENT, CHEMICAL WAS	W69-05370
TARY FILL, WASTE DILUTION, WATER	POLLUTION CONTROL, LEACHING, WATE	W69-03178

RY ENGINEERING, *LEACHING, WATER	POLLUTION SOURCES, SOLID WASTES,	W68-00058
LARY FLOW, *LAVA, BASALTS, WATER	POLLUTION SOURCES, MICROORGANISMS	W69-00979
AGES(LEGAL ASPECTS), HYDROCARBON	POLLUTION.: *DAM	W68-00627
PERCOLATION, GROUND-WATER, WATER	POLLUTION.: /ES, *BACTERIOPHAGE,	W69-00225
RSITY OF ILLINOIS, ENVIRONMENTAL	POLLUTION.: TEST HOLES, UNIVE	W70-06322
RIAL WASTES, SEWAGE, WASTE WATER(	POLLUTION), LEGAL ASPECTS.: /DUST	W70-00521
MOVEMENT, NITROGEN, WASTE WATER(	POLLUTION).: /RIENTS, GROUNDWATER	W70-00665
R, SEDIMENTS, FERTILIZERS, WATER	POLLUTION, SNOW, RUNOFF, DRAINAGE	W70-04193
ELATIVE RIGHT/ *REMEDIES, *WATER	POLLUTION, *PERCOLATING WATER, *R	W70-00521
OL, *POLLUTIO/ *ILLINOIS, *WATER	POLLUTION, *WATER POLLUTION CONTR	W70-02896
S, *GROUNDWATER MOVEMENT, *WATER	POLLUTION, INFILTRATION, ANALYTIC	W70-01291
*/ *VIRUSES, GROUNDWATER, WATER	POLLUTION, ABSORPTION, *LEACHING,	W70-04688
L, *INFILTRATION, *WATER QUALITY	POLLUTION, RECHARGE, DISCHARGE, G	W70-09637
WATE/ *PERCOLATING WATER, *WATER	POLLUTION, *SEEPAGE, *SUBSURFACE	W70-08049
WATE/ *PERCOLATING WATER, *WATER	POLLUTION, *SEEPAGE, *SUBSURFACE	W70-08050
, *LANDFILLS, *SOLID WAS/ *WATER	POLLUTION, *GROUNDWATER, *SEEPAGE	W70-06011
LY, SEEPAGE, INFILTRATION, WATER	POLLUTION, POLLUTANTS, LEGAL ASPE	W70-07632
N, *WATER/ *PENNSYLVANIA, *WATER	POLLUTION, *SALINE WATER INTRUSIO	W71-01028
, *SALINE WATER INTRUSION, WATER	POLLUTION, IMPAIRED WATER QUALITY	W70-08026
A, *GROUNDWATER MOVEMENT, *WATER	POLLUTION, PATH OF POLLUTANTS, DI	W69-03237
HALLOW WELLS, WATER WELLS, WATER	POLLUTION, DAMAGE, JUDICIAL DECIS	W68-00627
L DECISIONS, FUELS, WELLS, WATER	POLLUTION, SEEPAGE, GROUNDWATER,	W69-06117
LIGNINS, *BIOCHEMICAL OX/ *WATER	POLLUTION, *WOOD WASTES, *BARK, *	W68-01269
AL, WASTE WATER TREATMENT, WATER	POLLUTION, *SOIL WASTE TREATMENT,	W69-05328
ISLATION, STATE / *MAINE, *WATER	POLLUTION, *OIL WASTES, *OIL, LEG	W69-05370
AL, WASTE WATER TREATMENT, WATER	POLLUTION, *SOIL WASTE TREATMENT,	W69-05327
GROUNDWATER, *SEEPAGE, / *WATER	POLLUTION, *GROUNDWATER RECHARGE,	W68-00058
, *FERTILIZERS, *NITRATES, WATER	POLLUTION, NITROGEN, NITRITES, AO	W71-02036
*RHODE ISLAND, *SEEPAGE, *WATER	POLLUTION, *PERCOLATING WATER, RI	W71-01043
MONIA, SOIL CONTAMINATION, WATER	POLLUTION, WATER TABLE, OXIDATION	W71-03542
TES, *SEPARATION TECHNIQ/ *WATER	POLLUTION, *GROUNDWATER, *OIL WAS	W71-01930
..: *GROUNDWATER	POLLUTION, *CENTRAL VALLEY(CALIF)	W71-04548
S, LANDFILLS, WASTE DUMPS, WATER	POLLUTION, PRECIPITATION(ATMOSPHE	W71-05094
ECTS.: *GROUNDWATER	POLLUTION, LANDFILL POLLUTION EFF	W71-07194
MEDIES, INDUSTRIAL WASTES, WATER	POLLUTION, POLLUTION ABATEMENT, W	W71-11692
*WYOMING, *GROUNDWATER, *WATER	POLLUTION, *WATER POLLUTION CONTR	W71-10446
ING, LANDFILLS, HYDROLOGY, WATER	POLLUTION, PATH OF POLLUTANTS, MI	W71-08907
S, *OIL WASTES, *REMEDIES, WATER	POLLUTION, WATER POLLUTION EFFECT	W71-11724
IC CONDITIONS, INCINERATION, AIR	POLLUTION, TEMPERATURE, WASTE WAT	W71-07118
ASTES, *LEAC/ *LANDFILLS, *WATER	POLLUTION, *WASTE DUMPS, *SOLID W	W71-07194
NT, WASTE WATER TREATMENT, WATER	POLLUTION, PERCOLATING WATER, WAT	W71-10157
ER QUALITY, UNDER SEEPAGE, WATER	POLLUTION, INDUSTRIAL WASTES, POL	W71-13645
N, *OIL WASTES, *REMEDIES, WATER	POLLUTION, JUDICIAL DECISIONS, RE	W71-13521
ASS).: INFILTRATION	PONDS, CAPE COD(MASS), FALMOUTH(M	W71-01324
ASS).: INFILTRATION	PONDS, CAPE COD(MASS), FALMOUTH(M	W71-01205
ATION, INDUSTRIAL WASTES, ALGAE,	PONDS, FARM WASTES.: /GE, INFILTR	W71-06435
WASTES, RIVERS, STREAMS, LAKES,	PONDS, TIDAL WATERS, WELLS, GROUND	W69-05370
LABORATORY TESTS, PERMEABILITY,	POROSITY, POROUS MATERIALS, BIBLI	W69-00651
ON, GROUND WATER, *PERMEABILITY,	POROSITY, CLOSED CONDUIT FLOW, *G	W69-00979
IRRIGATION, HYDROGEOLOGY, SOILS,	POROSITY, PERMEABILITY, GROUNDWAT	W69-07375
STES, *UNIFORM FLOW, *DIFFUSION,	POROUS MATERIALS, *ENGINEERING ME	W69-01238
Y TESTS, PERMEABILITY, POROSITY,	POROUS MATERIALS, BIBLIOGRAPHIES,	W69-00651
, *UNIFORM F/ *DISPERSION, FLOW,	POROUS MEDIA, GROUNDWATER, WASTES	W69-01238
HARGE, CONVECTION, MIXING, FLOW,	POROUS MEDIA.: /S, ARTIFICIAL REC	W69-07554
ALINE WATER INTRUSION, AQUIFERS,	POROUS MEDIA, DIFFUSION, CONVECTI	W71-04559
, GROUNDWATER MOVEMENT, SEEPAGE,	POROUS MEDIA, EQUATIONS, MATHEMAT	W71-09611
DECISIONS, POLLUTION ABATEMENT,	POTABLE WATER, STANDARDS, WATER P	W70-08025
CILIATES, RANUNCULUS CIRCINATUS,	POTAMOGETON PUSILLUS.: /GELLATA,	W69-07838
ERS, GROUNDWATER, PRECIPITATION,	POTASSIUM, POULTRY, CATTLE, HOGS,	W71-03542
*HYDRAULIC	POTENTIAL, CANADA.: W70-07766	



WATER, PRECIPITATION, POTASSIUM,	POULTRY, CATTLE, HOGS, NITROGEN,	W71-03542
ICAL MODELS, CONVECTION, NUCLEAR	POWERPLANTS.: /QUATIONS, MATHEMAT	W71-11356
, WATER CONSERVATION, IRRIGATION	PRACTICES.: / WATER, SALINE WATER	W71-06063
YSIS, WATER TRANSFER, IRRIGATION	PRACTICES, LEACHING, TEXAS.: /NAL	W71-12122
S, WASTE DUMPS, WATER POLLUTION,	PRECIPITATION(ATMOSPHERIC), SEEPA	W71-05094
STES, *FERTILIZERS, GROUNDWATER,	PRECIPITATION, POTASSIUM, POULTRY	W71-03542
*NITRATES, GROUNDWATER, AMMONIA,	PRECIPITATION, SEDIMENTS, DENITRI	W71-06435
TION, FLOOD CONTROL, RESERVOIRS,	PRECIPITATION(ATMOSPHERIC).: /OLA	W70-06102
RAIN FIELDS, *TEST HOLES, ANNUAL	PRECIPITATION, LEACH BED, SPOKANE	W69-01076
N, *SEEPAGE, *SUBSURFACE WATERS,	PRIOR APPROPRIATION, GROUNDWATER,	W70-08049
BSURFACE RUNOFF, REASONABLE USE,	PRIOR APPROPRIATION, WATER POLLUT	W70-08050
POLLUTANTS, MATHEMATICAL MODELS,	PROBABILITY, THERMODYNAMICS, FLOW	W71-11776
ONS, LEGAL ASPECTS, ADJUDICATION	PROCEDURE.: /ERS, JUDICIAL DECISI	W71-01028
ACTERISTICS, SOIL ANALYSIS, TEST	PROCEDURES, CHEMICAL PROPERTIES,	W71-07887
R, SURFACE WATERS, TESTING, TEST	PROCEDURES, METHODOLOGY, WATER QU	W71-06514
ING, INFILTRATION, TUCSON BASIN,	PROCESS-RESPONSE MODEL, INSTRUMEN	W69-03197
WATER MOVEMENT, *ST/ *STOCHASTIC	PROCFSES, *POROUS MEDIA, *GROUND	W71-11776
POLLUTION/ *WATER QUALITY, *CROP	PRODUCTION, *FERTILIZERS, *WATER	W71-12084
NING, GROUNDWATER MOVEMENT, FLOW	PROFILES, SAMPLING, DATA COLLECTI	W71-11255
TEMPERATURE	PROFILES, THERMAL DIFFUSION.: /	W69-00651
SOIL LEACHING, GROUNDWATER, SOIL	PROFILES, WATER TABLE, SURFACE RU	W69-09721
NTS, DIGITAL COMPUTERS, COMPUTER	PROGRAMS.: /TION, PATH OF POLLUTA	W69-03237
ATION, *MODEL STUDIES, *COMPUTER	PROGRAMS.: /G, MANAGEMENT, PERCOL	W71-09936
N, *NUMERICAL ANALYSIS, COMPUTER	PROGRAMS, DIFFUSION, MIXING, GROU	W71-09611
S, *MATHEMATICAL MODELS, COMPUTER	PROGRAMS, CALIFORNIA, WATER POLLU	W71-04548
QUIFERS, MODEL STUDIES, DRAINAGE	PROGRAMS, SUBSURFACE DRAINAGE, WA	W71-01932
RICAL ANALYSIS, MIXING, COMPUTER	PROGRAMS, COMPUTER MODELS, MATHEM	W71-04559
INJUNCTION	PROHIBITORY).: /	W71-13645
TRESPASS, INJUNCTIONS	PROHIBITORY), NUISANCE.: /	W69-06117
GE BASINS, EXPERIMENTAL RECHARGE	PROJECT, FLUSHING MEADOWS PROJECT	W69-05328
GE BASINS, EXPERIMENTAL RECHARGE	PROJECT, FLUSHING MEADOWS PROJECT	W69-05327
CHARGE PROJECT, FLUSHING MEADOWS	PROJECT, PHOENIX(ARIZONA).: /L RE	W69-05327
CHARGE PROJECT, FLUSHING MEADOWS	PROJECT, PHOENIX(ARIZONA).: /L RE	W69-05328
ONS, PATH OF POLLUTANTS, FOREIGN	PROJECTS.: /, MATHEMATICS, EQUATI	W71-01930
L MECHANICS, WATER QUALITY, SOIL	PROPERTIES, WATER WELLS, WATER TA	W71-04121
IL STRUCTURE, INFILTRATION, SOIL	PROPERTIES, LEACHING, PATH OF POL	W71-06514
LYSIS, TEST PROCEDURES, CHEMICAL	PROPERTIES, GROUNDWATER, SOIL WAT	W71-07887
WASTE DUMPS, WASTE STORAGE, SOIL	PROPERTIES, MOISTURE CONTENT, POL	W68-00058
PERSION, WASTE DISPOSAL, THERMAL	PROPERTIES, MODEL TESTS, SATURATI	W69-00651
OIL CONTAMINATION, SOIL PHYSICAL	PROPERTIES.: / DISPOSAL FIELDS, S	W69-08621
DAM RHINE, POLDERS, COMPOSITION,	PSEUDOMONAS, MYCOBACTERIUM, BACIL	W69-07838
ROCOLATING WATER, EMINENT DOMAIN,	PUBLIC HEALTH, DOMESTIC WATER, IN	W70-02896
ION, *WATER WELLS, OIL INDUSTRY,	PUBLIC HEALTH, OIL WELLS, DRILLIN	W71-01028
SOURCES, WATER POLLUTION CONTROL,	PUBLIC HEALTH, ENVIRONMENTAL SANI	W70-06011
PATH OF POLLUTANTS, WOOD WASTES,	PULP AND PAPER INDUSTRY, DAMAGES,	W71-11692
EGISLATION, CONSTRUCTION, PUMPS,	PUMPING, STANDARDS, REGULATION, W	W71-04742
N, AQUIFERS, GRAVELS, AQUITARDS,	PUMPING, WATER WELLS, MUNICIPAL W	W71-02909
LLS, *LEGISLATION, CONSTRUCTION,	PUMPS, PUMPING, STANDARDS, REGULA	W71-04742
S, WATER POLLUTION SOURCES, SELF-	PURIFICATION, BIODEGRADATION.: /T	W70-09548
R), ACIDITY, OXYGEN, ALGAE, SELF-	PURIFICATION, BACTERIOPHAGE, RESE	W69-07838
NUNCULUS CIRCINATUS, POTAMOGETON	PUSILLUS.: /GELLATA, CILIATES, RA	W69-07838
LLUTION CONTROL, LEACHING, WATER	QUALITY CONTROL, DOMESTIC WASTES,	W69-03178
MUNICIPAL WASTES, SEWAGE, WATER	QUALITY CONTROL, WATER POLLUTION	W71-10446
RIGATION RETURN FLOW, HYDROLOGIC-	QUALITY MODEL.: /	W71-09936
*LANDFILL, *INFILTRATION, *WATER	QUALITY POLLUTION, RECHARGE, DISC	W70-09637
T, LEACHING, INFILTRATION, WATER	QUALITY.: /R, GROUNDWATER MOVEMEN	W71-08044
LIZERS, *WATER POLLUTION/ *WATER	QUALITY, *CROP PRODUCTION, *FERTI	W71-12084
N SOURCES, *ION EXCHANGE, *WATER	QUALITY, *IRRIGATION EFFICIENCY,	W71-09936
ER, *SATURATED SOILS, *I/ *WATER	QUALITY, *RETURN FLOW, *GROUNDWAT	W71-08073
POLLUTION IDENTIFICATION, *WATER	QUALITY, *MONITORING, *GROUNDWATE	W71-12122

