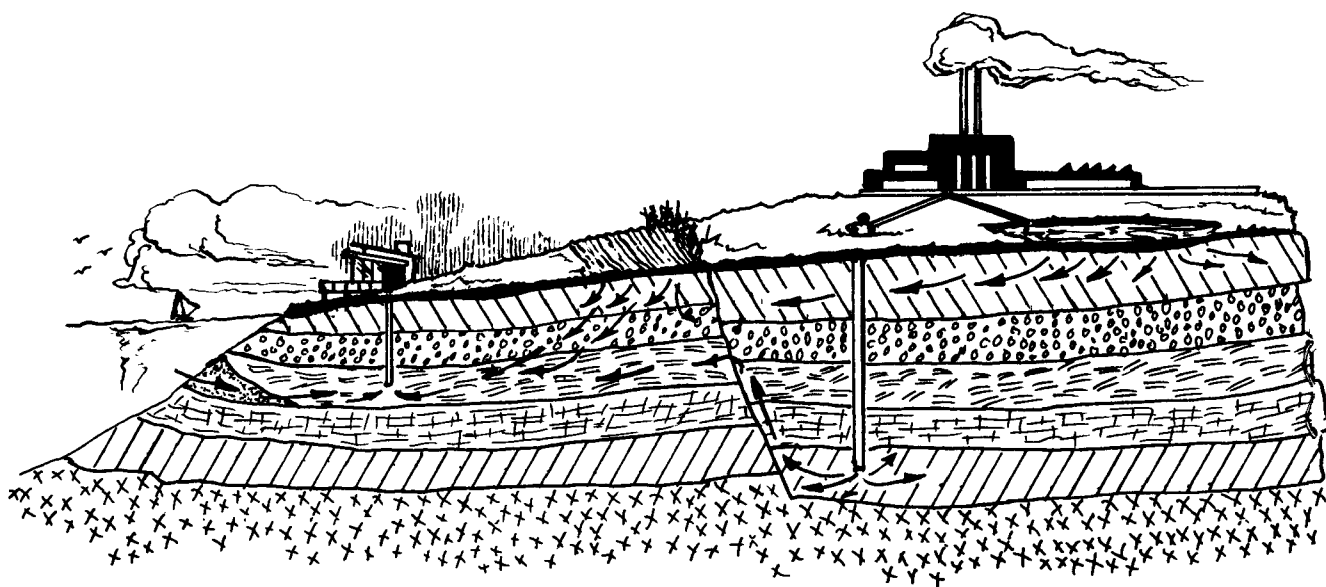




OFFICE OF WATER PROGRAMS

Subsurface Water Pollution A Selective Annotated Bibliography

Part I Subsurface Waste Injection



U.S. ENVIRONMENTAL PROTECTION AGENCY

SUBSURFACE WATER POLLUTION

A Selective

Annotated Bibliography

PART I

SUBSURFACE WASTE INJECTION

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
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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.