KLAHOM/ *WATER CHEMISTRY, *WATER	QUALITY, *CLIMATES, *LAND USE, *O	W70-06102
DUCED INFILTRATION, RECH/ *WATER	QUALITY, *MATHEMATICAL MODELS, IN	W69-02611
E DISPOSAL, *GROUNDWATER, *WATER	QUALITY, *LANDFILL, SANITARY FILL	W69-03178
GROUNDWATER, WATER LEVELS, WATER	QUALITY, BIOCHEMICAL OXYGEN DEMAN	W69-07114
TES, GEOLOGY, GROUNDWATER, WATER	QUALITY, COMPACTION, COMPRESSIBIL	W71-08907
MINISTRATION, GROUNDWATER, WATER	QUALITY, INSPECTION, INSTALLATION	W71-04742
WATER POLLUTION, IMPAIRED WATER	QUALITY, POLLUTANTS, INDUSTRIAL W	W70-08026
POLLUTION EFFECTS, IMPAIRED WATER	QUALITY, PERCOLATION, PENETRATION	W70-08025
IAL DECISIONS, OIL WASTES, WATER	QUALITY, SALINITY, PERCOLATING WA	W69-06118
LTRATION, WATER CHEMISTRY, WATER	QUALITY, SOIL CONTAMINATION.: /FI	W69-08620
MANAGEMENT EFFECTS, GROUNDWATER, WATER	QUALITY, SOIL WATER.: /ONIA, DRAI	W71-04548
*WATER POLLUTION EFFECTS, WATER	QUALITY, SALINITY, GROUNDWATER, D	W71-06063
BSORPTION, SOIL MECHANICS, WATER	QUALITY, SOIL PROPERTIES, WATER W	W71-04121
T PROCEDURES, METHODOLOGY, WATER	QUALITY, SOILS, PESTICIDES, CHROM	W71-06514
GES, *WATER WELL, IMPAIRED WATER	QUALITY, UNDER SEEPAGE, WATER POL	W71-13645
GISLATION, WELLS, IMPAIRED WATER	QUALITY, WATER POLLUTION CONTROL,	W71-11724
WATER MANAGEMENT, IMPAIRED WATER	QUALITY, WASTE DISPOSAL, GARBAGE	W71-07194
ANIA, SUBSURFACE DRAINAGE, WATER	QUALITY, WATER POLLUTION SOURCES,	W71-01204
ATA, GROUNDWATER MOVEMENT, WATER	QUALITY, WATER LEVELS, WATER SUPP	W70-05466
	RADIAL DIFFUSION EQUATIONS.:	W69-03212
DIFFUSION, MIXING, RADIOACTIVITY,	RADIATION, RADIOACTIVE WASTES, IO	W71-11356
ION EXCHANGE, DIFFUSION, MIXING,	RADIOACTIVITY, RADIATION, RADIOAC	W71-11356
MIXING, RADIOACTIVITY, RADIATION,	RADIOACTIVE WASTES, IONS, EQUATIO	W71-11356
UM, *LYSIMETERS, *RADIOISOTOPES,	RADIOACTIVE WASTE DISPOSAL, GROUND	W69-02681
NG, MATHEMATICAL MODELS, MIXING,	RADIOACTIVE WASTE DISPOSAL, UNSAT	W70-10058
LADOPHORA, FLAGELLATA, CILIATES,	RANUNCULUS CIRCINATUS, POTAMOGETO	W69-07838
NITRATE, PHOSPHORUS, PHOSPHATES,	RATES OF APPLICATION, NUTRIENTS,	W71-03542
, SURFACE WATERS, AQUIFERS, FLOW	RATES, LEACHING.: /E, GROUNDWATER	W70-09637
	RE-CYCLE.:	W71-07118
*SUPERVATANT	REASONABLE USE, DAMAGES, SURFACE	W70-08049
GROUND STREAMS, SUBSURFACE RUNOFF,	REASONABLE USE, PRIOR APPROPRIATI	W70-08050
GROUND STREAMS, SUBSURFACE RUNOFF,	REASONABLE USE, REMEDIES, WATER U	W70-00532
LEGAL ASPECTS, MUNICIPAL WATER,	REASONABLE USE, ARTIFICIAL USE, R	W70-02896
URAL USE, NATURAL FLOW DOCTRINE,	RECHARGE BASINS, EXPERIMENTAL REC	W69-05327
HARGE PROJEC/ SURFACE SPREADING,	RECHARGE BASINS, EXPERIMENTAL REC	W69-05328
HARGE PROJEC/ SURFACE SPREADING,	RECHARGE PROJECT, FLUSHING MEADOW	W69-05327
G, RECHARGE BASINS, EXPERIMENTAL	RECHARGE PROJECT, FLUSHING MEADOW	W69-08621
G, RECHARGE BASINS, EXPERIMENTAL	RECHARGE.:	W69-08620
MUNICIPAL WASTE	RECHARGE.:	W70-03102
WASTE WATER	RECHARGE, LOW-FLOW AUGMENTATION.:	W69-08621
AQUIFERS, WATER REUSE, ARTIFICIAL	RECHARGE, FILTRATION, SORPTION, I	W70-05466
ES. IRRIGATION WATER, ARTIFICIAL	RECHARGE, SAFE YIELD, WATER BALAN	W69-07554
FILTRATION, WATER SPREADING, PIT	RECHARGE, CONVECTION, MIXING, FLO	W69-08620
ERS, INJECTION WELLS, ARTIFICIAL	RECHARGE, LEGAL ASPECTS, AESTHETI	W70-04712
, *MUNICIPAL WASTES, *ARTIFICIAL	RECHARGE, *WATER SPREADING, *WATE	W70-05466
R REUSE, *TERTIARY / *ARTIFICIAL	RECHARGE, *WATER REUSE, *CALIFORN	W69-02611
IA, WATER YIELD, IN/ *ARTIFICIAL	RECHARGE, *SURFACE-GROUNDWATER RE	W69-03197
AL MODELS, INDUCED INFILTRATION,	RECHARGE, HYDROCHEMICAL FACIES, S	W68-00058
SULFATE, SILICATE, GROUND WATER	RECHARGE, GROUNDWATER, *SEEPAGE,	W69-05328
*WATER POLLUTION, *GROUNDWATER	RECHARGE, IRRIGATION, DENITRIFICA	W69-05327
UCED INFILTRATION, *GROUND WATER	RECHARGE, IRRIGATION, DENITRIFICA	W70-09637
UCED INFILTRATION, *GROUND WATER	RECHARGE, DISCHARGE, GROUNDWATER,	W71-10325
ATION, *WATER QUALITY POLLUTION,	RECHARGE, MODEL STUDIES, HYDRAULI	W71-03543
EMENT, *OILY WATER, *GROUNDWATER	RECHARGE, TRANSMISSIVITY, WATER L	W71-12410
CS, EFFLUENT STREAM, GROUNDWATER	RECHARGE, *WATER TREATMENT, *FILT	W71-12410
RGE, *INDUCED INFILTRATION, *PIT	RECHARGE, *INDUCED INFILTRATION,	W70-04712
*PIT RECHARGE, *WAT/ *ARTIFICIAL	RECLAIMED WATER.:	W69-05328
NT, WATER RESOURCES DEVELOPMENT,	RECLAMATION, INDUCED INFILTRATION	W69-05327
, SOIL PERCOLATION, *WASTE WATER	RECLAMATION, INDUCED INFILTRATION	W71-08073
, SOIL PERCOLATION, *WASTE WATER	RECLAMATION, PATH OF POLLUTANTS.:	
FLUCTUATIONS, SALINE SOILS, LAND		



ADMINISTRATIVE AGENCIES, CONTROL,	REGULATION, AQUIFERS, WELL REGULA	W71-10157
TES, NITROGEN CYCLE, PHOSPHORUS,	REGULATION, GROUNDWATER, RUNOFF,	W71-12084
TROL, REGULATION, AQUIFERS, WELL	REGULATIONS, SUBSURFACE DRAINAGE,	W71-10157
LATION, C/ *PUBLIC HEALTH, *WELL	REGULATIONS, *WATER WELLS, *LEGIS	W71-04742
TION, PUMPS, PUMPING, STANDARDS,	REGULATION, WELL PERMITS, DRILLIN	W71-04742
NDWATER, PERCOLATING WATER, WELL	REGULATIONS, PERCOLATION, SUBSURF	W69-06117
IRRIGATION, *SURFACE-GROUNDWATER	RELATIONSHIPS, DRAINAGE EFFECTS,	W69-00248
, RECHARGE, *SURFACE-GROUNDWATER	RELATIONSHIPS, OBSERVATION WELLS,	W69-02611
RAFT, WELLS, SURFACE-GROUNDWATER	RELATIONSHIPS, DA: / CYCLE, OVERD	W70-00532
*RECHARGE, *SURFACE-GROUNDWATER	RELATIONSHIPS, MALENCIAVES, PATH	W71-00194
ATER TABLE, *SURFACE-GROUNDWATER	RELATIONSHIPS, *WATER POLLUTION S	W70-07766
STREAMFLOW, SURFACE-GROUNDWATER	RELATIONSHIPS, INFILTRATION, EVAP	W70-06102
CIPAL WATER, SURFACE-GROUNDWATER	RELATIONSHIPS, GROUNDWATER MOVEME	W71-02909
IA CHANNELS, SURFACE-GROUNDWATER	RELATIONSHIPS, PERMEABILITY, ALGA	W71-12410
R POLLUTION, JUDICIAL DECISIONS,	RELATIVE RIGHTS, LEGAL ASPECTS, S	W71-13521
COLATING WATER, RIPARIAN RIGHTS,	RELATIVE RIGHTS, WATER POLLUTION	W71-01043
WATER, WELLS, SEEPAGE, DAMAGES,	REMEDIES.: / WELL CASINGS, SALINE	W71-03230
DICIAL DECISIONS, LEGAL ASPECTS,	REMEDIES, WELLS, DIKES, SHALLOW W	W71-13645
MUNICIPAL WATER, REASONABLE USE,	REMEDIES, WATER UTILIZATION, PERC	W70-00532
HIGHWAY ICE	REMOVAL.: /	W70-09844
CHLORIDE, *HIGHWAY ICING, *SNOW	REMOVAL, *MAINE, DEICERS, ROADS,	W70-09844
ION, PERCOLATION, FLOOD CONTROL,	RESERVOIRS, PRECIPITATION(ATMOSPH	W70-06102
ELF-PURIFICATION, BACTERIOPHAGE,	RESERVOIRS, SPORES, NITRITES,: /S	W69-07838
BARRIERS, INFILTRATION, OIL, OIL	RESERVOIRS, DRILLING EQUIPMENT, L	W71-08055
BIN, NITRATE MOVEMENT, FEEDLOTS,	RESIDUAL ACCUMULATION, SOIL CORES	W71-10372
TICIDES, INSECTICIDES, PESTICIDE	RESIDUES, INFILTRATION.: /RON PES	W70-01904
ONKA(MINN), SOIL MINERALS, PLANT	RESIDUES, MORRIS(MINN), SOIL PERC	W70-04193
ROORGANISMS, FERROBACILLUS, FLOW	RESISTANCE, RETENTION, HAWAII.: /	W69-00979
OGY, GROUNDWATER MOVEMENT, WATER	RESOURCES DEVELOPMENT, RECLAIMED	W70-04712
ILTRATION, TUCSON BASIN, PROCESS	RESPONSE MODEL, INSTRUMENTATION,	W69-03197
FERROBACILLUS, FLOW RESISTANCE,	RETENTION, HAWAII.: /ROORGANISMS,	W69-00979
ODEL.: *IRRIGATION	RETURN FLOW, HYDROLOGIC-QUALITY M	W71-09936
ERS, DRAINAGE WATER, IRRIGATION,	RETURN FLOW, WATER SUPPLY, LIVEST	W71-06435
IN/ *ARTIFICIAL RECHARGE, *WATER	REUSE, *CALIFORNIA, WATER YIELD,	W70-05466
USES, *GROUNDWATER MOVEM/ *WATER	REUSE, *PATHOGENIC BACTERIA, *VIR	W69-08621
AL WASTES, *ARTIFICIAL R/ *WATER	REUSE, *RECLAIMED WATER, *MUNICIP	W69-08620
CHARGE, *WATER SPREADING, *WATER	REUSE, *TERTIARY TREATMENT, INFIL	W70-04712
, WATER STORAGE, AQUIFERS, WATER	REUSE, ARTIFICIAL RECHARGE, LOW-F	W70-03102
UE, MINERALIZATION, CLAY LENSES,	RHINE RIVER, AMSTERDAM RHINE, POL	W69-07838
Y LENSES, RHINE RIVER, AMSTERDAM	RHINE, POLDERS, COMPOSITION, PSEU	W69-07838
ATER SOURCES, DRAINAGE, RIPARIAN	RIGHTS, ARTESIAN WELLS, DITCHES,	W69-06118
WATERS, SURFACE RUNOFF, RIPARIAN	RIGHTS, COMPETING USES, DOMESTIC	W70-00532
ON, JUDICIAL DECISIONS, RELATIVE	RIGHTS, LEGAL ASPECTS, STATE GOVE	W71-13521
ISLATION, WATER RIGHTS, RIPARIAN	RIGHTS, NATURAL USE, NATURAL FLOW	W70-02896
ON, *PERCOLATING WATER, RIPARIAN	RIGHTS, RELATIVE RIGHTS, WATER PO	W71-01043
GOVERNMENTS, LEGISLATION, WATER	RIGHTS, RIPARIAN RIGHTS, NATURAL	W70-02896
N, *PERCOLATING WATER, *RELATIVE	RIGHTS, WATER LAW, GROUND WATER,	W70-00521
UND, LEAKAGE, PERCOLATION, WATER	RIGHTS, WATER POLLUTION SOURCES,	W70-07631
WATER, RIPARIAN RIGHTS, RELATIVE	RIGHTS, WATER POLLUTION EFFECTS,	W71-01043
UPPER	RIO GRANDE, SALT BALANCE.: /	W70-08662
DICIAL DECISIONS, LEGAL ASPECTS,	RIPARIAN LAND, PERCOLATION, SUBSU	W71-01043
REASONABLE USE, ARTIFICIAL USE,	RIPARIAN LANDS, GROUNDWATER, PERC	W70-02896
ENTS, LEGISLATION, WATER RIGHTS,	RIPARIAN RIGHTS, NATURAL USE, NAT	W70-02896
*SURFACE WATERS, SURFACE RUNOFF,	RIPARIAN RIGHTS, COMPETING USES,	W70-00532
R POLLUTION, *PERCOLATING WATER,	RIPARIAN RIGHTS, RELATIVE RIGHTS,	W71-01043
DWATER, WATER SOURCES, DRAINAGE,	RIPARIAN RIGHTS, ARTESIAN WELLS,	W69-06118
*SUSQUEHANNA	RIVER BASIN, (N Y).:	W70-03102
ECTS, LEACHING. DENITRIFICATION,	RIVER FLOW, WATER POLLUTION SOURC	W70-08662
RECIPITATION, LEACH BED, SPOKANE	RIVER VALLEY.: /T HOLES, ANNUAL P	W69-01076
*FEEDLOTS, SOUTH PLATTE	RIVER VALLEY.:	W71-02036

*FEEDLOT, PLATTE	RIVER VALLEY.:	W71-03543
PHOENIX(ARIZ), SALT	RIVER(ARIZ).:	W70-04712
NUTRIENTS, WATER MIXING, RUSSIAN	RIVER(CALIF), YAKIMA BASIN(PACIFI	W70-04504
NGFI/ *URBAN STORM RUNOFF, JAMES	RIVER(MO), WILSON CREEK(MO), SPRI	W71-09154
*SUSQUEHANNA	RIVER(NY), BINGHAMTON(NY).:	W71-02909
NERALIZATION, CLAY LENSES, RHINE	RIVER, AMSTERDAM RHINE, POLDERS,	W69-07838
S, GLACIAL DRIFT, AQUIFERS, OHIO	RIVER, KENTUCKY.: /HING, CHLORIDE	W71-00194
ETWORK ANALYSIS.:	RIVER, S.W. OHIO WATER COMPANY, N	W69-02611
GREAT MIAMI	RIVERS, STREAMS, LAKES, PONDS, TI	W69-05370
TION SOURCES, INDUSTRIAL WASTES,	ROADS, CHEMCONTROL, SALTS, GROUND	W70-09844
*SNOW REMOVAL, *MAINE, DEICERS,	ROUTING, LANDFILL MANAGEMENT, LEA	W68-00058
CH/ *UNSATURATED FLOW, *MOISTURE	RUNOFF, BASE FLOW, PERCOLATION, L	W71-06443
RIENTS, ALGAE, NITRATES, SURFACE	RUNOFF, DRAINAGE WATER, GRASSLAND	W70-04193
TILIZERS, WATER POLLUTION, SNOW,	RUNOFF, FARM WASTES, AERORIC COND	W69-09721
L PROFILES, WATER TABLE, SURFACE	RUNOFF, GASOLINE, WATER POLLUTION	W70-08049
REASONABLE USE, DAMAGES, SURFACE	RUNOFF, GROUNDWATER, CELLULOSE, H	W68-01269
HEMICAL OXYGEN DEMAND, LEACHING,	RUNOFF, GROUNDWATER MOVEMENT, LIM	W71-09154
, STORM RUNOFF, ODOR, SUBSURFACE	RUNOFF, JAMES RIVER(MO), WILSON C	W71-09154
REEK(MO), SPRINGFI/ *URBAN STORM	RUNOFF, ODOR, SUBSURFACE RUNOFF,	W71-09154
LUTION SOURCES, *FISHKILL, STORM	RUNOFF, PERCOLATION, EUTROPHICATI	W71-12084
PHORUS, REGULATION, GROUNDWATER,	RUNOFF, REASONABLE USE, PRIOR APP	W70-08050
UNDERGROUND STREAMS, SUBSURFACE	RUNOFF, REASONABLE USE, DAMAGES,	W70-08049
UNDERGROUND STREAMS, SUBSURFACE	RUNOFF, RIPARIAN RIGHTS, COMPETIN	W70-00532
QUATER, *SURFACE WATERS, SURFACE	RUNOFF, STREAMS, SOIL TYPES, PERM	W71-05094
ER MOVEMENT, HYDRAULICS, SURFACE	RUNOFF, SUBSURFACE STREAMS, DEEP	W70-00521
E WATER, PERCOLATION, SUBSURFACE	RUNOFF, UREAS, FERTILIZERS, DRAIN	W71-06435
ION, SEDIMENTS, DENITRIFICATION,	RUNOFF, WATER POLLUTION CONTROL,	W71-10372
ON, LEACHING, EROSION, NITROGEN,	RUSSIAN RIVER(CALIF), YAKIMA BASI	W70-04504
SSOLVED NUTRIENTS, WATER MIXING,	S LAW, PERMEABILITY, *RIVER FLOW.	W69-02611
SORPTION, WATER CHEMISTRY, DARCY	S.W. OHIO WATER COMPANY, NETWORK	W69-02611
ANALYSIS.:	SAFF YIELD, WATER BALANCE, HYDROG	W70-05466
GREAT MIAMI RIVER,	SALINE SOILS, WASTE STO: / DIFFUS	W70-08026
, WATER SPREADING, PIT RECHARGE,	SALINE SOILS, SALINE WATER.:	W70-09844
ION, GRAVITATIONAL WATER, SALTS,	SALINE SOILS, LAND RECLAMATION, P	W71-08073
L, SALTS, GROUNDWATER, LEACHING,	SALINE WATER INTRUSION, WATER POL	W71-10446
CHING, WATER LEVEL FLUCTUATIONS,	SALINE WATER INTRUSION, AQUIFERS,	W71-04559
ATING WATER, UNDERGROUND, WELLS,	SALINE WATER-FRESH WATER INTERFAC	W71-03230
TER MODELS, MATHEMATICAL MODELS,	SALINE WATER, WATER CONSERVATION,	W71-06063
ELLS, *WATER WELLS, GROUNDWATER,	SALINE WATER, WELLS, SEEPAGE, DAM	W71-03230
TION IDENTIFICATION, SOIL WATER,	SALINE WATER, SUBSURFACE WATERS,	W71-13521
NDARIES(SURFACES), WELL CASINGS,	SALINE WATER.:	W70-09844
TATE JURISDICTION, OIL INDUSTRY,	SALINE WATER.:/TROL, SALTS, GROU	W71-01028
NDWATER, LEACHING, SALINE SOILS,	SALINE WATER-FRESHWATER INTERFACE	W71-01028
LLING, OIL FIELDS, SALINE WATER,	SALINE: /STIC WASTES, FARM WASTES	W70-08049
OIL WELLS, DRILLING, OIL FIELDS,	SALINITY, FERTILIZERS, GROUNDWATE	W70-08662
, MUNICIPAL WASTES, NATURAL GAS,	SALINITY, STREAMFLOW, SURFACE-GRO	W70-06102
URFACE DRAINAGE, DRAINAGE WATER,	SALINITY, PERCOLATING WATER, WELL	W69-06118
*CLIMATES, *LAND USE, *OKLAHOMA,	SALINITY, GROUNDWATER, DISSOLVED	W71-06063
IONS, OIL WASTES, WATER QUALITY,	SALINITY, WITHDRAWAL, GROUNDWATER	W71-08044
OLLUTION EFFECTS, WATER QUALITY,	SALT BALANCE, PERCOLATING WATER,	W71-06063
ER CHEMISTRY, SOLUTES, NITRATES,	SALT BALANCE.:	W70-08662
TER, DISSOLVED SOLIDS, LEACHING,	SALT RIVER(ARIZ).:	W70-04712
UPPER RIO GRANDE,	SALT TRANSPORT.:	W71-06063
PHOENIX(ARIZ),	SALTS, GROUNDWATER, LEACHING, SAL	W70-09844
*SALT WATER IRRIGATION,	SALTS, SALINE SOILS, WASTE STO: /	W70-08026
NE, DEICERS, ROADS, CHEMCONTROL,	SAMPLING, GROUNDWATER MOVEMENT, P	W70-06322
DIFFUSION, GRAVITATIONAL WATER,	SAMPLING, DATA COLLECTION, WELLS,	W71-11255
OGY, INFILTRATION, PERMEABILITY,	SAN JACINTO VALLEY(CALIF).:	W70-05466
NDWATER MOVEMENT, FLOW PROFILES,	SAND, ALDRIN INFILTRATION.:	W70-01904
OTTAWA	SANDS, CHLORINATION, MICROORGANIS	W69-07838
IC BACTERIA, METABOLISM, CANALS,		



LABORATORY TESTS, PERMEAMETERS, WASTES, INFILTRATION, AQUIFERS, SPIRATION, \*LANDFILLS, DRAINAGE, D STATES, \*REVIEWS, METHODOLOGY, ATER, \*WATER QUALITY, \*LANDFILL, STATE COLLEGE(PENN), OL, PUBLIC HEALTH, ENVIRONMENTAL UNDERWATER MOVEMENT, ENVIRONMENTAL WASTE DISPOSAL, UNSATURATED FLOW, UNSATURATED FLOW, MODEL STUDIES, THERMAL PROPERTIES, MODEL TESTS, LL CASINGS, ARTESIAN WELLS, WELL ION, OLIGOTROPHY, SEWAGE, ALGAE, URAI WATERSHEDS, ORGANIC MATTER, UNDERWATER, AMMONIA, PRECIPITATION, EMENT, INFILTRATION, NAVIGATION, STES, INCINERATION, PERCOLATION, LL CASINGS, SALINE WATER, WELLS, LUTION, JUDICIAL DECISIONS, OIL, , FUELS, WELLS, WATER POLLUTION, GROUND, GROUNDWATER, WATER SUPPLY, ION, PRECIPITATION(ATMOSPHERIC), , MODEL TESTS, SATURATION ZONES, LS, GROUNDWATER, SURFACE WATERS, INFILTRATION, PATH OF POLLUTANTS, N, MIXING, GROUNDWATER MOVEMENT, S, NUTRIENTS, SOIL WATER, SOILS, GROUNDWATER MOVEMENT, PERCOLATION, ELLS, DITCHES, DRAINAGE EFFECTS, L, IMPAIRED WATER QUALITY, UNDER OLATION, PENETRATION, DIFFUSION, UTANTS, WATER POLLUTION SOURCES, (WATER), ACIDITY, OXYGEN, ALGAE, , ALGAE, SCUM, WEEDS, NUTRIENTS, SOIL DISPOSAL FIELDS, CESSPOOLS, POLLUTION CONTROL, GROUNDWATER, \*BIODEGRADATION, SOIL DISPOSAL/ , SOIL CONTAMINATION, CESSPOOLS, N, FILTRATION, SEWAGE TREATMENT, NE WATER, OIL WASTES, CESSPOOLS, , ORGANIC COMPOUNDS, DISPERSION, POSAL, WASTE WATER TREATMENT, W/ POSAL, WASTE WATER TREATMENT, W/ RECHARGE, HYDROCHEMICAL FACIES, LSON CREEK(MO), SPRINGFIELD(MO), AINAGE, AQUIFERS, SINKS, CITIES, TORING, WATER POLLUTION SOURCES, TORING, WATER POLLUTION SOURCES, TMENT, INFILTRATION, FILTRATION, MS, EUTROPHICATION, OLIGOTROPHY, N FLOW, WATER SUPPLY, LIVESTOCK, STRIAL WASTES, MUNICIPAL WASTES, PENETRATION, INDUSTRIAL WASTES, SINKS, CITIES, SEWAGE TREATMENT, ASPECTS, REMEDIES, WELLS, DIKES, PERCOLATION, SUBSURFACE DRAINAGE, PERCOLATING WATER, WELL SPACING, ATE, FLUORIDE, NITRATE, SULFATE, QUALITY, \*IRRIGATION EFFICIENCY,

SANDS, CHLORINATED HYDROCARBON PE SANITARY ENGINEERING.: / DOMESTIC SANITARY ENGINEERING, \*LEACHING, SANITARY ENGINEERING, LANDFILLS, SANITARY FILL, WASTE DILUTION, WA SANITARY LANDFILL DRAINAGE.: SANITATION, WASTE DISPOSAL, DISPO SANITATION, ENVIRONMENTAL ENGINEE SATURATED FLOW, ADSORPTION, ADSOR SATURATED SOILS.: /ION, SEEPAGE, SATURATION ZONES, SEEPAGE, NUMERI SCREENS, EXCAVATION, WATER POLICY SCUM, WEEDS, NUTRIENTS, SEPTIC TA SEDIMENTS, FERTILIZERS, WATER POL SEDIMENTS, DENITRIFICATION, RUNOF SEEPAGE.: /CTION, GROUNDWATER MOV SEEPAGE.: /PRESSIBILITY, SOLID WA SEEPAGE, DAMAGES, REMEDIES.: / WE SEEPAGE, DAMAGES, OIL INDUSTRY, S SEEPAGE, GROUNDWATER, PERCOLATING SEEPAGE, INFILTRATION, WATER POLL SEEPAGE, INFILTRATION, GROUNDWATE SEEPAGE, NUMERICAL METHOD, LABORA SEEPAGE, PERCOLATION.: /TERS, WEL SEEPAGE, PENETRATION, INDUSTRIAL SEEPAGE, POROUS MEDIA, EQUATIONS, SEEPAGE, SOIL CHEMISTRY, ABSORPTI SEEPAGE, UNSATURATED FLOW, MODEL SEEPAGE, WASTE STORAGE, LEGAL ASP SEEPAGE, WATER POLLUTION, INDUSTR SEEPAGE.: /ED WATER QUALITY, PERC SELF-PURIFICATION, BIODEGRADATION SELF-PURIFICATION, BACTERIOPHAGE, SEPTIC TANKS, EFFLUENTS, SWAMPS, SEPTIC TANKS, SULFATES, SULFIDES, SEPTIC TANKS, MANAGEMENT.: /WATER SEWAGE DISPOSAL, ORGANIC LOADING, SEWAGE DISPOSAL, GROUNDWATER MOVE SEWAGE DISPOSAL, HYDROGEOLOGY, GR SEWAGE DISPOSAL, DOMESTIC WASTES, SEWAGE EFFLUENTS, BIODEGRADATION, SEWAGE EFFLUENT, \*WASTE WATER DIS SEWAGE EFFLUENT, \*WASTE WATER DIS SEWAGE EFFLUENT, C.O.D., B.O.D., SEWAGE PLANT BYPASSES.: /(MO), WI SEWAGE TREATMENT, SEWERS, AERATIO SEWAGE TREATMENT, WASTE WATER DIS SEWAGE TREATMENT, WASTE WATER DIS SEWAGE TREATMENT, SEWAGE DISPOSAL SEWAGE, ALGAE, SCUM, WEEDS, NUTRI SEWAGE, INFILTRATION, INDUSTRIAL SEWAGE, WATER QUALITY CONTROL, WA SEWAGE, WASTE WATER(POLLUTION), L SEWERS, AERATION, MONITORING, LAN SHALLOW WELLS.: /ECISIONS, LEGAL SHALLOW WELLS, SUBSURFACE WATERS, SHALLOW WELLS, GROUNDWATER, WATER SILICATE, GROUND WATER RECHARGE, SIMULATED LANDFILL.: SIMULATION, GROUNDWATER, PLANNING

W70-01904  
W69-03178  
W68-00058  
W71-08907  
W69-03178  
W71-01204  
W70-06011  
W70-06572  
W70-10058  
W69-02681  
W69-00651  
W71-04742  
W70-04193  
W70-04193  
W71-06435  
W71-04882  
W71-08907  
W71-03230  
W70-07631  
W69-06117  
W70-07632  
W71-05094  
W69-00651  
W69-05370  
W70-00521  
W71-09611  
W71-04121  
W69-02681  
W69-06118  
W71-13645  
W70-08025  
W70-09548  
W69-07838  
W70-04193  
W68-01010  
W71-10372  
W68-01010  
W69-00652  
W70-04712  
W70-08049  
W70-01291  
W69-05327  
W69-05328  
W69-03197  
W71-09154  
W71-09154  
W71-01205  
W71-01324  
W70-04712  
W70-04193  
W71-06435  
W71-10446  
W70-00521  
W71-09154  
W71-13645  
W69-06117  
W69-06118  
W69-03197  
W70-09548  
W71-09936

RIAL WASTES, DRAINAGE, AQUIFERS,	SINKS, CITIES, SEWAGE TREATMENT,	W71-09154
EASUREMENT, DISCHARGE(WATER), ON-	SITE DATA COLLECTIONS, UNDERFLOW.	W70-07766
I/ *WATER POLLUTION EFFECTS, *ON-	SITE INVESTIGATIONS, *SOIL INVEST	W70-06322
G, / *FEEDLOTS, OXIDATION DITCH,	SLOTTED FLOORS, AERATOR, SPREADIN	W71-03542
S, FERTILIZERS, WATER POLLUTION,	SNOW, RUNOFF, DRAINAGE WATER, GRA	W70-04193
CHING, *AQUIFER CHARACTERISTICS,	SOIL ANALYSIS, TEST PROCEDURES, C	W71-07887
TRITES, NITROGEN-CYCLE, HISTORY,	SOIL ANALYSIS, WATER TRANSFER, IR	W71-12122
NTS, SOIL WATER, SOILS, SEEPAGE,	SOIL CHEMISTRY, ABSORPTION, SOIL	W71-04121
NTS, EFFLUENT, AQUIFER, AMMONIA,	SOIL CONTAMINATION, WATER POLLUTI	W71-03542
FLUCTUATIONS, AMMONIA, NEBRASKA,	SOIL CONTAMINATION, OBSERVATION W	W71-03543
WATER CHEMISTRY, WATER QUALITY,	SOIL CONTAMINATION.: /FILTRATION,	W69-08620
RCOLATION, SOIL DISPOSAL FIELDS,	SOIL CONTAMINATION, SOIL PHYSICAL	W69-08621
LTRATION, ANALYTICAL TECHNIQUES,	SOIL CONTAMINATION EFFECTS, ORGAN	W70-01291
POLLUTANTS, NITROGEN COMPOUNDS,	SOIL CONTAMINATION, CESSPOOLS, SE	W69-00652
FEEDLOTS, RESIDUAL ACCUMULATION,	SOIL CORES.: / NITRATE MOVEMENT,	W71-10372
RGANIC LOADING, *BIODEGRADATION,	SOIL DISPOSAL FIELDS, CESSPOOLS,	W68-01010
TION, INFILTRATION, PERCOLATION,	SOIL DISPOSAL FIELDS, SOIL CONTAM	W69-08621
OFF, DRAINAGE WATER, GRASSLANDS,	SOIL EROSION.: /LUTION, SNOW, RUN	W70-04193
LEACHING, DRAINAGE, FARM WASTES,	SOIL MANAGEMENT, GROUNDWATER, WIS	W71-06443
AGE, SOIL CHEMISTRY, ABSORPTION,	SOIL MECHANICS, WATER QUALITY, SO	W71-04121
MANURES, LAKE MINNETONKA(MINN),	SOIL MINERALS, PLANT RESIDUES, MO	W70-04193
ORIDES, *CAPILLARY CONDUCTIVITY,	SOIL MOISTURE.: /A, NITRATES, CHL	W69-01076
OLLUTION, *SOIL WASTE TREATMENT,	SOIL PERCOLATION, *WASTE WATER RE	W69-05327
OLLUTION, *SOIL WASTE TREATMENT,	SOIL PERCOLATION, *WASTE WATER RE	W69-05328
S, PLANT RESIDUES, MORRIS(MINN),	SOIL PERCOLATION.: / SOIL MINERAL	W70-04193
OSAL FIELDS, SOIL CONTAMINATION,	SOIL PHYSICAL PROPERTIES.: / DISP	W69-08621
TH, *SOIL LEACHING, GROUNDWATER,	SOIL PROFILES, WATER TABLE, SURFA	W69-09721
MPs, WASTE DUMPS, WASTE STORAGE,	SOIL PROPERTIES, MOISTURE CONTENT	W68-00058
Y, SOIL STRUCTURE, INFILTRATION,	SOIL PROPERTIES, LEACHING, PATH O	W71-06514
, SOIL MECHANICS, WATER QUALITY,	SOIL PROPERTIES, WATER WELLS, WAT	W71-04121
ANALYTICAL TECHNIQUES, BIOASSAY,	SOIL STRUCTURE, INFILTRATION, SOI	W71-06514
AULTICS, SURFACE RUNOFF, STREAMS,	SOIL TYPES, PERMEABILITY, FLOODS,	W71-05094
CTS, GROUNDWATER, WATER QUALITY,	SOIL WATER.: /ONJA, DRAINAGE EFFE	W71-04548
WATER, POLLUTION IDENTIFICATION,	SOIL WATER. SALINE WATER, WATER C	W71-06063
TILIZERS, PESTICIDES, NUTRIENTS,	SOIL WATER, SOILS, SEEPAGE, SOIL	W71-04121
NDWATER, SOIL WATER, SOLUBILITY,	SOIL WATER TRANSMISSIVITY.: /GROU	W71-07887
HEMICAL PROPERTIES, GROUNDWATER,	SOIL WATER, SOLUBILITY, SOIL WATE	W71-07887
S, MOISTURE CONTENT, POLLUTANTS,	SOIL WATER MOVEMENT.: / PROPERTIE	W68-00058
MEARILITY, GROUNDWATER MOVEMENT,	SOIL WATER MOVEMENT, INFILTRATION	W69-07375
L ASPECTS, AESTHETICS, AQUIFERS,	SOIL WATER MOVEMENT, GROUNDWATER	W69-08620
ER MOVEMENT, PATH OF POLLUTANTS,	SOIL WATER MOVEMENT, OILY WATER,	W71-01043
HOMOGENEOUS MEDIA, UNSATURATED	SOIL.: /ION, SEEPAGE, UNSATURATE	W69-02681
D FLOW, MODEL STUDIES, SATURATED	SOILS.: /ION, SEEPAGE, UNSATURATE	W69-02681
N FLOW, *GROUNDWATER, *SATURATED	SOILS, *IRRIGATION EFFECTS, LEACH	W71-08073
OIL-WATER INTERFACES, IMPERVIOUS	SOILS, GROUNDWATER BARRIERS, INFI	W71-08055
WATER LEVEL FLUCTUATIONS, SALINE	SOILS, LAND RECLAMATION, PATH OF	W71-08073
TANKS, EFFLUENTS, SWAMPS, FOREST	SOILS, MINNESOTA, WISCONSIN, MICH	W70-04193
RES, METHODOLOGY, WATER QUALITY,	SOILS, PESTICIDES, CHROMATOGRAPHY	W71-06514
INKLER IRRIGATION, HYDROGEOLOGY,	SOILS, POROSITY, PERMEABILITY, GR	W69-07375
S, GROUNDWATER, LEACHING, SALINE	SOILS, SALINE WATER.: /TROL, SALT	W70-09844
STICIDES, NUTRIENTS, SOIL WATER,	SOILS, SEEPAGE, SOIL CHEMISTRY, A	W71-04121
AVITATIONAL WATER, SALTS, SALINE	SOILS, WASTE STO: / DIFFUSION, GR	W70-08026
ACHING, WATER POLLUTION SOURCES,	SOLID WASTES, WASTES, GARBAGE DUM	W68-00058
TY, COMPACTION, COMPRESSIBILITY,	SOLID WASTES, INCINERATION, PERCO	W71-08907
SALINITY, GROUNDWATER, DISSOLVED	SOLIDS, LEACHING, SALT BALANCE, P	W71-06063
ERTIES, GROUNDWATER, SOIL WATER,	SOLUBILITY, SOIL WATER TRANSMISSI	W71-07887
RIGATION WATER, WATER CHEMISTRY,	SOLUTES, NITRATES, SALINITY, WITH	W71-08044
NVECTION, *GROUNDWATER MOVEMENT,	SOLUTES, WASTES, PATH OF POLLUTAN	W69-08921
TRANSIENT STORAGE, GRAPHICAL	SOLUTIONS.: /SORPTION, INFILTRATION, PERCOLATI	W69-00248
ARTIFICIAL RECHARGE, FILTRATION,		W69-08621