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| ERS, AQUICLUD/ *INJECTION WELLS, | *WASTE DISPOSAL, *ILLINOIS, AQUIF | W69-03251 |
| RADIOACTIVE W/ *INJECTION WELLS, | *WASTE DISPOSAL, BRINE DISPOSAL, | W68-00326 |
| S, *WATER POL/ *INJECTION WELLS, | *WASTE DISPOSAL, INDUSTRIAL WASTE | W68-00659 |
| MPRESSIBILITY, ACID WASTE DISPO/ | *WASTE DISPOSAL WELLS, AQUIFER CO | W68-00530 |
| LEGAL ASPECTS, SOCIAL ASPECTS/ | *WASTE DISPOSAL, *INJECTION WELLS | W69-02228 |
| ATER BASINS, / *INJECTION WELLS, | *WASTE DISPOSAL, *KANSAS, GROUNDW | W69-04946 |
| *EARTHQUAKES, *INJECTION WELLS, | *WASTE DISPOSAL, *COLORADO, HYDRO | W69-07412 |
| GIC FORMATION/ *INJECTION WELLS, | *WASTE DISPOSAL, *NEW YORK, GEOLO | W69-04943 |
| , *LIQUID WASTES, GEOLOGIC FORM/ | *WASTE DISPOSAL, *INJECTION WELLS | W69-04941 |
| , *ROCK MECHANICS, *FRACTURES(G/ | *WASTE DISPOSAL, *INJECTION WELLS | W69-03522 |
| ES, *INJECTION WELLS, AQUIFERS,/ | *WASTE DISPOSAL, *INDUSTRIAL WAST | W69-06943 |
| DWATER BASINS/ *INJECTION WELLS, | *WASTE DISPOSAL, *MICHIGAN, GROUND | W69-04945 |
| EQOLOGIC FORMA/ *INJECTION WELLS, | *WASTE DISPOSAL, *PENNSYLVANIA, G | W69-04944 |
| ES, AQUIFERS,/ *INJECTION WELLS, | *WASTE DISPOSAL, *INDUSTRIAL WAST | W69-07117 |
| *EARTHQUAKES, *INJECTION WELLS, | *WASTE DISPOSAL, *COLORADO, HYDRO | W69-07413 |
| NG, GROUNDWAT/ *INJECTION WELLS, | *WASTE DISPOSAL, *COLORADO, WYOMI | W69-04947 |
| *EARTHQUAKES, *INJECTION WELLS, | *WASTE DISPOSAL, *COLORADO, HYDRO | W69-07411 |
| *EARTHQUAKES, *INJECTION WELLS, | *WASTE DISPOSAL, *COLORADO, HYDRO | W69-07410 |
| SUBSURFACE LIQUID-WASTE STORAGE, | *WASTE INJECTION WELLS.: | *W71-06695 |
| TE STORAGE, *FLUID WASTE, *ENVI/ | *WASTE MIGRATION, *SUBSURFACE WAS | W71-13909 |
| *WASTE DISPOSAL, *LIQUID WASTES, | *WASTE STORAGE, *INJECTION WELLS, | W71-06695 |
| NC/ *RADIOACTIVE WASTE DISPOSAL, | *WASTE TREATMENT, EVAPORATION, CO | W69-04229 |
| N / *RADIOACTIVE WASTE DISPOSAL, | *WASTE TREATMENT, COAGULATION, IO | W69-09717 |
| *INJECTION WELLS, *DEEP WELLS, | *WASTE WATER DISPOSAL, *FLORIDA, | W70-02468 |
| L WASTES, *INJECTION WELLS, SUR/ | *WASTE WATER DISPOSAL, *INDUSTRIA | W70-05181 |