TAL ENGINEERING, WATER POLLUTION	SOURCES.: /SANITATION, ENVIRONMEN	W70-06572
ION, RIVER FLOW, WATER POLLUTION	SOURCES.: /LEACHING, DENITRIFICAT	W70-08662
ELS, OIL WASTES, WATER POLLUTION	SOURCES.: /STUDIES, HYDRAULIC MOD	W71-10325
ICULATE FORM, FEEDLOTS, NUTRIENT	SOURCES.: /BOLISM, MOBILITY, PART	W71-06443
, *FARM WASTES, *WATER POLLUTION	SOURCES, *GROUNDWATER, *AGRICULTU	W71-04121
STES, *WASTE D/ *WATER POLLUTION	SOURCES, *URBANIZATION, *SOLID WA	W71-05094
, *SOIL WATER / *WATER POLLUTION	SOURCES, *HERBICIDES, *NEW MEXICO	W71-06514
, *RETURN FLOW/ *WATER POLLUTION	SOURCES, *WATER POLLUTION EFFECTS	W71-08044
LUTION CONTROL, *WATER POLLUTION	SOURCES, *FISHKILL, STORM RUNOFF,	W71-09154
WAT/ *OKLAHOMA, *WATER POLLUTION	SOURCES, *OIL WASTES, *REMEDIES,	W71-11724
IND/ *MONTANA, *WATER POLLUTION	SOURCES, *WATER WELLS, *REMEDIES,	W71-11692
ALITY, *IRRIGAT/ WATER POLLUTION	SOURCES, *ION EXCHANGE, *WATER OU	W71-09936
M/ *WASHINGTON, *WATER POLLUTION	SOURCES, *DAMAGES, *WATER WELL, I	W71-13645
UNDWATER MOVEM/ *WATER POLLUTION	SOURCES, *INDUSTRIAL WASTES, *GRO	W71-00194
FFUSION, *SOIL/ *WATER POLLUTION	SOURCES, *PATH OF POLLUTANTS, *DI	W70-10058
ATES, *AMMONIA, *WATER POLLUTION	SOURCES, *CORES, FIELDS, PLANTS,	W70-04488
HALLOW WELLS, GROUNDWATER, WATER	SOURCES, DRAINAGE, RIPARIAN RIGHT	W69-06118
R, OIL INDUSTRY, WATER POLLUTION	SOURCES, GROUNDWATER MOVEMENT, UN	W70-08025
N, WATER RIGHTS, WATER POLLUTION	SOURCES, GROUNDWATER, GROUNDWATER	W70-07631
R, HYDROGEOLOGY, WATER POLLUTION	SOURCES, GROUNDWATER MOVEMENT, PE	W71-07194
RELATIONSHIPS, *WATER POLLUTION	SOURCES, INFILTRATION, WASTES, HY	W70-07766
CHEMICAL WASTES, WATER POLLUTION	SOURCES, INDUSTRIAL WASTES, RIVER	W69-05370
LLS, *GASOLINE, *WATER POLLUTION	SOURCES, JUDICIAL DECISIONS, FUEL	W69-06117
R APPROPRIATION, WATER POLLUTION	SOURCES, JUDICIAL DECISIONS, LEGA	W70-08050
, WATER QUALITY, WATER POLLUTION	SOURCES, LYSIMETERS.: /E DRAINAGE	W71-01204
ROU/ *NITRATES, *WATER POLLUTION	SOURCES, LEACHING, FARM WASTES, G	W71-08218
AMS, CALIFORNIA, WATER POLLUTION	SOURCES, LEACHING, DRAINAGE WATER	W71-04548
SO/ *SURFACE WATERS, GEOLOGICAL	SOURCES, MINERALIZATION, NITROGEN	W71-06435
WATER INTRUSION, WATER POLLUTION	SOURCES, MINERALOGY, INDUSTRIAL W	W71-10446
UNOFF, GASOLINE, WATER POLLUTION	SOURCES, MINE WATER, OIL WASTES,	W70-08049
*LAVA, BASALTS, WATER POLLUTION	SOURCES, MICROORGANISMS, FERROBAC	W69-00979
, *FERTILIZERS, *WATER POLLUTION	SOURCES, NITROGEN, NITRATES, NITR	W71-12084
URFACE DRAINAGE, WATER POLLUTION	SOURCES, PIPES, CLOSED CONDUITS,	W70-07632
TLE, *LEACHING, *WATER POLLUTION	SOURCES, PATH OF POLLUTANTS, WATE	W70-00665
H OF POLLUTANTS, WATER POLLUTION	SOURCES, SELF-PURIFICATION, BIODE	W70-09548
NG, *MONITORING, WATER POLLUTION	SOURCES, SEWAGE TREATMENT, WASTE	W71-01205
RING, *LEACHING, WATER POLLUTION	SOURCES, SOLID WASTES, WASTES, GA	W68-00058
NG, *MONITORING, WATER POLLUTION	SOURCES, SEWAGE TREATMENT, WASTE	W71-01324
OURCES, MINERALIZATION, NITROGEN	SOURCES, WELL WATER, FEEDLOTS.: /	W71-06435
, *SOLID WASTES, WATER POLLUTION	SOURCES, WATER POLLUTION CONTROL,	W70-06011
LLUTION EFFECTS, WATER POLLUTION	SOURCES.: /UPPLY, FARMS, WATER PO	W71-13521
BROOKINGS	SOUTH DAKOTA).: NA	W69-03178
TIVE GRASSES, FEEDLOTS, CORRALS,	SOUTH PLATTE VALLEY(COLO).: NA	W70-04488
*FEEDLOTS,	SOUTH PLATTE RIVER VALLEY.: NA	W71-02036
ALINITY, PERCOLATING WATER, WELL	SPACING, SHALLOW WELLS, GROUNDWAT	W69-06118
	SPHERICAL DIFFUSIVITY.: NA	W70-10058
*OIL	SPIILLS.: NA	W71-10325
ANNUAL PRECIPITATION, LEACH BED,	SPOKANE RIVER VALLEY.: /T HOLES,	W69-01076
TION, BACTERIOPHAGE, RESERVOIRS,	SPORES, NITRITES,: /SELF-PURIFICA	W69-07838
	SPRAY DISPOSAL.: NA	W69-07375
IMENTAL RECHARGE PROJEC/ SURFACE	SPREADING, RECHARGE BASINS, EXPER	W69-05328
IMENTAL RECHARGE PROJEC/ SURFACE	SPREADING, RECHARGE BASINS, EXPER	W69-05327
Y / *ARTIFICIAL RECHARGE, *WATER	SPREADING, *WATER REUSE, *TERTIAR	W70-04712
WATER YIELD, INFILTRATION, WATER	SPREADING, PIT RECHARGE, SAFE YIE	W70-05466
DISPOSAL, *INFILTRATION, *WATER	SPREADING, *MONITORING, WATER POL	W71-01205
LUTION SO/ *INFILTRATION, *WATER	SPREADING, *MONITORING, WATER POL	W71-01324
DITCH, SLOTTED FLOORS, AERATOR,	SPREADING, LAND DISPOSAL.: /ATION	W71-03542
PHOSPHORUS, ALFALFA-BROMEGRASS,	SPRING THAWS, FERTILIZER-NITROGEN	W69-09721
MES RIVER(MO), WILSON CREEK(MO),	SPRINGFIELD(MO), SEWAGE PLANT BYP	W71-09154
, *IRRIGATION, *CHEMICAL WASTES,	SPRINKLER IRRIGATION, INFILTRATIO	W69-07114

LUTION ABATEMENT, POTABLE WATER,	STANDARDS, WATER POLLUTION EFFECT	W70-08025
N, CONSTRUCTION, PUMPS, PUMPING,	STANDARDS, REGULATION, WELL PERMI	W71-04742
	STARK COUNTY(OHIO).:	W70-07193
DFILL DRAINAGE.:	STATE COLLEGE(PENN), SANITARY LAN	W71-01204
*OIL WASTES, *OIL, LEGISLATION,	STATE GOVERNMENTS, POLLUTION ABAT	W69-05370
N CONTROL, *POLLUTION ABATEMENT,	STATE GOVERNMENTS, LOCAL GOVERNME	W70-02896
RELATIVE RIGHTS, LEGAL ASPECTS,	STATE GOVERNMENTS, STATE JURISDIC	W71-13521
EGAL ASPECTS, STATE GOVERNMENTS,	STATE JURISDICTION, OIL INDUSTRY,	W71-13521
ASTES, *WASTE TREATMENT, *UNITED	STATES, *REVIEWS, METHODOLOGY, SA	W71-08907
YDROGRAPHS, HYDROGRAPH ANALYSIS,	STATISTICAL MODELS, STATISTICAL M	W70-03102
PH ANALYSIS, STATISTICAL MODELS,	STATISTICAL METHODS, WATER STORAG	W70-03102
ATER, SALTS, SALINE SOILS, WASTE	STO: / DIFFUSION, GRAVITATIONAL W	W70-08026
SEEPAGE, DAMAGES, OIL INDUSTRY,	STORAGE TANKS, SUBSURFACE DRAINAG	W70-07631
DELS, STATISTICAL METHODS, WATER	STORAGE, AQUIFERS, WATER REUSE, A	W70-03102
TRANSIENT	STORAGE, GRAPHICAL SOLUTIONS.:	W69-00248
DRAINAGE EFFECTS, SEEPAGE, WASTE	STORAGE, LEGAL ASPECTS.:/TCHES,	W69-06118
ARBAGE DUMPS, WASTE DUMPS, WASTE	STORAGE, SOIL PROPERTIES, MOISTUR	W68-00058
LSON CREEK(MO), SPRINGFI/ *URBAN	STORM RUNOFF, JAMES RIVER(MO), WI	W71-09154
ER POLLUTION SOURCES, *FISHKILL,	STORM RUNOFF, ODOR, SUBSURFACE RU	W71-09154
QUIFER CHARACTERISTICS, EFFLUENT	STREAM, GROUNDWATER RECHARGE, TRA	W71-03543
*LAND USE, *OKLAHOMA, SALINITY,	STREAMFLOW, SURFACE-GROUNDWATER R	W70-06102
N, SUBSURFACE RUNOFF, SUBSURFACE	STREAMS, DEEP PERCOLATION, GROUND	W70-00521
EUTROPHICATION, OLIGOTR/ *LAKES,	STREAMS, FISH, LAND, ECOSYSTEMS,	W70-04193
, SUBSURFACE WATERS, UNDERGROUND	STREAMS, GROUNDWATER MOVEMENT, PA	W71-01043
RIGHTS, WATER POLLUTION EFFECTS,	STREAMS, GROUNDWATER, JUDICIAL DE	W71-01043
MENT, UNDERFLOW, ARTESIAN WELLS,	STREAMS, JUDICIAL DECISIONS, POLL	W70-08025
RCEs, INDUSTRIAL WASTES, RIVERS,	STREAMS, LAKES, PONDS, TIDAL WATE	W69-05370
DRAINAGE, UNDERFLOW, UNDERGROUND	STREAMS, PERCOLATING WATER, SUBSU	W70-07631
IATION, GROUNDWATER, UNDERGROUND	STREAMS, SUBSURFACE RUNOFF, REASO	W70-08049
WATERS, GROUNDWATER, UNDERGROUND	STREAMS, SUBSURFACE RUNOFF, REASO	W70-08050
ENT, HYDRAULICS, SURFACE RUNOFF,	STREAMS, SOIL TYPES, PERMEABILITY	W71-05094
TRESPASS, NEGLIGENCE, NUISANCE,	STRICT LIABILITY.:	W70-00521
TICAL TECHNIQUES, BIOASSAY, SOIL	STRUCTURE, INFILTRATION, SOIL PRO	W71-06514
ARMER COUNTY(TEXAS), HOLLY SUGAR	STUDIES.:/ HIGH PLAINS(TEXAS), P	W71-12122
MANAGEMENT, PERCOLATION, *MODEL	STUDIES, *COMPUTER PROGRAMS.:/G,	W71-09936
EMATICAL MODELS, AQUIFERS, MODEL	STUDIES, DRAINAGE PROGRAMS, SUBSU	W71-01932
ER, *GROUNDWATER RECHARGE, MODEL	STUDIES, HYDRAULIC MODELS, OIL WA	W71-10325
ION, *MATHEMATICAL MODELS, MODEL	STUDIES, HYDRAULIC MODELS, TRACER	W69-07554
ON, *GROUNDWATER MOVEMENT, MODEL	STUDIES, LABORATORY TESTS, PATH O	W70-09548
TECHNIQUES, INFILTRATION, MODEL	STUDIES, MATHEMATICS, EQUATIONS,	W71-01930
SEEPAGE, UNSATURATED FLOW, MODEL	STUDIES, SATURATED SOILS.:/ION,	W69-02681
, WELL REGULATIONS, PERCOLATION,	SUBSURFACE DRAINAGE, SHALLOW WELL	W69-06117
SURFACE DRAINAGE, SHALLOW WELLS,	SUBSURFACE WATERS, LEGAL ASPECTS.	W69-06117
ROUND WATER, PATH OF POLLUTANTS,	SUBSURFACE FLOW, GASOLINE, WATER	W68-00627
INJECTION WELLS, WASTE DISPOSAL,	SUBSURFACE WATERS.:/POLLUTANTS,	W69-03212
ES, OIL INDUSTRY, STORAGE TANKS,	SUBSURFACE DRAINAGE, UNDERFLOW, U	W70-07631
ON, ION TRANSPORT, PENNSYLVANIA,	SUBSURFACE DRAINAGE, WATER QUALIT	W71-01204
TER MOVEMENT, PERCOLATING WATER,	SUBSURFACE WATERS, DIFFUSION, GRA	W70-08026
AL DECISIONS, OIL, OIL INDUSTRY,	SUBSURFACE DRAINAGE, WATER POLLUT	W70-07632
ROUNDWATER, UNDERGROUND STREAMS,	SUBSURFACE RUNOFF, REASONABLE USE	W70-08049
ROUNDWATER, UNDERGROUND STREAMS,	SUBSURFACE RUNOFF, REASONABLE USE	W70-08050
OUND STREAMS, PERCOLATING WATER,	SUBSURFACE WATERS, UNDERGROUND, L	W70-07631
WATER SUPPLY, PERCOLATING WATER,	SUBSURFACE WATERS, JUDICIAL DECIS	W71-01028
CTS, RIPARIAN LAND, PERCOLATION,	SUBSURFACE WATERS, UNDERGROUND ST	W71-01043
WASTES, HYDRAULIC CONDUCTIVITY,	SUBSURFACE DRAINAGE, TRANSMISSIVI	W70-07766
RIGHTS, WATER LAW, GROUND WATER,	SUBSURFACE WATER, PERCOLATION, SU	W70-00521
, SUBSURFACE WATER, PERCOLATION,	SUBSURFACE RUNOFF, SUBSURFACE STR	W70-00521
PERCOLATION, SUBSURFACE RUNOFF,	SUBSURFACE STREAMS, DEEP PERCOLAT	W70-00521
ODEL STUDIES, DRAINAGE PROGRAMS,	SUBSURFACE DRAINAGE, WATER MANAGE	W71-01932
ION, AQUIFERS, WELL REGULATIONS,	SUBSURFACE DRAINAGE, WASTE TREATM	W71-10157