| OLOGY, *WATER POLLUTION SOURCES, | *WASTE WATER DISPOSAL, *INJECTION | W70-05922 |
| CTIVATED SLUDGE, *OIL, SKIMMING, | *WASTE WATER TREATMENT, INDUSTRIA | W70-06614 |
| WELLS, GEOLOGIC FORMATIONS, IN/ | *WASTE WATER DISPOSAL, *INJECTION | W68-00807 |
| WELLS, ILLINOIS, *INDUSTRIAL W/ | *WASTE WATER DISPOSAL, *INJECTION | W68-00530 |
| WELLS, *LEGAL ASPECTS, *REGULA/ | *WASTE WATER DISPOSAL, *INJECTION | W69-02342 |
| WELLS, GEOLOGIC FORMATIONS, IN/ | *WASTE WATER DISPOSAL, *INJECTION | W68-00808 |
| L WASTES, *AL/ *INJECTION WELLS, | *WASTE WATER DISPOSAL, *INDUSTRIA | W71-02428 |
| TREATMENT, *WATER REUSE, AQUIF/ | *WASTE WATER TREATMENT, *TERTIARY | W71-01970 |
| WELLS, *ALABAMA, AQUIFERS, AQU/ | *WASTE WATER DISPOSAL, *INJECTION | W70-09771 |
| WELLS, *ALAB/ *WATER CHEMISTRY, | *WASTE WATER DISPOSAL, *INJECTION | W70-09773 |
| ES, *DISPOSAL, COSTS, EFFLUENTS, | *WASTE WATER DISPOSAL, WASTE WATE | W71-04614 |
| PERFORMANCE, ULTIMATE DISPOSAL, | *WASTE WATER DISPOSAL, *INDUSTRIA | W70-07033 |
| R, *INDUSTRIA/ *INJECTION WELLS, | *WASTE WATER DISPOSAL, *OHIO RIVE | W70-09549 |
| L RECHARGE/ *TERTIARY TREATMENT, | *WASTE WATER DISPOSAL, *ARTIFICIA | W71-12415 |
| WELL/ *WATER WELLS, *DEWATERING, | *WASTE WATER DISPOSAL, INJECTION | W71-10423 |
| URCES, *INJECTION WELLS, *IDAHO, | *WASTE WATER DISPOSAL, *AQUIFERS, | W71-12274 |
| , *TERTIARY TREATMENT, *FILTERS, | *WASTE WATER TREATMENT, *RECHARGE | W71-08124 |
| SPOSAL, *INJECTION WELLS, *ALAB/ | *WATER CHEMISTRY, *WASTE WATER DI | W70-09773 |
| *INJECTION WELLS, *HYDROGEOLOGY, | *WATER LAW, *REVIEWS, REGULATION, | W70-05521 |
| POLLUTION TRE/ *ACID MINE WATER, | *WATER POLLUTION CONTROL, *WATER | W70-04330 |
| WATER DISPOSAL, / *HYDROGEOLOGY, | *WATER POLLUTION SOURCES, *WASTE | W70-05922 |
| WATER, *WATER POLLUTION CONTROL, | *WATER POLLUTION TREATMENT, *APPA | W70-04330 |
| STE DISPOSAL, INDUSTRIAL WASTES, | *WATER POLLUTION CONTROL, WATER W | W68-00659 |
| CHIAN MOUNTAIN / *COST ANALYSIS, | *WATER POLLUTION CONTROL, *APPALA | W71-03877 |
| POSAL, *WATER POLLUTION CONTROL, | *WATER POLLUTION TREATMENT, *CONF | W70-07380 |

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| POLLUTION T/ *ULTIMATE DISPOSAL, | *WATER POLLUTION CONTROL, *WATER | W70-07380 |
| ABAMA), *MOBILE COUNTY(ALABAMA), | *WATER POLLUTION CONTROL.: /TY(AL | W71-03766 |
| ION WELLS,/ *PATH OF POLLUTANTS, | *WATER POLLUTION EFFECTS, *INJECT | W71-04578 |
| ASTE DISPOSAL, *INJECTION WELLS, | *WATER POLLUTION, *INDUSTRIAL WAS | W71-03766 |
| ION WELLS, *IDAHO, *WASTE WATER/ | *WATER POLLUTION SOURCES, *INJECT | W71-12274 |
| ER ANALYSIS, WATER TREATMENT MI/ | *WATER POLLUTION LEGISLATION, WAT | W71-09721 |
| AHOMA, *ADMINISTRATIVE AGENCIES, | *WATER POLLUTION CONTROL, *WELL R | W71-10143 |
| EGULATIONS, / *UTAH, *OIL WELLS, | *WATER POLLUTION CONTROL, *WELL R | W71-10260 |
| DISPOSAL, */ *INDUSTRIAL WASTES, | *WATER POLLUTION CONTROL, *WASTE | W71-07195 |
| W/ *OKLAHOMA, *INJECTION WELLS, | *WATER POLLUTION CONTROL, *SALINE | W71-10261 |
| S, *OIL INDUSTRY, *ENCROACHMENT, | *WATER POLLUTION SOURCES, WELL RE | W71-09040 |
| LLS, *INJECTION WELLS/ *INDIANA, | *WATER POLLUTION CONTROL, *OIL WE | W71-12925 |
| URCES DEVELOPMENT, *WATER WELLS, | *WATER QUALITY CONTROL, *HYDROGEO | W71-08542 |
| TER WELLS, *WATER/ *GROUNDWATER, | *WATER RESOURCES DEVELOPMENT, *WA | W71-08542 |
| RY TREATMENT, *FILTERS, *WASTE / | *WATER REUSE, *INJECTION, *TERTIA | W71-08124 |
| TREATMENT, *TERTIARY TREATMENT, | *WATER REUSE, AQUIFERS, ACTIVATED | W71-01970 |
| , WASTE WATER TREATMENT, GROUND/ | *WATER REUSE, *TERTIARY TREATMENT | W70-07721 |
| DEL STUDIES, / *INJECTION WELLS, | *WATER REUSE, *RECHARGE WELLS, MO | W70-03249 |
| ICIAL RECHARGE, *RECHARGE WELLS, | *WATER REUSE, *NEW YORK, *SALINE | W70-04355 |
| INJECTION WELLS, ARTESIAN WELL/ | *WATER REUSE, NEW YORK, RECHARGE, | W69-03716 |
| *KANSAS, *CATTLE, *OIL WASTES, | *WATER SUPPLY, WATER POLLUTION, W | W71-13593 |
| IZATION, DEWATERING, FILTRATION, | *WATER TREATMENT, WASTES, FLORIDA | W71-07476 |
| ELECTROLYT/ *ARTIFICIAL RECHARGE, | *WATER TREATMENT, *COAGULATION, E | W70-04609 |
| R, *WATER RESOURCES DEVELOPMENT, | *WATER WELLS, *WATER QUALITY CONT | W71-08542 |
| WATER DISPOSAL, INJECTION WELL/ | *WATER WELLS, *DEWATERING, *WASTE | W71-10423 |
| | *WELL CONSTRUCTION.: | W70-00990 |
| ASTE DISPOSAL, *INJECTION WELLS, | *WELL REGULATIONS, AQUIFERS, WATE | W70-04103 |
| NCIES, *WATER POLLUTION CONTROL, | *WELL REGULATIONS, STATE GOVERNME | W71-10143 |
| TEMENT, WA/ *KANSAS, *OIL WELLS, | *WELL REGULATIONS, *POLLUTION ABA | W71-10440 |
| WELLS, *WATER POLLUTION CONTROL, | *WELL REGULATIONS, WELL CASINGS, | W71-10260 |
| WELLS, WELL CASINGS, CORROSION, | *WELL SCREENS, *DRILLING FLUIDS, | W68-00659 |
| ASTE DISPOSAL, *INJECTION WELLS, | *WELLS, *LIQUID WASTES, *HYDROGEO | W71-07195 |
| NE WATER INTRUSION, *OIL FIELDS, | *WEST VIRGINIA, OIL WELLS, INJECT | W71-04368 |