ON CONTROL, POLLUTION ABATEMENT,	SURFACE WATERS, PERCOLATING WA	W71-10446
, *FISHKILL, STORM RUNOFF, ODOR,	SURFACE RUNOFF, GROUNDWATER MO	W71-09154
ILTRATION, GROUNDWATER MOVEMENT,	SURFACE MOVEMENT, CONSUMPTIVE	W71-13645
ION, OIL INDUSTRY, SALINE WATER,	SURFACE WATERS, GROUNDWATER, P	W71-13521
DOMONAS, MYCOBACTERIUM, BACILLUS	SUBTILIS, BACILLUS MYCOIDES, BACI	W69-07838
AS), PARKER COUNTY(TEXAS), HOLLY	SUGAR STUDIES.: / HIGH PLAINS(TEX	W71-12122
*TANNINS,	SUGARS.:	W68-01269
BICARBONATE, FLUORIDE, NITRATE,	SULFATE, SILICATE, GROUND WATER R	W69-03197
FIELDS, CESSPOOLS, SEPTIC TANKS,	SULFATES, SULFIDES, PERCOLATING W	W68-01010
SSPOOLS, SEPTIC TANKS, SULFATES,	SULFIDES, PERCOLATING WATER, INFI	W68-01010
ATER/ *SURFACTANTS, *ALKYBENZENE	SULFONATES, *DETERGENTS, *GROUNDW	W70-01291
T, GROUNDWATER, WISCONSIN, WATER	SUPPLY.: / WASTES, SOIL MANAGEMEN	W71-06443
ATER LEVELS, *WATER WELLS, WATER	SUPPLY, AQUIFERS, ION EXCHANGE, P	W69-02611
CTS, COMPENSATION, BRINES, WATER	SUPPLY, BOUNDARIES(SURFACES), WEL	W71-03230
TERS, DRILLING, OIL WELLS, WATER	SUPPLY, FARMS, WATER POLLUTION EF	W71-13521
NG, AQUIFERS, WATER TABLE, WATER	SUPPLY, GASES, CARBON DIOXIDE, ME	W70-06011
, IRRIGATION, RETURN FLOW, WATER	SUPPLY, LIVESTOCK, SEWAGE, INFILT	W71-06435
*SOIL, GROUNDWATER BASINS, WATER	SUPPLY, MUD, BENTHOS, HYDROGEN, R	W69-07838
WELL CASINGS, GROUNDWATER, WATER	SUPPLY, PERCOLATING WATER, SUBSUR	W71-01028
UNDERGROUND, GROUNDWATER, WATER	SUPPLY, SEEPAGE, INFILTRATION, WA	W70-07632
TER QUALITY, WATER LEVELS, WATER	SUPPLY, WATER UTILIZATION, SURVEY	W70-05466
, *GROUNDWATER, *SURFACE WATERS,	SURFACE RUNOFF, RIPARIAN RIGHTS,	W70-00532
TER, SOIL PROFILES, WATER TABLE,	SURFACE RUNOFF, FARM WASTES, AERO	W69-09721
RUNOFF, REASONABLE USE, DAMAGES,	SURFACE RUNOFF, GASOLINE, WATER P	W70-08049
RUS, NUTRIENTS, ALGAE, NITRATES,	SURFACE RUNOFF, BASE FLOW, PERCOL	W71-06443
GROUNDWATER MOVEMENT, HYDRAULICS,	SURFACE RUNOFF, STREAMS, SOIL TYP	W71-05094
S, EXPERIMENTAL RECHARGE PROJEC/	SURFACE SPREADING, RECHARGE BASIN	W69-05328
S, EXPERIMENTAL RECHARGE PROJEC/	SURFACE SPREADING, RECHARGE BASIN	W69-05327
IDAL WATERS, WELLS, GROUNDWATER,	SURFACE WATERS, SEEPAGE, PERCOLAT	W69-05370
ECHARGE, DISCHARGE, GROUNDWATER,	SURFACE WATERS, AQUIFERS, FLOW RA	W70-09637
PHICATION, NITROGEN, PHOSPHORUS,	SURFACE WATERS, PERCOLATION, SUSP	W70-04504
*SOLID WASTES, *WASTE DISPOSAL,	SURFACE WASTERS, GROUNDWATER, GAR	W71-05094
OIL WATER MOVEMENT, GROUNDWATER,	SURFACE WATERS, TESTING, TEST PRO	W71-06514
G, WATER WELLS, MUNICIPAL WATER,	SURFACE-GROUNDWATER RELATIONSHIPS	W71-02909
T, *FILTATION, ALLUVIA CHANNELS,	SURFACE-GROUNDWATER RELATIONSHIPS	W71-12410
ROLOGIC CYCLE, OVERDRAFT, WELLS,	SURFACE-GROUNDWATER RELATIONSHIPS	W70-00532
*OKLAHOMA, SALINITY, STREAMFLOW,	SURFACE-GROUNDWATER RELATIONSHIPS	W70-06102
BRINES, WATER SUPPLY, BOUNDARIES(	SURFACES), WELL CASINGS, SALINE W	W71-03230
*SOIL-WATER ENVIRONMENT, ANIONIC	SURFACTANTS, SYNTHETIC DETERGENTS	W70-01291
WATER SUPPLY, WATER UTILIZATION,	SURVEYS, GEOPHYSICS.: /R LEVELS,	W70-05466
EEOLOGY, WATER POLLUTION CONTROL,	SURVEYS, LEACHING, GEOLOGY, GROUN	W70-07193
US, SURFACE WATERS, PERCOLATION,	SUSPENDED LOAD, GROUNDWATER, AQUI	W70-04504
LITY, BIOCHEMICAL OXYGEN DEMAND,	SUSPENDED LOAD.: /VELS, WATER QUA	W69-07114
RIENTS, SEPTIC TANKS, EFFLUENTS,	SWAMPS, FOREST SOILS, MINNESOTA,	W70-04193
:	SWEETENING, AQUIFER DESALINATION.	W71-01932
AQUIFER	SYNTHETIC DETERGENTS.: /L-WATER E	W70-01291
ENVIRONMENT, ANIONIC SURFACTANTS,	SYSTEMS, *GROUNDWATER MOVEMENT, D	W71-01932
RFACES, *LEACHING, *SALINE WATER	SYSTEMS, HYDRAULIC MODELS, MATHEM	W71-01932
*GROUNDWATER MOVEMENT, DRAINAGE	TABLE, *SURFACE-GROUNDWATER RELAT	W70-07766
GROUNDWATER, *PIEZOMETRY, *WATER	TABLE, ENVIRONMENTAL EFFECTS, WAT	W71-04121
L PROPERTIES, WATER WELLS, WATER	TABLE, INFILTRATION.: /IL CONTAMI	W71-03543
NATION, OBSERVATION WELLS, WATER	TABLE, OXIDATION LAGOON, IRRIGATI	W71-03542
MINATION, WATER POLLUTION, WATER	TABLE, PERCOLATION.: / AQUIFERS,	W71-02036
COLORADO, DENITRIFICATION, WATER	TABLE, SURFACE RUNOFF, FARM WASTE	W69-09721
GROUNDWATER, SOIL PROFILES, WATER	TABLE, WATER SUPPLY, GASES, CARBO	W70-06011
ATION, LEACHING, AQUIFERS, WATER	TANKS, EFFLUENTS, SWAMPS, FOREST	W70-04193
, SCUM, WEEDS, NUTRIENTS, SEPTIC	TANKS, MANAGEMENT.: /WATER POLLUT	W71-10372
ION CONTROL, GROUNDWATER, SEPTIC	TANKS, SUBSURFACE DRAINAGE, UNDER	W70-07631
, DAMAGES, OIL INDUSTRY, STORAGE	TANKS, SULFATES, SULFIDES, PERCOL	W68-01010
SPPOSAL FIELDS, CESSPOOLS, SEPTIC	TECHNIQUES, SOIL CONTAMINATION EF	W70-01291
LUTION, INFILTRATION, ANALYTICAL		

N, CHEMICAL ANALYSIS, ANALYTICAL	TECHNIQUES, BIOASSAY, SOIL STRUCT	W71-06514
OWATER, *OIL WASTES, *SEPARATION	TECHNIQUES, INFILTRATION, MODEL S	W71-01930
MS, INCINERATION, AIR POLLUTION,	TEMPERATURE, WASTE WATER TREATMEN	W71-07118
ORGANISMS, CHEMICAL ANALYSIS,	TEMPERATURE, NITRATES, PLANTS, AM	W69-07838
FUSION.:	TEMPERATURE PROFILES, THERMAL DIF	W69-00651
EQUIPMENT, LEASES, DAMAGES, LAND	TENURE, JUDICIAL DECISIONS, LEGIS	W71-08055
ROLOGIC DATA, LEGISLATION, LAND	TENURE, LEGAL ASPEC: /DAMAGES, HY	W71-11692
S, ENVIRONMENTAL POLLUTION.:	TEST HOLES, UNIVERSITY OF ILLINOI	W70-06322
CHARACTERISTICS, SOIL ANALYSIS,	TEST PROCEDURES, CHEMICAL PROPERT	W71-07887
OWATER, SURFACE WATERS, TESTING,	TEST PROCEDURES, METHODOLOGY, WAT	W71-06514
NT, GROUNDWATER, SURFACE WATERS,	TESTING, TEST PROCEDURES, METHODO	W71-06514
EMENT, MODEL STUDIES, LABORATORY	TESTS, PATH OF POLLUTANTS, WATER	W70-09548
GROUNDWATER MOVEMENT, LABORATORY	TESTS, PERMEAMETERS, SANDS, CHLOR	W70-01904
GE, NUMERICAL METHOD, LABORATORY	TESTS, PERMEABILITY, POROSITY, PO	W69-00651
POSAL, THERMAL PROPERTIES, MODEL	TESTS, SATURATION ZONES, SEEPAGE,	W69-00651
IRRIGATION PRACTICES, LEACHING,	TEXAS.: /NALYSIS, WATER TRANSFER,	W71-12122
IGH PLAINS(TEXAS), PARKER COUNTY(	TEXAS), HOLLY SUGAR STUDIES.: / H	W71-12122
*OGALLALA AQUIFER, HIGH PLAINS(	TEXAS), PARKER COUNTY(TEXAS), HOL	W71-12122
ORUS, ALFALFA-BROMEGRASS, SPRING	THAWS, FERTILIZER-NITROGEN.: /SPH	W69-09721
TEMPERATURE PROFILES,	THERMAL DIFFUSION.:	W69-00651
	THERMAL GRADIENTS.:	W69-08921
ON, *DISPERSION, WASTE DISPOSAL,	THERMAL PROPERTIES, MODEL TESTS,	W69-00651
ATHEMATICAL MODELS, PROBABILITY,	THERMODYNAMICS, FLOW, MASS TRANSF	W71-11776
, RIVERS, STREAMS, LAKES, PONDS,	TIDAL WATERS, WELLS, GROUNDWATER,	W69-05370
ISSIVITY, HEAD LOSS, DARCY'S LAW,	TIME LAG, NITROGEN COMPOUNDS, NIT	W70-07766
USE, HYDROGEN ION CONCENTRATION,	TOXICITY.: /, GROUNDWATER, CELLUL	W68-01269
TRITIATED WATER(	TRACER), MINE DUMP LEACHING.:	W71-11255
MODEL STUDIES, HYDRAULIC MODELS,	TRACERS, INJECTION WELLS, ARTIFIC	W69-07554
AL MODELS, CURRENTS(WATER), MASS	TRANSFER, AQUIFERS.: / MATHEMATIC	W69-08921
LITY, THERMODYNAMICS, FLOW, MASS	TRANSFER, DIFFUSION, MIXING, DISP	W71-11776
E, HISTORY, SOIL ANALYSIS, WATER	TRANSFER, IRRIGATION PRACTICES, L	W71-12122
TIONS.:	TRANSIENT STORAGE, GRAPHICAL SOLU	W69-00248
DUCTIVITY, SUBSURFACE DRAINAGE,	TRANSMISSIVITY, HEAD LOSS, DARCY'S	W70-07766
IL WATER, SOLUBILITY, SOIL WATER	TRANSMISSIVITY.: /GROUNDWATER, SO	W71-07887
NT STREAM, GROUNDWATER RECHARGE,	TRANSMISSIVITY, WATER LEVEL FLUCT	W71-03543
*SALT WATER IRRIGATION, SALT	TRANSPORT.:	W71-06063
LOW, ADSORPTION, ADSORPTION, ION	TRANSPORT.: /ED FLOW, SATURATED F	W70-10058
MENT, KARST, INFILTRATION, ION	TRANSPORT, PENNSYLVANIA, SUBSURFA	W71-01204
WATER POLLUTION SOURCES, SEWAGE	TREATMENT, WASTE WATER DISPOSAL,	W71-01324
WATER POLLUTION SOURCES, SEWAGE	TREATMENT, WASTE WATER DISPOSAL,	W71-01205
NT, WATER POLLUTION, *SOIL WASTE	TREATMENT, SOIL PERCOLATION, *WAS	W69-05327
ASTE WATER DISPOSAL, WASTE WATER	TREATMENT, WATER POLLUTION, *SOIL	W69-05328
NT, WATER POLLUTION, *SOIL WASTE	TREATMENT, SOIL PERCOLATION, *WAS	W69-05328
ASTE WATER DISPOSAL, WASTE WATER	TREATMENT, WATER POLLUTION, *SOIL	W69-05327
READING, *WATER REUSE, *TERTIARY	TREATMENT, INFILTRATION, FILTRATI	W70-04712
INFILTRATION, FILTRATION, SEWAGE	TREATMENT, SEWAGE DISPOSAL, HYDRO	W70-04712
E/ *OXIDATION LAGOONS, *TERTIARY	TREATMENT, *SLUDGE DIGESTION, ANA	W71-07118
LUTION, TEMPERATURE, WASTE WATER	TREATMENT, OHIO.: /ATION, AIR POL	W71-07118
LLUTION CONTROL, WATER POLLUTION	TREATMENT, WELL PERMITS, ADMINIST	W71-10157
QUALITY CONTROL, WATER POLLUTION	TREATMENT, ADMINISTRATIVE AGENCIE	W71-10446
GE, WASTE TREATMENT, WASTE WATER	TREATMENT, WATER POLLUTION, PERCO	W71-10157
POSAL, *MUNICIPAL WASTES, *WASTE	TREATMENT, *UNITED STATES, *REVIE	W71-08907
ILTRATION, *PIT RECHARGE, *WATER	TREATMENT, *FILTATION, ALLUVIA CH	W71-12410
AQUIFERS, SINKS, CITIES, SEWAGE	TREATMENT, SEWERS, AERATION, MONI	W71-09154
IONS, SUBSURFACE DRAINAGE, WASTE	TREATMENT, WASTE WATER TREATMENT,	W71-10157
TRICT LIABILITY.:	TRESPASS, NEGLIGENCE, NUISANCE, S	W70-00521
), NUISANCE.:	TRESPASS, INJUNCTIONS(PROHIBITORY	W69-06117
P LEACHING.:	TRITIATED WATER(TRACER), MINE DUM	W71-11255
HYDRAULIC LOADING, INFILTRATION,	TUCSON BASIN, PROCESS-RESPONSE MO	W69-03197
S, SURFACE RUNOFF, STREAMS, SOIL	TYPES, PERMEABILITY, FLOODS, EVAL	W71-05094



ER WELL, IMPAIRED WATER QUALITY,	UNDER SEEPAGE, WATER POLLUTION, I	W71-13645
ATER), ON-SITE DATA COLLECTIONS,	UNDERFLOW.: /UREMENT, DISCHARGE(W	W70-07766
N SOURCES, GROUNDWATER MOVEMENT,	UNDERFLOW, ARTESIAN WELLS, STREAM	W70-08025
RAGE TANKS, SUBSURFACE DRAINAGE,	UNDERFLOW, UNDERGROUND STREAMS, P	W70-07631
LATING WATER, SUBSURFACE WATERS,	UNDERGROUND, LEAKAGE, PERCOLATION	W70-07631
PERCOLATION, SUBSURFACE WATERS,	UNDERGROUND STREAMS, GROUNDWATER	W71-01043
RIPRI APPROPRIATION, GROUNDWATER,	UNDERGROUND STREAMS, SUBSURFACE R	W70-08049
*SUBSURFACE WATERS, GROUNDWATER,	UNDERGROUND STREAMS, SUBSURFACE R	W70-08050
SUBSURFACE DRAINAGE, UNDERFLOW,	UNDERGROUND STREAMS, PERCOLATING	W70-07631
SIAN WELLS, WATER WELLS, INFLOW,	UNDERGROUND, GROUNDWATER, WATER S	W70-07632
RFACE WATERS, PERCOLATING WATER,	UNDERGROUND, WELLS, SALINE WATER	W71-10446
NATL POLLUTION.: TEST HOLES,	UNIVERSITY OF ILLINOIS, ENVIRONME	W70-06322
ING, RADIOACTIVE WASTE DISPOSAL.	UNSATURATED FLOW, SATURATED FLOW,	W70-10058
HOMOGENEOUS MEDIA,	UNSATURATED SOIL.: /	W69-02681
MOVEMENT, PERCOLATION, SEEPAGE,	UNSATURATED FLOW, MODEL STUDIES,	W69-02681
	UPPER RIO GRANDE, SALT BALANCE.: /	W70-08662
INENTS, DENITRIFICATION, RUNOFF,	UREAS, FERTILIZERS, DRAINAGE WATE	W71-06435
S, SURFA/ *FLORIDA, *CONSUMPTIVE	USE, *GROUNDWATER, *SURFACE WATER	W70-00532
*WATER QUALITY, *CLIMATES, *LAND	USE, *OKLAHOMA, SALINITY, STREAMF	W70-06102
ANAGEMENT(APPLIED), *CONJUNCTIVE	USE, *STREAMFLOW, *INDUCED INFILT	W70-03102
ATURAL FLOW DOCTRINE, REASONABLE	USE, ARTIFICIAL USE, RIPARIAN LAN	W70-02896
S, SUBSURFACE RUNOFF, REASONABLE	USE, DAMAGES, SURFACE RUNOFF, GAS	W70-08049
SUBSURFACE MOVEMENT, CONSUMPTIVE	USE, DOMESTIC WATER, POLLUTION AB	W71-13645
RIGHTS, RIPARIAN RIGHTS, NATURAL	USE, NATURAL FLOW DOCTRINE, REASO	W70-02896
S, SUBSURFACE RUNOFF, REASONABLE	USE, PRIOR APPROPRIATION, WATER P	W70-08050
CTS, MUNICIPAL WATER, REASONABLE	USE, REMEDIES, WATER UTILIZATION,	W70-00532
RINE, REASONABLE USE, ARTIFICIAL	USE, RIPARIAN LANDS, GROUNDWATER,	W70-02896
NOFF, RIPARIAN RIGHTS, COMPETING	USES, DOMESTIC WATER, LEGAL ASPEC	W70-00532
LITHUANIA(	USSR).: /	W71-07887
	USSR, RADIAL DIFFUSION EQUATIONS.	W69-03212
ATER LEVELS, WATER SUPPLY, WATER	UTILIZATION, SURVEYS, GEOPHYSICS.	W70-05466
REASONABLE USE, REMEDIES, WATER	UTILIZATION, PERCOLATING WATER, A	W70-00532
*RUHR	VALLEY.: /	W71-12410
*FEEDLOTS, SOUTH PLATTE RIVER	VALLEY.: /	W71-02036
*FEEDLOT, PLATTE RIVER	VALLEY.: /T HOLES, ANNUAL PRECIPI	W71-03543
TATION, LEACH BED, SPOKANE RIVER	VALLEY(CALIF).: /	W69-01076
SAN JACINTO	VALLEY(CALIF).: /	W70-05466
*GROUNDWATER POLLUTION, *CENTRAL	VALLEY(COLO).: NATIVE GRASSES,	W71-04548
FEEDLOTS, CORRALS, SOUTH PLATTE	N. OHIO WATER COMPANY, NETWORK AN	W70-04488
ALYSIS.: GREAT MIAMI RIVER, S.	WASTE DILUTION, WATER POLLUTION C	W69-02611
ALITY, *LANDFILL, SANITARY FILL,	WASTE DISPOSAL, GROUNDWATER MOVEM	W69-03178
ERS, *RADIOISOTOPES, RADIOACTIVE	WASTE DISPOSAL, THERMAL PROPERTIE	W69-02681
UIFERS, CONVECTION, *DISPERSION,	WASTE DISPOSAL, SUBSURFACE WATERS	W69-00651
OF POLLUTANTS, INJECTION WELLS,	WASTE DISPOSAL, DISPOSAL, WASTES,	W69-03212
EALTH, ENVIRONMENTAL SANITATION,	WASTE DISPOSAL, UNSATURATED FLOW,	W70-06011
ICAL MODELS, MIXING, RADIOACTIVE	WASTE DISPOSAL, GARBAGE DUMPS.: /	W70-10058
AGEMENT, IMPAIRED WATER QUALITY,	WASTE DISPOSAL, GROUNDWATER, PERC	W71-07194
R POLLUTION EFFECTS, POLLUTANTS,	WASTE DISPOSAL, LEGISLATION, WELL	W71-11692
POLLUTANTS, PERCOLATION, WASTES,	WASTE DUMPS, WATER POLLUTION, PRE	W71-11724
WATER, GARBAGE DUMPS, LANDFILLS,	WASTE DUMPS, WASTE STORAGE, SOIL	W71-05094
D WASTES, WASTES, GARBAGE DUMPS,	WASTE RECHARGE.: /	W68-00058
MUNICIPAL	WASTE STO: / DIFFUSION, GRAVITATI	W69-08621
ONAL WATER, SALTS, SALINE SOILS,	WASTE STORAGE, SOIL PROPERTIES, M	W70-08026
TES, GARBAGE DUMPS, WASTE DUMPS,	WASTE STORAGE, LEGAL ASPECTS.: /T	W68-00058
CHES, DRAINAGE EFFECTS, SEEPAGE,	WASTE TREATMENT, SOIL PERCOLATION	W69-06118
REATMENT, WATER POLLUTION, *SOIL	WASTE TREATMENT, SOIL PERCOLATION	W69-05327
REATMENT, WATER POLLUTION, *SOIL	WASTE TREATMENT, WASTE WATER TREA	W69-05328
EGULATIONS, SUBSURFACE DRAINAGE,	WASTE WATER TREATMENT, WATER POLL	W71-10157
RFACE DRAINAGE, WASTE TREATMENT,	WASTE WATER TREATMENT, OHIO.: /AT	W71-10157
ION, AIR POLLUTION, TEMPERATURE,		W71-07118