BIBLIOGRAPHY

REPLENISHING THE AQUIFER WITH TREATED SEWAGE EFFLUENT,

GROUND WATER AGE, VOL 2, NO 8, PP 30-35, APR 1968. 6 P, 8 ILLUS.

DESCRIPTORS:

*ARTIFICIAL RECHARGE, *INJECTION WELLS, *GROUNDWATER, NEW YORK, *SEWAGE EFFLUENTS, TERTIARY TREATMENT, FILTERS, SPECIFIC CAPACITY, WELL SCREENS, *RECHARGE WELLS, *SALINE WATER INTRUSION, WELL CASINGS, STAINLESS STEEL, POTABLE WATER, AIR ENTRAINMENT, GASES, WATER REUSE, BARRIERS, WATER MANAGEMENT(APPLIED), WATER QUALITY CONTROL.

IDENTIFIERS:

DEGASIFIERS, EH OF WATER, PH OF WATER, FIBERGLASS CASINGS, SALT WATER BARRIER, AIR CLOGGING, WATER LEVEL MONITORING.

ABSTRACT:

TREATED SEWAGE FROM A RECENTLY COMPLETED TERTIARY-TREATMENT PLANT IS BEING USED EXPERIMENTALLY AT BAY PARK, N.Y., TO RECHARGE AQUIFERS ARTIFICALLY. THE PURPOSE IS TO SEE IF A BARRIER CAN BE CREATED TO RETARD THE INTRUSION OF SALT WATER INTO THE HEAVILY PUMPED AQUIFERS. AFTER TREATMENT THE EFFLUENT WHICH MEETS POTABLE-WATER STANDARDS IS STORED IN A 50,000 GAL STORAGE TANK WHERE THE PH AND EH OF THE WATER IS ADJUSTED CHEMICALLY. THEN IT MOVES THROUGH A VACUUM DEGASIFIER TO REMOVE AIR AND OTHER GASES BEFORE IT IS PUMPED INTO THE INJECTION WELL. THE WELL IS A 36-IN. HOLE, 508 FT DEEP, WITH A 15-FT THICK CEMENT PLUG AT THE BOTTOM. IT CONTAINS 62 FT OF 16-IN. STAINLESS STEEL SCREEN ATTACHED TO 420 FT OF 18-IN. FIBERGLASS CASING. IN THE ANNULAR SPACE THE WELL HAS 2 3-IN. TREMIE PIPES FOR ADDING FILTER-PACK MATERIAL, A 4-IN. WATER INJECTION PIPE ENTERING THE CASING 192 FT BELOW THE SURFACE, AND A 5-IN. OBSERVATION WELL. AT A PUMPING RATE OF 1,000 GPM, THE SPECIFIC CAPACITY OF THE WELL IS 35 GPM/FT. INJECTION TESTS ARE AT 400 GPM (576,000 GPD). IF THE PROJECT IS FEASIBLE, SIMILAR WELLS WILL BE CONSTRUCTED ALONG 15 MI OF OCEAN FRONT AND ULTIMATELY 27 MGD OF TREATED SEWAGE WILL BE INJECTED.

FIELD 05F

ACCESSION NO. W68-00029

DEEP WELL INJECTION IS EFFECTIVE FOR WASTE DISPOSAL.

ENVIRON SCI AND TECHNOL, VOL 2, NO 6, PP 406-410, JUNE 1968. 5 P, 5 FIG, 1 PHOTO.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, BRINE DISPOSAL, RADIOACTIVE WASTE DISPOSAL, RIPARIAN RIGHTS, WASTE STORAGE, WATER QUALITY ACT, *CHEMICAL WASTES, LIQUID WASTES, THERMAL POLLUTION, EARTHQUAKES, *LEGAL ASPECTS, LEGISLATION, PERMEABILITY, OHIO, WATER POLLUTION CONTROL.

IDENTIFIERS:

TOXIC WASTE DISPOSAL, WASTE DISPOSAL LEGISLATION, FWPCA, GEOLOGICAL CONSIDERATION, DENVER, LEGAL QUESTIONS, SITE SELECTION.

ABSTRACT:

A SURVEY MADE OF PAST AND PRESENT WASTE DISPOSAL BY INJECTION INDICATES THAT DEEP WELLS ARE EFFECTIVE AND THAT INDUSTRY SHOULD MAKE USE OF THIS METHOD. OF ABOUT 40,000 BRINE DISPOSAL WELLS IN USE, 20,000 ARE IN TEXAS. IN THE PAST 4 YR WELLS DRILLED FOR DISPOSAL OF OTHER INDUSTRIAL WASTES HAVE DOUBLED IN NUMBER TO 110. SURFACE DISPOSAL METHODS ARE BECOMING RESTRICTED, AND DEEP INJECTION IS PERHAPS THE CHEAPEST ALTERNATIVE. FOR VERY TOXIC WASTES IT IS OFTEN THE ONLY FEASIBLE TECHNIQUE. A SURVEY BY FWPCA SHOWS 32 WELLS IN TEXAS, 24 IN LOUISIANA, 21 IN MICHIGAN, 9 IN INDIANA, AND 5 OR FEWER IN EACH OF 12 OTHER STATES. ONLY TEXAS AND OHIO HAVE LEGISLATION REFERRING SPECIFICALLY TO INDUSTRIAL WASTE INJECTION. POROUS CONFINED ROCK STRATA ARE REQUIRED FOR INJECTION; ABOUT 1/2 THE U. S. IS UNDERLAIN BY SUITABLE ROCKS, PREDOMINANTLY IN THE CENTRAL PLAINS AND SOUTHEASTERN COASTAL AREAS. WASTES MUST BE LOW IN SOLIDS AND PRECIPITABLE DISSOLVED SOLIDS CONTENT. HEAT GENERATION CAN PRESENT PROBLEMS IN RADIOACTIVE OR CHEMICAL REACTIVE WASTES. SOME CONTROVERSY EXISTS IN DENVER, WHERE INJECTION MAY BE RELATED TO EARTHQUAKE ACTIVITY. THE HISTORY AND ECONOMICS OF VISTRON'S WELL IN LIMA, OHIO ARE GIVEN. LEGAL RESTRICTIONS ON WELL CONSTRUCTION AND OPERATION MUST BE STUDIED BEFORE ANY CONSTRUCTION IS STARTED.