SEWAGE EFFLUENT, C.O.D., B.O.D.,	WASTE WATERS, HYDRAULIC LOADING,	W69-03197
EFFLUENT, *WASTE WATER DISPOSAL,	WASTE WATER TREATMENT, WATER POLL	W69-05327
EFFLUENT, *WASTE WATER DISPOSAL,	WASTE WATER TREATMENT, WATER POLL	W69-05328
	WASTE WATER RECHARGE.:	W69-08620
UTION SOURCES, SEWAGE TREATMENT,	WASTE WATER DISPOSAL, NITRATES, E	W71-01324
UTION SOURCES, SEWAGE TREATMENT,	WASTE WATER DISPOSAL, NITRATES, E	W71-01205
TION, INDUSTRIAL WASTES, SEWAGE,	WASTE WATER(POLLUTION), LEGAL ASP	W70-00521
GROUNDWATER MOVEMENT, NITROGEN,	WASTE WATER(POLLUTION).: /RIENTS,	W70-00665
WASTES, *WASTE DISPOSAL, SURFACE	MASTERS, GROUNDWATER, GARBAGE DUM	W71-05094
CATTLE WASTES, FEEDLOT	WASTES.:	W70-00665
ORGANIC CHEMICAL	WASTES.:	W69-07114
TRIAL WASTES, ALGAE, PONDS, FARM	WASTES.: /GE, INFILTRATION, INDUS	W71-06435
SE, *RECLAIMED WATER, *MUNICIPAL	WASTES, *ARTIFICIAL RECHARGE, LEG	W69-08620
ICAL OX/ *WATER POLLUTION, *WOOD	WASTES, *BARK, *LIGNINS, *BIOCHEM	W68-01269
R POLLUTION SOURCES, PATH/ *FARM	WASTES, *CATTLE, *LEACHING, *WATE	W70-00665
ITRATE, AQUIFER, DISCHARG/ *FARM	WASTES, *CATTLE, *GROUNDWATER, *N	W71-03543
, PRECIPITATION, / *SOILS, *FARM	WASTES, *FERTILIZERS, GROUNDWATER	W71-03542
R POLLUTION SOURCES, *INDUSTRIAL	WASTES, *GROUNDWATER MOVEMENT, *R	W71-00194
*WATER Q/ *HYDROGEOLOGY, *SOLID	WASTES, *LANDFILL, *INFILTRATION,	W70-09637
POLLUTION, *WASTE DUMPS, *SOLID	WASTES, *LEACHING, *GROUNDWATER,	W71-07194
*MAINE, *WATER POLLUTION, *OIL	WASTES, *OIL, LEGISLATION, STATE	W69-05370
INE WATER INTRU/ *MICHIGAN, *OIL	WASTES, *PATH OF POLLUTANTS, *SAL	W70-08026
S, *SALINE WATER INTRUSION, *OIL	WASTES, *REMEDIES, WATER POLLUTIO	W71-13521
, *WATER POLLUTION SOURCES, *OIL	WASTES, *REMEDIES, WATER POLLUTIO	W71-11724
TILIZERS, *NITRATES, WATE/ *FARM	WASTES, *SOIL CONTAMINATION, *FER	W71-02036
ER POLLUTION, *GROUNDWATER, *OIL	WASTES, *SEPARATION TECHNIQUES, I	W71-01930
FLOW, POROUS MEDIA, GROUNDWATER,	WASTES, *UNIFORM FLOW, *DIFFUSION	W69-01238
N SOURCES, *URBANIZATION, *SOLID	WASTES, *WASTE DISPOSAL, SURFACE	W71-05094
*GR/ *PATH OF POLLUTANTS, *FARM	WASTES, *WATER POLLUTION SOURCES,	W71-04121
ST/ *WASTE DISPOSAL, *MUNICIPAL	WASTES, *WASTE TREATMENT, *UNITED	W71-08907
ATER TABLE, SURFACE RUNOFF, FARM	WASTES, AEROBIC CONDITIONS, INCUR	W69-09721
SEWAGE, INFILTRATION, INDUSTRIAL	WASTES, ALGAE, PONDS, FARM WASTES	W71-06435
WASTES, INFILTRATION, DOMESTIC	WASTES, BENTHIC FAUNA, INDUSTRIAL	W71-09154
ATION, WASTE DISPOSAL, DISPOSAL,	WASTES, CALIFORNIA, PERCOLATING W	W70-06011
LLUTION SOURCES, MINE WATER, OIL	WASTES, CESSPOOLS, SEWAGE DISPOSA	W70-08049
ASTES, BENTHIC FAUNA, INDUSTRIAL	WASTES, DRAINAGE, AQUIFERS, SINKS	W71-09154
OIL WATER MOVEMENT, *RADIOACTIVE	WASTES, EQUATIONS, GROUNDWATER MO	W70-10058
POOLS, SEWAGE DISPOSAL, DOMESTIC	WASTES, FARM WASTES, MUNICIPAL WA	W70-08049
CATTLE	WASTES, FEEDLOT WASTES.:	W70-00665
POLLUTION SOURCES, SOLID WASTES,	WASTES, GARBAGE DUMPS, WASTE DUMP	W68-00058
LUTION, PATH OF POLLUTANTS, MINE	WASTES, GEOLOGY, GROUNDWATER, WAT	W71-08907
POLLUTION SOURCES, LEACHING, FARM	WASTES, GROUNDWATER, HYDRAULIC CO	W71-08218
QUALITY, POLLUTANTS, INDUSTRIAL	WASTES, GROUNDWATER, WATER POLLUT	W70-08026
POLLUTION SOURCES, INFILTRATION,	WASTES, HYDRAULIC CONDUCTIVITY, S	W70-07766
WATER QUALITY CONTROL, DOMESTIC	WASTES, INFILTRATION, AQUIFORS, S	W69-03178
MPACTION, COMPRESSIBILITY, SOLID	WASTES, INCINERATION, PERCOLATION	W71-08907
ACTIVITY, RADIATION, RADIOACTIVE	WASTES, IONS, EQUATIONS, MATHEMAT	W71-11356
*GROUNDWATER MOVEMENT, MUNICIPAL	WASTES, IRRIGATION WATER, ARTIFIC	W69-08621
DROGEOLOGY, *ILLINOIS, MUNICIPAL	WASTES, LEACHING, GROUNDWATER MOV	W70-06572
ING, *COPPER, *WASTE DUMPS, MINE	WASTES, MINING, GROUNDWATER MOVEM	W71-11255
SOURCES, MINERALOGY, INDUSTRIAL	WASTES, MUNICIPAL WASTES, SEWAGE,	W71-10446
DISPOSAL, DOMESTIC WASTES, FARM	WASTES, MUNICIPAL WASTES, NATURAL	W70-08049
C WASTES, FARM WASTES, MUNICIPAL	WASTES, NATURAL GAS, SALINE: /STI	W70-08049
UTROPHICATION, FERTILIZERS, FARM	WASTES, NUTRIENTS, DENITRIFICATIO	W71-10372
*GROUNDWATER MOVEMENT, SOLUTES,	WASTES, PATH OF POLLUTANTS, MATHE	W69-08921
AGE, WATER POLLUTION, INDUSTRIAL	WASTES, POLLUTANTS, INFILTRATION,	W71-13645
LATION, PATH OF POLLUTANTS, WOOD	WASTES, PULP AND PAPER INDUSTRY,	W71-11692
ER POLLUTION SOURCES, INDUSTRIAL	WASTES, RIVERS, STEAMS, LAKES, P	W69-05370
SEEPAGE, PENETRATION, INDUSTRIAL	WASTES, SEWAGE, WASTE WATER(POLLU	W70-00521
GY, INDUSTRIAL WASTES, MUNICIPAL	WASTES, SEWAGE, WATER QUALITY CON	W71-10446



LATION, LEACHING, DRAINAGE, FARM	WASTES, SOIL MANAGEMENT, GROUNDWA	W71-06443
DISPOSAL, *IRRIGATION, *CHEMICAL	WASTES, SPRINKLER IRRIGATION, INF	W69-07114
*WELLS, JUDICIAL DECISIONS, OIL	WASTES, WATER QUALITY, SALINITY,	W69-06118
S, POLLUTION ABATEMENT, CHEMICAL	WASTES, WATER POLLUTION SOURCES,	W69-05370
, WATER POLLUTION SOURCES, SOLID	WASTES, WASTES, GARBAGE DUMPS, WA	W68-00058
ER, *SEEPAGE, *LANDFILLS, *SOLID	WASTES, WATER POLLUTION SOURCES,	W70-06011
WATER MOVEMENT, OILY WATER, OIL	WASTES, WAT: /OF POLLUTANTS, SOIL	W71-01043
L STUDIES, HYDRAULIC MODELS, OIL	WASTES, WATER POLLUTION SOURCES.:	W71-10325
GASES, POLLUTANTS, *PERCOLATION,	WASTES, WASTE DISPOSAL, LEGISLATI	W71-11724
TER WELLS, *REMEDIES, INDUSTRIAL	WASTES, WATER POLLUTION, POLLUTIO	W71-11692
MOVEMENT, OILY WATER, OIL WASTES,	WAT: /OF POLLUTANTS, SOIL WATER M	W71-01043
ALTH, DOMESTIC WATER, INDUSTRIAL	WATE: / EMINENT DOMAIN, PUBLIC HE	W70-02896
ADDITION, PIT RECHARGE, SAFE YIELD,	WATER BALANCE, HYDROGEOLOGY, DATA	W70-05466
TANT IDENTIFICATION, ADSORPTION,	WATER CHEMISTRY, DARCY'S LAW, PER	W69-02611
UNDWATER MOVEMENT, INFILTRATION,	WATER CHEMISTRY, WATER QUALITY, S	W69-08620
SION, *HAWAII, IRRIGATION WATER,	WATER CHEMISTRY, SOLUTES, NITRATE	W71-08044
ER TABLE, ENVIRONMENTAL EFFECTS,	WATER CHEMISTRY, INFILTRATION.: /	W71-04121
GREAT MIAMI RIVER, S.W. OHIO	WATER COMPANY, NETWORK ANALYSIS.:	W69-02611
ATION, SOIL WATER, SALINE WATER,	WATER CONSERVATION, IRRIGATION PR	W71-06063
ER POLLUTION, PERCOLATING WATER,	WATER CONSERVATION, ADMINISTRATIO	W71-10157
MENT, W/ SEWAGE EFFLUENT, *WASTE	WATER DISPOSAL, WASTE WATER TREAT	W69-05327
*ICAL WASTES, SPRINKLER / *WASTE	WATER DISPOSAL, *IRRIGATION, *CHE	W69-07114
MENT, W/ SEWAGE EFFLUENT, *WASTE	WATER DISPOSAL, WASTE WATER TREAT	W69-05328
INKLER IRRIGATION, HYDRO/ *WASTE	WATER DISPOSAL, *IRRIGATION, *SPR	W69-07375
SOURCES, SEWAGE TREATMENT, WASTE	WATER DISPOSAL, NITRATES, EUTROPH	W71-01324
SOURCES, SEWAGE TREATMENT, WASTE	WATER DISPOSAL, NITRATES, EUTROPH	W71-01205
DETERGENT BEHAVIOR(WATER), *SOIL-	WATER ENVIRONMENT, ANIONIC SURFAC	W70-01291
INE WATER S/ *SALINE WATER-FRESH-	WATER INTERFACES, *LEACHING, *SAL	W71-01932
WATER, GROUNDWATER MOVEMENT, OIL-	WATER INTERFACES, IMPERVIOUS SOIL	W71-08055
GROUNDWATER, SALINE WATER-FRESH	WATER INTERFACES, MIXING, PENETRA	W71-03230
ER WELLS/ *PENNSYLVANIA, *SALINE	WATER INTRUSION, *OIL WELLS, *WAT	W71-03230
ELS, MATHEMATICAL MODELS, SALINE	WATER INTRUSION, AQUIFERS, POROUS	W71-04559
REMEDIES, WATER / *KANSAS, *SALINE	WATER INTRUSION, *OIL WASTES, *RE	W71-13521
WATER, UNDERGROUND, WELLS, SALINE	WATER INTRUSION, WATER POLLUTION	W71-10446
N EFFECTS, *RETURN FLOW, *SALINE	WATER INTRUSION, *HAWAII, IRRIGAT	W71-08044
VANIA, *WATER POLLUTION, *SALINE	WATER INTRUSION, *WATER WELLS, DI	W71-01028
ES, *PATH OF POLLUTANTS, *SALINE	WATER INTRUSION, WATER POLLUTION,	W70-08026
:	WATER IRRIGATION, SALT TRANSPORT.	W71-06063
OLATING WATER, *RELATIVE RIGHTS,	WATER LAW, GROUND WATER, SUBSURFA	W70-00521
ANTS, SUBSURFACE FLOW, GASOLINE,	WATER LAW, WELLS, GROUND WATER TO	W68-00627
RELATIONSHIPS, OBSERVATION WELLS,	WATER LEVELS, *WATER WELLS, WATER	W69-02611
TION, INFILTRATION, GROUNDWATER,	WATER LEVELS, WATER QUALITY, RIOC	W69-07114
GROUNDWATER MOVEMENT, WATER QUALITY,	WATER LEVELS, WATER SUPPLY, WATER	W70-05466
WATER RECHARGE, TRANSMISSIVITY,	WATER LEVEL FLUCTUATIONS, AMMONIA	W71-03543
, *IRRIGATION EFFECTS, LEACHING,	WATER LEVEL FLUCTUATIONS, SALINE	W71-08073
GROUNDWATER MOVEMENT, PERCOLATION,	WATER MANAGEMENT, IMPAIRED WATER	W71-07194
E PROGRAMS, SUBSURFACE DRAINAGE,	WATER MANAGEMENT(APPLIED).: /INAG	W71-01932
L DRAINAGE, DISSOLVED NUTRIENTS,	WATER MIXING, RUSSIAN RIVER(CALIF	W70-04504
TREATS, DEEP PERCOLATION, GROUND	WATER MOVEMENT, INFILTRATION, PAT	W70-00521
TY, CLOSED CONDUIT FLOW, *GROUND	WATER MOVEMENT, CAPILLARY FLOW, *	W69-00979
LITY, GROUNDWATER MOVEMENT, SOIL	WATER MOVEMENT, INFILTRATION, PER	W69-07375
ISTURE CONTENT, POLLUTANTS, SOIL	WATER MOVEMENT.: / PROPERTIES, CO	W68-00058
EFFECTS, AESTHETICS, AQUIFERS, SOIL	WATER MOVEMENT, GROUNDWATER MOVEM	W69-08620
SOLINE, WATER LAW, WELLS, GROUND	WATER MOVEMENT.: /URFACE FLOW, GA	W68-00627
MOVEMENT, PATH OF POLLUTANTS, SOIL	WATER MOVEMENT, OILY WATER, OIL W	W71-01043
OF POLLUTANTS, *DIFFUSION, *SOIL	WATER MOVEMENT, *RADIOACTIVE WAST	W70-10058
*HERBICIDES, *NEW MEXICO, *SOIL	WATER MOVEMENT, GROUNDWATER, SURF	W71-06514
OF POLLUTANTS, *LEACHING, *SOIL	WATER MOVEMENT, *OILY WATER, *GRO	W71-10325
WELLS, WELL SCREENS, EXCAVATION,	WATER POLICY, AQUIFERS, PERCOLATI	W71-04742
ING, *GROUNDWATER, HYDROGEOLOGY,	WATER POLLUTION SOURCES, GROUNDWA	W71-07194



E DUMPS, LANDFILLS, WASTE DUMPS,	WATER POLLUTION, PRECIPITATION(AT	W71-05094
, COMPUTER PROGRAMS, CALIFORNIA,	WATER POLLUTION SOURCES, LEACHING	W71-04548
NATION, *FERTILIZERS, *NITRATES,	WATER POLLUTION, NITROGEN, NITRIT	W71-02036
ER, AMMONIA, SOIL CONTAMINATION,	WATER POLLUTION, WATER TABLE, OXI	W71-03542
TRUSION, *OIL WASTES, *REMEDIES,	WATER POLLUTION, JUDICIAL DECISIO	W71-13521
TES, *REMEDIES, WATER POLLUTION,	WATER POLLUTION EFFECTS, POLLUTIO	W71-11724
DAMAGE, *WATER QUALITY, *IRRIGAT/	WATER POLLUTION SOURCES, *ION EXC	W71-09936
SOURCES, *OIL WASTES, *REMEDIES,	WATER POLLUTION, WATER POLLUTION	W71-11724
S, *REMEDIES, INDUSTRIAL WASTES,	WATER POLLUTION, POLLUTION ABATEM	W71-11692
MINING, EROSION, NITROGEN, RUNOFF,	WATER POLLUTION CONTROL, GROUNDWA	W71-10372
ENGINEERING, LANDFILLS, HYDROLOGY,	WATER POLLUTION, PATH OF POLLUTAN	W71-08907
, WELLS, SALINE WATER INTRUSION,	WATER POLLUTION SOURCES, MINERALO	W71-10446
, SEWAGE, WATER QUALITY CONTROL,	WATER POLLUTION TREATMENT, ADMINI	W71-10446
TREATMENT, WASTE WATER TREATMENT,	WATER POLLUTION, PERCOLATING WATE	W71-10157
RED WATER QUALITY, UNDER SEEPAGE,	WATER POLLUTION, INDUSTRIAL WASTE	W71-13645
OIL WELLS, WATER SUPPLY, FARMS,	WATER POLLUTION EFFECTS, WATER PO	W71-13521
WATERS, *WATER POLLUTION CONTROL,	WATER POLLUTION TREATMENT, WELL P	W71-10157
FARMS, WATER POLLUTION EFFECTS,	WATER POLLUTION SOURCES,: /SUPPLY,	W71-13521
S, HYDRAULIC MODELS, OIL WASTES,	WATER POLLUTION SOURCES,: /STUDIE	W71-10325
, WELLS, IMPAIRED WATER QUALITY,	WATER POLLUTION CONTROL, DAMAGES,	W71-11724
POLLUTION, POLLUTION ABATEMENT,	WATER POLLUTION EFFECTS, POLLUTAN	W71-11692
LATORY TESTS, PATH OF POLLUTANTS,	WATER POLLUTION SOURCES, SELF-PUR	W70-09548
DAMAGES, SURFACE RUNOFF, GASOLINE,	WATER POLLUTION SOURCES, MINE WAT	W70-08049
LEAKAGE, PERCOLATION, WATER RIGHTS,	WATER POLLUTION SOURCES, GROUNDWA	W70-07631
, *WATER SPREADING, *MONITORING,	WATER POLLUTION SOURCES, SEWAGE T	W71-01205
IPARIAN RIGHTS, RELATIVE RIGHTS,	WATER POLLUTION EFFECTS, STREAMS,	W71-01043
POLLUTANTS, *SALINE WATER INTRUSION,	WATER POLLUTION, IMPAIRED WATER Q	W70-08026
NO, DENITRIFICATION, RIVER FLOW,	WATER POLLUTION SOURCES,: /LEACHI	W70-08662
SURFACE DRAINAGE, WATER QUALITY,	WATER POLLUTION SOURCES, LYSINETE	W71-01204
WATER SUPPLY, SEEPAGE, INFILTRATION,	WATER POLLUTION, POLLUTANTS, LEGA	W70-07632
UNAVAILABLE USE, PRIOR APPROPRIATION,	WATER POLLUTION SOURCES, JUDICIAL	W70-08050
WATER INDUSTRY, SUBSURFACE DRAINAGE,	WATER POLLUTION SOURCES, PIPES, C	W70-07632
LEMENT, POTABLE WATER, STANDARDS,	WATER POLLUTION EFFECTS, IMPAIRED	W70-08025
INDUSTRIAL WASTES, GROUNDWATER,	WATER POLLUTION EFFECTS, LEGAL AS	W70-08026
WATER, OILY WATER, OIL INDUSTRY,	WATER POLLUTION SOURCES, GROUNDWA	W70-08025
, *WATER SPREADING, *MONITORING,	WATER POLLUTION SOURCES, SEWAGE T	W71-01324
WELLS, *SHALLOW WELLS, WATER WELLS,	WATER POLLUTION, DAMAGE, JUDICIAL	W68-00627
JUDICIAL DECISIONS, FUELS, WELLS,	WATER POLLUTION, SEEPAGE, GROUNDW	W68-06117
, SANITARY FILL, WASTE DILUTION,	WATER POLLUTION CONTROL, LEACHING	W69-03178
DISPOSAL, WASTE WATER TREATMENT,	WATER POLLUTION, *SOIL WASTE TREA	W69-05327
SANITARY ENGINEERING, *LEACHING,	WATER POLLUTION SOURCES, SOLID WA	W68-00058
CAPILLARY FLOW, *LAVA, BASALTS,	WATER POLLUTION SOURCES, MICROORG	W69-00979
TION ABATEMENT, CHEMICAL WASTES,	WATER POLLUTION SOURCES, INDUSTRI	W69-05370
DISPOSAL, WASTE WATER TREATMENT,	WATER POLLUTION, *SOIL WASTE TREA	W69-05328
DAMAGE, PERCOLATION, GROUND-WATER,	WATER POLLUTION,: /YES, *BACTERIO	W69-00225
ION SOURCES, PATH OF POLLUTANTS,	WATER POLLUTION EFFECTS, NUTRIENT	W70-00665
WATER, SEDIMENTS, FERTILIZERS,	WATER POLLUTION, SNOW, RUNOFF, DR	W70-04193
*WASTE DISPOSAL, *HYDROGEOLOGY,	WATER POLLUTION CONTROL, SURVEYS,	W70-07193
CHING, */ *VIRUSES, GROUNDWATER,	WATER POLLUTION, ABSORPTION, *LEA	W70-04688
WASTES, WATER POLLUTION SOURCES,	WATER POLLUTION CONTROL, PUBLIC H	W70-06011
DAMAGE, *LANDFILLS, *SOLID WASTES,	WATER POLLUTION SOURCES, WATER PO	W70-06011
TION, ENVIRONMENTAL ENGINEERING,	WATER POLLUTION SOURCES,: /SANITA	W70-06572
LOGIC DATA, GROUNDWATER MOVEMENT,	WATER QUALITY, WATER LEVELS, WATE	W70-05466
TION, GROUNDWATER, WATER LEVELS,	WATER QUALITY, BIOCHEMICAL OXYGEN	W69-07114
, INFILTRATION, WATER CHEMISTRY,	WATER QUALITY, SOIL CONTAMINATION	W69-08620
WATER POLLUTION CONTROL, LEACHING,	WATER QUALITY CONTROL, DOMESTIC W	W69-03178
JUDICIAL DECISIONS, OIL WASTES,	WATER QUALITY, SALINITY, PERCOLAT	W69-06118
PENNSYLVANIA, SUBSURFACE DRAINAGE,	WATER QUALITY, WATER POLLUTION SO	W71-01204
USION, WATER POLLUTION, IMPAIRED	WATER QUALITY, POLLUTANTS, INDUST	W70-08026
WATER POLLUTION EFFECTS, IMPAIRED	WATER QUALITY, PERCOLATION, PENET	W70-08025

ASTES, MUNICIPAL WASTES, SEWAGE,	WATER QUALITY CONTROL, WATER POLL	W71-10446
NE WASTES, GEOLOGY, GROUNDWATER,	WATER QUALITY, COMPACTION, COMPRE	W71-08907
AL, LEGISLATION, WELLS, IMPAIRED	WATER QUALITY, WATER POLLUTION CO	W71-11724
OVEMENT, LEACHING, INFILTRATION,	WATER QUALITY.: /R, GROUNDWATER M	W71-08044
*DAMAGES, *WATER WELL, IMPAIRED	WATER QUALITY, UNDER SEEPAGE, WAT	W71-13645
ES, ADMINISTRATION, GROUNDWATER,	WATER QUALITY, INSPECTION, INSTAL	W71-04742
G, TEST PROCEDURES, METHODOLOGY,	WATER QUALITY, SOILS, PESTICIDES,	W71-06514
TRY, ABSORPTION, SOIL MECHANICS,	WATER QUALITY, SOIL PROPERTIES, W	W71-04121
TION, WATER MANAGEMENT, IMPAIRED	WATER QUALITY, WASTE DISPOSAL, GA	W71-07194
ATION, *WATER POLLUTION EFFECTS,	WATER QUALITY, SALINITY, GROUNDWA	W71-06063
, DRAINAGE EFFECTS, GROUNDWATER,	WATER QUALITY, SOIL WATER.: /ONIA	W71-04548
TRATE, SULFATE, SILICATE, GROUND	WATER RECHARGE, HYDROCHEMICAL FAC	W69-03197
WASTE	WATER RECHARGE.: :	W69-08620
N, INDUCED INFILTRATION, *GROUND	WATER RECHARGE, IRRIGATION, DENIT	W69-05328
N, INDUCED INFILTRATION, *GROUND	WATER RECHARGE, IRRIGATION, DENIT	W69-05327
ATMENT, SOIL PERCOLATION, *WASTE	WATER RECLAMATION, INDUCED INFILT	W69-05327
ATMENT, SOIL PERCOLATION, *WASTE	WATER RECLAMATION, INDUCED INFILT	W69-05328
ROGEOLOGY, GROUNDWATER MOVEMENT,	WATER RESOURCES DEVELOPMENT, RECL	W70-04712
ETHODS, WATER STORAGE, AQUIFERS,	WATER REUSE, ARTIFICIAL RECHARGE,	W70-03102
LOCAL GOVERNMENTS, LEGISLATION,	WATER RIGHTS, RIPARIAN RIGHTS, NA	W70-02896
DERGROUND, LEAKAGE, PERCOLATION,	WATER RIGHTS, WATER POLLUTION SOU	W70-07631
ING, SHALLOW WELLS, GROUNDWATER,	WATER SOURCES, DRAINAGE, RIPARIAN	W69-06118
RNIA, WATER YIELD, INFILTRATION,	WATER SPREADING, PIT RECHARGE, SA	W70-05466
CAL MODELS, STATISTICAL METHODS,	WATER STORAGE, AQUIFERS, WATER RE	W70-03102
LEACHING, AQUIFERS, WATER TABLE,	WATER SUPPLY, GASES, CARBON DIOXI	W70-06011
NT, WATER QUALITY, WATER LEVELS,	WATER SUPPLY, WATER UTILIZATION,	W70-05466
LLS, WATER LEVELS, *WATER WELLS,	WATER SUPPLY, AQUIFERS, ION EXCHA	W69-02611
ONDS, *SOIL, GROUNDWATER BASINS,	WATER SUPPLY, MUD, BENTHOS, HYDRO	W69-07838
NFLOW, UNDERGROUND, GROUNDWATER,	WATER SUPPLY, SEEPAGE, INFILTRATI	W70-07632
ELLS, WELL CASINGS, GROUNDWATER,	WATER SUPPLY, PERCOLATING WATER,	W71-01028
L ASPECTS, COMPENSATION, BRINES,	WATER SUPPLY, BOUNDARIES(SURFACES	W71-03230
WATER, IRRIGATION, RETURN FLOW,	WATER SUPPLY, LIVESTOCK, SEWAGE,	W71-06435
AGEMENT, GROUNDWATER, WISCONSIN,	WATER SUPPLY.: / WASTES, SOIL MAN	W71-06443
ING WATERS, DRILLING, OIL WELLS,	WATER SUPPLY, FARMS, WATER POLLUT	W71-13521
R INTERFACES, *LEACHING, *SALINE	WATER SYSTEMS, *GROUNDWATER MOVEM	W71-01932
PERCOLATION, LEACHING, AQUIFERS,	WATER TABLE, WATER SUPPLY, GASES,	W70-06011
ING, GROUNDWATER, SOIL PROFILES,	WATER TABLE, SURFACE RUNOFF, FARM	W69-09721
ONTAMINATION, OBSERVATION WELLS,	WATER TABLE, INFILTRATION.: /IL C	W71-03543
Y, SOIL PROPERTIES, WATER WELLS,	WATER TABLE, ENVIRONMENTAL EFFECT	W71-04121
FERS, COLORADO, DENITRIFICATION,	WATER TABLE, PERCOLATION.: / AQUI	W71-02036
CONTAMINATION, WATER POLLUTION,	WATER TABLE, OXIDATION LAGOON, IR	W71-03542
ER, SOIL WATER, SOLUBILITY, SOIL	WATER TRANSMISSIVITY.: /GROUNDWAT	W71-07887
M-CYCLE, HISTORY, SOIL ANALYSIS,	WATER TRANSFER, IRRIGATION PRACTI	W71-12122
DRAINAGE, WASTE TREATMENT, WASTE	WATER TREATMENT, WATER POLLUTION,	W71-10157
IR POLLUTION, TEMPERATURE, WASTE	WATER TREATMENT, OHIO.: /ATION, A	W71-07118
NT, *WASTE WATER DISPOSAL, WASTE	WATER TREATMENT, WATER POLLUTION,	W69-05327
NT, *WASTE WATER DISPOSAL, WASTE	WATER TREATMENT, WATER POLLUTION,	W69-05328
ITY, WATER LEVELS, WATER SUPPLY,	WATER UTILIZATION, SURVEYS, GEOPH	W70-05466
WATER, REASONABLE USE, REMEDIES,	WATER UTILIZATION, PERCOLATING WA	W70-00532
COLATING WATERS, *SHALLOW WELLS,	WATER WELLS, WATER POLLUTION, DAM	W68-00627
AL PIPES, WELLS, ARTESIAN WELLS,	WATER WELLS, INFLOW, UNDERGROUND,	W70-07632
WATER QUALITY, SOIL PROPERTIES,	WATER WELLS, WATER TABLE, ENVIRON	W71-04121
RS, GRAVELS, AQUITARDS, PUMPING,	WATER WELLS, MUNICIPAL WATER, SUR	W71-02909
ARGE, *WATER REUSE, *CALIFORNIA,	WATER YIELD, INFILTRATION, WATER	W70-05466
RESOURCES DEVELOPMENT, RECLAIMED	WATER.: /NDWATER MOVEMENT, WATER	W70-04712
GROUNDWATER, WATER QUALITY, SOIL	WATER.: /ONIA, DRAINAGE EFFECTS,	W71-04548
, LEACHING, SALINE SOILS, SALINE	WATER.: /TROL, SALTS, GROUNDWATER	W70-09844
INDUSTRIAL WASTES, SEWAGE, WASTE	WATER(POLLUTION), LEGAL ASPECTS.: :	W70-00521
DWATER MOVEMENT, NITROGEN, WASTE	WATER(POLLUTION).: /RIENTS, GROUND	W70-00665
..	WATER(TRACER), MINE DUMP LEACHING	W71-11255