FIELD 05E

ACCESSION NO. W68-00326

FEASIBILITY OF SUBSURFACE DISPOSAL OF INDUSTRIAL WASTES OF ILLINOIS,
ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.

ROBERT E. BERGSTROM.

ILL GEOL SURV CIRC 426, 18 P, 1968. 4 FIG, 1 TAB, 18 REF.

DESCRIPTORS:

*WASTE WATER DISPOSAL, *INJECTION WELLS, ILLINOIS, *INDUSTRIAL WASTES,
PERMEABILITY, AQUIFERS, AQUICLUDES, *AQUIFER CHARACTERISTICS, POROSITY,
LEGAL ASPECTS, REGULATION, ENVIRONMENTAL EFFECTS, STRATIGRAPHY,
GEOLOGIC CONTROL.

IDENTIFIERS:

*WASTE DISPOSAL WELLS, AQUIFER COMPRESSIBILITY, ACID WASTE DISPOSAL,
WASTE DISPOSAL REGULATION, FEASIBILITY FACTORS.

ABSTRACT:

THE FACTORS BEARING ON FEASIBILITY AND LEGALITY OF INDUSTRIAL WASTE DISPOSAL WELLS ARE DESCRIBED, WITH MAIN EMPHASIS ON GEOLOGIC CONDITIONS AND NATURAL RESOURCES. THE GEOLOGIC CONDITIONS RANGE FROM FAVORABLE FOR DEEP-WELL DISPOSAL IN THE ILLINOIS BASIN, WHERE THE SECTION IS THICK, MANY AQUIFERS ARE CONFINED, AND DEEP GROUNDWATERS ARE HIGHLY MINERALIZED, TO UNFAVORABLE OR QUESTIONABLE IN THE NORTH WHERE THE SECTION IS THIN AND MAINLY PERMEABLE. GROUNDWATER IS FRESH TO GREAT DEPTH IN THE NORTH AND THE DEEP AQUIFERS ARE HEAVILY PUMPED. THE MOST PROMISING DISPOSAL RESERVOIRS IN THE SOUTH ARE THE ORDOVICIAN ST. PETER SANDSTONE AND THE CAMBRIAN IRONTON-GALESVILLE AND MT. SIMON SANDSTONES. THESE ARE IMPORTANT AQUIFERS IN THE NORTH. OTHER POSSIBLE DISPOSAL ZONES INCLUDE PENNSYLVANIA AND MISSISSIPPI SANDSTONES, DEVONIAN AND SILURIAN LIMESTONES, AND ORDOVICIAN AND CAMBRIAN DOLOMITES. OF THE 3 DISPOSAL WELLS IN THE STATE, ONE IS IN THE MT. SIMON SANDSTONE, ONE IN A DEVONIAN LIMESTONE, AND ONE IN A CAMBRIAN DOLOMITE.

FIELD 05E

ACCESSION NO. W68-00530

DESIGN OF WASTE DISPOSAL WELLS,

GROUND WATER ASSOCIATES, NORMAN, OKLA.

JOHN H. MARSH.

GROUND WATER, VOL 6, NO 2, PP 4-8, MAR-APR 1968. 5 P, 6 FIG, 3 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, INDUSTRIAL WASTES, *WATER POLLUTION CONTROL, WATER WELLS, WELL CASINGS, CORROSION, *WELL SCREENS, *DRILLING FLUIDS, LOGGING(RECORDING), PRESSURE HEAD, ROTARY DRILLING, LIQUID WASTES.