ANIONIC SUR/ *DETERGENT BEHAVIOR(	WATER), *SOIL-WATER ENVIRONMENT,	W70-01291
RATES, PLANTS, AMMONIA, HARDNESS(	WATER), ACIDITY, OXYGEN, ALGAE, S	W69-07838
S, MATHEMATICAL MODELS, CURRENTS(	WATER), MASS TRANSFER, AQUIFERS.:	W69-08921
DISCHARGE MEASUREMENT, DISCHARGE(	WATER), ON-SITE DATA COLLECTIONS,	W70-07766
OIL FIELDS, SALINE WATER, SALINE	WATER-FRESHWATER INTERFACES, WELL	W71-01028
ACHING, *SALINE WATER S/ *SALINE	WATER-FRESH-WATER INTERFACES, *LE	W71-01932
WATER WELLS, GROUNDWATER, SALINE	WATER-FRESH WATER INTERFACES, MIX	W71-03230
N WATER, *RETURN FLOW, *DRAINAGE	WATER, *DETERIORATION, *WATER POL	W71-06063
ING, *SOIL WATER MOVEMENT, *OILY	WATER, *GROUNDWATER RECHARGE, MOD	W71-10325
CIAL R/ *WATER REUSE, *RECLAIMED	WATER, *MUNICIPAL WASTES, *ARTIFI	W69-08620
LOSED CONDU/ PERCOLATION, GROUND	WATER, *PERMEABILITY, POROSITY, C	W69-00979
CIAL DECIS/ *PENNSYLVANIA, *OILY	WATER, *PIPELINES, *LEAKAGE, JUDI	W70-07632
, *WATER POLLUTION, *PERCOLATING	WATER, *RELATIVE RIGHTS, WATER LA	W70-00521
TER, *DETERIORATION/ *IRRIGATION	WATER, *RETURN FLOW, *DRAINAGE WA	W71-06063
XTRACTION, ATOMIC ABSOR/ *GROUND	WATER, *TRACE ELEMENTS, CHELATE E	W69-03197
JUDICIAL D/ *CONNECTICUT, *OILY	WATER, *UNDERSEEPAGE, *POLLUTION,	W70-07631
, *SUBSURFACE WATER/ *PERCOLATING	WATER, *WATER POLLUTION, *SEEPAGE	W70-08050
, *SUBSURFACE WATER/ *PERCOLATING	WATER, *WATER POLLUTION, *SEEPAGE	W70-08049
ISLAND, *GASOLINE, *PERCOLATING	WATER, *WELLS, GROUNDWATER, OILY	W70-08025
, OIL WASTES/ *ILLINOIS, *SALINE	WATER, *WELLS, JUDICIAL DECISIONS	W69-06118
TION SOURCES, LEACHING, DRAINAGE	WATER, AMMONIA, DRAINAGE EFFECTS,	W71-04548
, WATER UTILIZATION, PERCOLATING	WATER, AQUIFERS, HYDROGEOLOGY, GR	W70-00532
NT, MUNICIPAL WASTES, IRRIGATION	WATER, ARTIFICIAL RECHARGE, FILTR	W69-08621
LANDS, GROUNDWATER, PERCOLATING	WATER, EMINENT DOMAIN, PUBLIC HEA	W70-02896
LIZATION, NITROGEN SOURCES, WELL	WATER, FEEDLOTS.: /OURCES, MINERA	W71-06435
POLLUTION, SNOW, RUNOFF, DRAINAGE	WATER, GRASSLANDS, SOIL EROSION,::	W70-04193
TER, *SEEPAGE, DRILL HOLES, OILY	WATER, GROUNDWATER MOVEMENT, OIL-	W71-08055
DOMAIN, PUBLIC HEALTH, DOMESTIC	WATER, INDUSTRIAL WATE: / EMINENT	W70-02896
POLLUTANTS, NITROGE/ PERCOLATING	WATER, INFILTRATION, DETERGENTS,	W69-00652
SULFATES, SULFIDES, PERCOLATING	WATER, INFILTRATION, GROUNDWATER	W68-01010
FF, UREAS, FERTILIZERS, DRAINAGE	WATER, IRRIGATION, RETURN FLOW, W	W71-06435
ER POLICY, AQUIFERS, PERCOLATING	WATER, LEG: /ENS, EXCAVATION, WAT	W71-04742
RIGHTS, COMPETING USES, DOMESTIC	WATER, LEGAL ASPECTS, MUNICIPAL W	W70-00532
TANTS, SOIL WATER MOVEMENT, OILY	WATER, OIL WASTES, WAT: /OF POLLU	W71-01043
WATER, *WELLS, GROUNDWATER, OILY	WATER, OIL INDUSTRY, WATER POLLUT	W70-08025
E, WATER POLLUTION SOURCES, MINE	WATER, OIL WASTES, CESSPOOLS, SEW	W70-08049
MANAGEMENT, JUDICIAL DECISIONS, GROUND	WATER, PATH OF POLLUTANTS, SUBSUR	W68-00627
WASTES, CALIFORNIA, PERCOLATING	WATER, PERCOLATION, LEACHING, AQU	W70-06011
ER LAW, GROUND WATER, SUBSURFACE	WATER, PERCOLATION, SUBSURFACE RU	W70-00521
SPOSAL, GROUNDWATER, PERCOLATING	WATER, PERCOLATION, PATH OF POLLU	W71-11692
ELEMENT, CONSUMPTIVE USE, DOMESTIC	WATER, POLLUTION ABATEMENT, JUDIC	W71-13645
CHING, SALT BALANCE, PERCOLATING	WATER, POLLUTION IDENTIFICATION,	W71-06063
WATER, LEGAL ASPECTS, MUNICIPAL	WATER, REASONABLE USE, REMEDIES,	W70-00532
, *WATER POLLUTION, *PERCOLATING	WATER, RIPARIAN RIGHTS, RELATIVE	W71-01043
WATERS, DIFFUSION, GRAVITATIONAL	WATER, SALTS, SALINE SOILS, WASTE	W70-08026
LS, DRILLING, OIL FIELDS, SALINE	WATER, SALINE WATER-FRESHWATER IN	W71-01028
, *SUBSURFACE DRAINAGE, DRAINAGE	WATER, SALINITY, FERTILIZERS, GRO	W70-08662
, POLLUTION IDENTIFICATION, SOIL	WATER, SALINE WATER, WATER CONSER	W71-06063
ERS, PESTICIDES, NUTRIENTS, SOIL	WATER, SOILS, SEEPAGE, SOIL CHEMI	W71-04121
AL PROPERTIES, GROUNDWATER, SOIL	WATER, SOLUBILITY, SOIL WATER TRA	W71-07887
NS, POLLUTION ABATEMENT, POTABLE	WATER, STANDARDS, WATER POLLUTION	W70-08025
GROUNDWATER MOVEMENT, PERCOLATING	WATER, SUBSURFACE WATERS, DIFFUSI	W70-08026
WATER, WATER SUPPLY, PERCOLATING	WATER, SUBSURFACE WATERS, JUDICIA	W71-01028
LATIVE RIGHTS, WATER LAW, GROUND	WATER, SUBSURFACE WATER, PERCOLAT	W70-00521
UNDERGROUND STREAMS, PERCOLATING	WATER, SUBSURFACE WATERS, UNDERGR	W70-07631
RISDICTION, OIL INDUSTRY, SALINE	WATER, SUBSURFACE WATERS, GROUNDW	W71-13521
PUMPING, WATER WELLS, MUNICIPAL	WATER, SURFACE-GROUNDWATER RELATI	W71-02909
, SUBSURFACE WATERS, PERCOLATING	WATER, UNDERGROUND, WELLS, SALINE	W71-10446
NT, WATER POLLUTION, PERCOLATING	WATER, WATER CONSERVATION, ADMINI	W71-10157
ENTIFICATION, SOIL WATER, SALINE	WATER, WATER CONSERVATION, IRRIGA	W71-06063

R INTRUSION, *HAWAII, IRRIGATION	WATER, WATER CHEMISTRY, SOLUTES,	W71-08044
CTERIOPHAGE, PERCOLATION, GROUND-	WATER, WATER POLLUTION.: /ES, *BA	W69-00225
SEEPAGE, GROUNDWATER, PERCOLATING	WATER, WELL REGULATIONS, PERCOLAT	W69-06117
R QUALITY, SALINITY, PERCOLATING	WATER, WELL SPACING, SHALLOW WELL	W69-06118
(SURFACES), WELL CASINGS, SALINE	WATER, WELLS, SEEPAGE, DAMAGES, R	W71-03230
WELLS, WASTE DISPOSAL, SUBSURFACE	WATERS.: /POLLUTANTS, INJECTION W	W69-03212
LS, WA/ *LOUISIANA, *PERCOLATING	WATERS, *SHALLOW WELLS, WATER WEL	W68-00627
*MISSOURI, *PERMITS, *SUBSURFACE	WATERS, *WATER POLLUTION CONTROL,	W71-10157
DISCHARGE, GROUNDWATER, SURFACE	WATERS, AQUIFERS, FLOW RATES, LEA	W70-09637
T, PERCOLATING WATER, SUBSURFACE	WATERS, DIFFUSION, GRAVITATIONAL	W70-08026
WATERS, GROUNDWATER, PERCOLATING	WATERS, DRILLING, OIL WELLS, WATE	W71-13521
ALIZATION, NITROGEN SO/ *SURFACE	WATERS, GEOLOGICAL SOURCES, MINER	W71-06435
DUSTRY, SALINE WATER, SUBSURFACE	WATERS, GROUNDWATER, PERCOLATING	W71-13521
POLLUTION, *SEEPAGE, *SUBSURFACE	WATERS, GROUNDWATER, UNDERGROUND	W70-08050
EFFLUENT, C.O.D., B.O.D., WASTE	WATERS, HYDRAULIC LOADING, INFILT	W69-03197
Y, PERCOLATING WATER, SUBSURFACE	WATERS, JUDICIAL DECISIONS, LEGAL	W71-01028
INAGE, SHALLOW WELLS, SUBSURFACE	WATERS, LEGAL ASPECTS.: /FACE DRA	W69-06117
N, NITROGEN, PHOSPHORUS, SURFACE	WATERS, PERCOLATION, SUSPENDED LO	W70-04504
POLLUTION ABATEMENT, SUBSURFACE	WATERS, PERCOLATING WATER, UNDERG	W71-10446
POLLUTION, *SEEPAGE, *SUBSURFACE	WATERS, PRIOR APPROPRIATION, GROU	W70-08049
ERS, WELLS, GROUNDWATER, SURFACE	WATERS, SEEPAGE, PERCOLATION.: /T	W69-05370
TIVE USE, *GROUNDWATER, *SURFACE	WATERS, SURFACE RUNOFF, RIPARIAN	W70-00532
R MOVEMENT, GROUNDWATER, SURFACE	WATERS, TESTING, TEST PROCEDURES,	W71-06514
S, PERCOLATING WATER, SUBSURFACE	WATERS, UNDERGROUND, LEAKAGE, PER	W70-07631
AN LAND, PERCOLATION, SUBSURFACE	WATERS, UNDERGROUND STREAMS, GROU	W71-01043
RS, STREAMS, LAKES, PONDS, TIDAL	WATERS, WELLS, GROUNDWATER, SURFA	W69-05370
*DRAINAGE, *EUTRO/ *AGRICULTURAL	WATERSHED, *SUBSURFACE DRAINAGE,	W70-04504
CHIGAN, PHOSPHORUS, AGRICULTURAL	WATERSHEDS, ORGANIC MATTER, SEDIM	W70-04193
LIGOTROPHY, SEWAGE, ALGAE, SCUM,	WEEDS, NUTRIENTS, SEPTIC TANKS, E	W70-04193
ER-FRESHWATER INTERFACES, WELLS,	WELL CASINGS, GROUNDWATER, WATER	W71-01028
ALITY, INSPECTION, INSTALLATION,	WELL CASINGS, ARTESIAN WELLS, WEL	W71-04742
ER SUPPLY, BOUNDARIES(SURFACES),	WELL CASINGS, SALINE WATER, WELLS	W71-03230
PUMPING, STANDARDS, REGULATION,	WELL PERMITS, DRILLING, ADMINISTR	W71-04742
TROL, WATER POLLUTION TREATMENT,	WELL PERMITS, ADMINISTRATIVE AGEN	W71-10157
, CONTROL, REGULATION, AQUIFERS,	WELL REGULATIONS, SUBSURFACE DRAI	W71-10157
GROUNDWATER, PERCOLATING WATER,	WELL REGULATIONS, PERCOLATION, SU	W69-06117
N, WELL CASINGS, ARTESIAN WELLS,	WELL SCREENS, EXCAVATION, WATER P	W71-04742
TY, SALINITY, PERCOLATING WATER,	WELL SPACING, SHALLOW WELLS, GROU	W69-06118
INERALIZATION, NITROGEN SOURCES,	WELL WATER, FEEDLOTS.: /OURCES, M	W71-06435
LUTION SOURCES, *DAMAGES, *WATER	WELL, IMPAIRED WATER QUALITY, UND	W71-13645
DISPOSAL	WELLS.: /ECISIONS, LEGAL ASPECTS,	W69-07554
REMEDIES, WELLS, DIKES, SHALLOW	WELLS, *GASOLINE, *WATER POLLUTIO	W71-13645
N SOURCES, JU/ *NEW YORK, *WATER	WELLS, *GROUNDWATER, *SEEPAGE, DR	W69-06117
ILL HOLES, OILY/ *KENTUCKY, *OIL	WELLS, *LEGISLATION, CONSTRUCTION	W71-08055
HEALTH, *WELL REGULATIONS, *WATER	WELLS, *REMEDIES, INDUSTRIAL WAST	W71-04742
*WATER POLLUTION SOURCES, *WATER	WELLS, *WATER WELLS, GROUNDWATER,	W71-11692
A, *SALINE WATER INTRUSION, *OIL	WELLS, ARTIFICIAL RECHARGE, CONVE	W71-03230
AULIC MODELS, TRACERS, INJECTION	WELLS, ARTESIAN WELLS, WATER WELL	W69-07554
S, CLOSED CONDUITS, METAL PIPES,	WELLS, DIKES, SHALLOW WELLS.: /EC	W70-07632
ISIONS, LEGAL ASPECTS, REMEDIES,	WELLS, DITCHES, DRAINAGE EFFECTS,	W71-13645
INAGE, RIPARIAN RIGHTS, ARTESIAN	WELLS, DRILLING, OIL FIELDS, SALI	W69-06118
OIL INDUSTRY, PUBLIC HEALTH, OIL	WELLS, GROUNDWATER, WATER SOURCES	W71-01028
ING WATER, WELL SPACING, SHALLOW	WELLS, GROUNDWATER, SURFACE WATER	W69-06118
AMS, LAKES, PONDS, TIDAL WATERS,	WELLS, GROUND WATER MOVEMENT.: /U	W69-05370
RFACE FLOW, GASOLINE, WATER LAW,	WELLS, GROUNDWATER, SALINE WATER-	W68-00627
ER INTRUSION, *OIL WELLS, *WATER	WELLS, IMPAIRED WATER QUALITY, WA	W71-03230
ES, WASTE DISPOSAL, LEGISLATION,	WELLS, INFLOW, UNDERGROUND, GROUN	W71-11724
ES, WELLS, ARTESIAN WELLS, WATER	WELLS, METHODOLOGY, CHEMICAL ANAL	W70-07632
ILES, SAMPLING, DATA COLLECTION,	WELLS, MUNICIPAL WATER, SURFACE-G	W71-11255
AVELS, AQUITARDS, PUMPING, WATER		W71-02909

*SALINE WATER INTRUSION, *WATER	WELLS, OIL INDUSTRY, PUBLIC HEALT	W71-01028
PERCOLATING WATER, UNDERGROUND,	WELLS, SALINE WATER INTRUSION, WA	W71-10446
ES), WELL CASINGS, SALINE WATER,	WELLS, SEEPAGE, DAMAGES, REMEDIES	W71-03230
ER MOVEMENT, UNDERFLOW, ARTESIAN	WELLS, STREAMS, JUDICIAL DECISION	W70-08025
ON, SUBSURFACE DRAINAGE, SHALLOW	WELLS, SUBSURFACE WATERS, LEGAL A	W69-06117
NS, HYDROLOGIC CYCLE, OVERDRAFT,	WELLS, SURFACE-GROUNDWATER RELATI	W70-00532
, *PATH OF POLLUTANTS, INJECTION	WELLS, WASTE DISPOSAL, SUBSURFACE	W69-03212
A, *PERCOLATING WATERS, *SHALLOW	WELLS, WATER WELLS, WATER POLLUTI	W68-00627
TION WELLS, WATER LEVELS, *WATER	WELLS, WATER SUPPLY, AQUIFERS, IO	W69-02611
WATER RELATIONSHIPS, OBSERVATION	WELLS, WATER LEVELS, *WATER WELLS	W69-02611
RCEs, JUDICIAL DECISIONS, FUELS,	WELLS, WATER POLLUTION, SEEPAGE,	W69-06117
NG WATERS, *SHALLOW WELLS, WATER	WELLS, WATER POLLUTION, DAMAGE, J	W68-00627
TS, METAL PIPES, WELLS, ARTESIAN	WELLS, WATER WELLS, INFLOW, UNDER	W70-07632
QUALITY, SOIL PROPERTIES, WATER	WELLS, WATER TABLE, ENVIRONMENTAL	W71-04121
SOIL CONTAMINATION, OBSERVATION	WELLS, WATER TABLE, INFILTRATION.	W71-03543
ERCOLATING WATERS, DRILLING, OIL	WELLS, WATER SUPPLY, FARMS, WATER	W71-13521
ALLATION, WELL CASINGS, ARTESIAN	WELLS, WELL SCREENS, EXCAVATION,	W71-04742
INE WATER-FRESHWATER INTERFACES,	WELLS, WELL CASINGS, GROUNDWATER,	W71-01028
N STORM RUNOFF, JAMES RIVER(MO),	WILSON CREEK(MO), SPRINGFIELD(MO)	W71-09154
PACIFIC NORTHWEST), LAKE MENDOTA(	WIS).: /VER(CALIF), YAKIMA BASIN(	W70-04504
SWAMPS, FOREST SOILS, MINNESOTA,	WISCONSIN, MICHIGAN, PHOSPHORUS,	W70-04193
S, SOIL MANAGEMENT, GROUNDWATER,	WISCONSIN, WATER SUPPLY.: / WASTE	W71-06443
RY, SOLUTES, NITRATES, SALINITY,	WITHDRAWAL, GROUNDWATER, GROUNDWA	W71-08044
PERCOLATION, PATH OF POLLUTANTS,	WOOD WASTES, PULP AND PAPER INDUS	W71-11692
*SUSQUEHANNA RIVER BASIN, (N	Y).:	W70-03102
ER MIXING, RUSSIAN RIVER(CALIF),	YAKIMA BASIN(PACIFIC NORTHWEST),	W70-04504
*WATER REUSE, *CALIFORNIA, WATER	YIELD, INFILTRATION, WATER SPREAD	W70-05466
ER SPREADING, PIT RECHARGE, SAFE	YIELD, WATER BALANCE, HYDROGEOLOG	W70-05466
ATER POLLUTION SOURCES, JU/ *NEW	YORK, *WATER WELLS, *GASOLINE, *W	W69-06117
LOW, *INDUCED INFILTRATION, *NEW	YORK, HYDROGRAPHS, HYDROGRAPH ANA	W70-03102
PERTIES, MODEL TESTS, SATURATION	ZONES, SEEPAGE, NUMERICAL METHOD,	W69-00651