IDENTIFIERS:

DISPOSAL WELL COMPLETION METHODS, CASING PERFORATION, GRAVEL PACKING, CORROSION-RESISTANT TUBING, CORROSION-RESISTANT SCREENING.

ABSTRACT:

BASIC DESIGN PRINCIPLES FOR DISPOSAL WELLS ARE PRESENTED, AND 2 RECENTLY CONSTRUCTED WELLS FOR DISPOSAL OF VERY CORROSIVE REFINERY WASTE ARE DESCRIBED. MANY DISPOSAL WELLS ARE CONSTRUCTED USING OIL WELL COMPLETION TECHNIQUES WHICH ARE GREATLY INFERIOR TO MODERN WATER WELL TECHNIQUE, FOR DISPOSAL-WELL PURPOSES. OIL WELL DRILLING WITH BENTONITE MUD TENDS TO PLUG PORES, AND THE COMMON PRACTICE OF CEMENTING CASING AND GUN PERFORATING THE SELECTED DISPOSAL INTERVAL PROVIDES INSUFFICIENT AREA FOR EFFICIENT OUTFLOW. DRILLING WITH ORGANIC MUD WHICH BREAKS DOWN AFTER USE AND THE SETTING OF SCREEN INSTEAD OF PERFORATED CASING GREATLY ENHANCES THE ACCESS OF FLUIDS TO THE INJECTION ZONE. DESIGN REQUIREMENTS FOR DISPOSAL WELLS ARE THE SAME AS FOR WATER WELLS WITH THE ADDITIONAL CONSIDERATIONS OF AQUIFER PROTECTION BY SELECTION OF A ZONE BOUNDED BY AQUICLIDES, POSITIVE SEALING OF CASING THROUGH THE AQUICLUDE, PROTECTION OF CASING FROM THE FLUID IN THE INJECTION STRING, PREVENTING CLOGGING BY PRECIPITATES OR SEDIMENT, AND USE OF SCREEN WITH ENOUGH OPENING AREA TO KEEP FLOW RATE UNDER 0.05 FT PER SEC. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W68-00659

DEEP INJECTION WELLS.

WATER WELL J, VOL 22, NO 8, PP 12-13, AUG 1968. 2 P, 1 FIG, 1 TAB.

DESCRIPTORS:

*WASTE WATER DISPOSAL, *INJECTION WELLS, GEOLOGIC FORMATIONS, INJECTION, INDUSTRIAL WASTES, CHEMICAL WASTES.

IDENTIFIERS:

*INJECTION RATES, *INJECTION PRESSURES, INJECTION WELL LOCATIONS.

ABSTRACT:

THE INFORMATION AVAILABLE ON INDUSTRIAL WASTE INJECTION WELLS IS SUMMARIZED. THE DATA FROM 110 WELLS LISTED BY FWPCA ARE ANALYZED. ABOUT 82% OF THE WELLS ARE USED BY CHEMICAL AND PHARMACEUTICAL PLANTS, REFINERIES, NATURAL GAS PLANTS, AND METAL PRODUCT PLANTS. THE DEPTH RANGE IS A FEW HUNDRED TO OVER 12,000 FT, BUT 64% ARE LESS THAN 4,000 AND 92% ARE LESS THAN 6,000 FEET DEEP. INJECTION IS INTO UNLITHIFIED SAND IN 33%, SANDSTONE IN 41%, AND CARBONATES IN 22%. OF THE REMAINING 5, THE ROCKY MOUNTAIN ARSENAL WELL IS IN FRACTURED PRECAMBRIAN GNEISS; A PAPER MILL WELL IS IN FRACTURED PRECAMBRIAN GNEISS AND YOUNGER SANDSTONES AND CARBONATES; AND 3 WELLS ARE INJECTING INTO EVAPORITES. INJECTION RATES VARY FROM A FEW TO OVER 900 GPM, WITH 34% LESS THAN 100 GPM AND 78% LESS THAN 400 GPM. EXISTING INJECTION SYSTEMS ARE CONCENTRATED IN THE NORTH-CENTRAL AND GULF COAST AREAS. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W68-00807

HOW TO BURY A MAJOR POLLUTION PROBLEM.

WATER WELL J, VOL 22, NO 8, P 20, AUG 1968. 1 P, 1 FIG.

DESCRIPTORS:

*WASTE WATER DISPOSAL, *INJECTION WELLS, GEOLOGIC FORMATIONS, INJECTION, INDUSTRIAL WASTES, CHEMICAL WASTES, WASTE WATER, TREATMENT, OHIO.

IDENTIFIERS:

*INJECTION RATES, INJECTION WELL CONSTRUCTION.

ABSTRACT:

AN INJECTION WELL IS BEING CONSTRUCTED IN MIDDLETOWN, OHIO, TO DISPOSE OF SPENT STEEL MILL PICKLE LIQUOR. THE DISPOSAL HORIZON IS THE MT. SIMON SANDSTONE, ABOUT 3000 FT DEEP, JUST ABOVE THE PRECAMBRIAN BASEMENT. THE FORMATION'S POROSITY IS 8 TO 22%, AND THE DISPOSAL ZONE IS 274 FT THICK. THE WELL WILL MEET RIGID STATE SPECIFICATIONS TO ELIMINATE ANY CONTAMINATION OF USABLE GROUNDWATER. IT IS CASED AND CEMENTED FROM THE SURFACE TO THE DISPOSAL ZONE. THE SURFACE CASING IS ALSO CEMENTED. OIL UNDER HIGHER-THAN-INJECTION PRESSURE WILL ISOLATE THE COATED INJECTION TUBING FROM THE CASING TO CONTROL ACCIDENTAL LEAKAGE. THE PUMPS ARE MADE OF CORROSION-RESISTANT TITANIUM-PALLADIUM ALLOYS. ALL SEDIMENT OVER 2-MICRON SIZE WILL BE REMOVED FROM THE WASTE BEFORE INJECTION. THE PLANNED INJECTION RATE IS 70 GPM, CONSIDERABLY BELOW CAPACITY. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W68-00808

DEEP-WELL DISPOSAL OF WASTES,

U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

WILLIAM R. WALKER, AND RONALD C. STEWART.

ASCE PROC, J SANIT ENG DIV, VOL 94, NO SA5, POP 6171, PP 945-968, OCT 1968.
24 P, 5 TAB, 68 REF.

DESCRIPTORS:

*WASTE WATER DISPOSAL, *INJECTION WELLS, *LEGAL ASPECTS, *REGULATION,
HYDROGEOLOGY, PERMEABILITY, POROSITY, WATER QUALITY.

IDENTIFIERS:

COMPATIBILITY(INJECTION WATER).

ABSTRACT:

DEEP-WELL DISPOSAL AS A METHOD FOR POLLUTION CONTROL IN THE U. S. IS INVESTIGATED TO ASCERTAIN THE DEGREE OF DEVELOPMENT OF DEEP-WELL DISPOSAL, AND THE PROCEDURES EVOLVED TO CONTROL THIS MODE OF DISPOSAL ARE REVIEWED. ONLY 9 OF THE 45 STATES SURVEYED EXPRESSLY PROHIBIT OR, AS A MATTER OF POLICY, ACTIVELY DISCOURAGE THE METHOD OF DEEP-WELL DISPOSAL. SOME TYPE OF DISPOSAL WELLS ARE PRESENTLY IN OPERATION IN 25 STATES. THE TWO CONTROLLING CONDITIONS NECESSARY FOR AN OPERABLE DEEP-WELL DISPOSAL SYSTEM ARE A SUITABLE DISPOSAL STRATUM, AND A WASTE PHYSICALLY AND CHEMICALLY COMPATIBLE WITH THE RESIDENT MATERIAL IN THE DISPOSAL FORMATION. CARE MUST BE TAKEN TO ASSURE THAT THE VARIOUS BENEFITS ARE BALANCED, AND THAT ONE ASPECT IS NOT PROTECTED IN SUCH A MANNER AS TO BE TO THE COMPLETE DETRIMENT OF OTHERS. STATE REGULATIONS ARE SUMMARIZED AND TABULATED. (KNAPP-USGS)

FIELD 05E, 06E

ACCESSION NO. W69-02342

PROGRESS IN THE UNITED STATES OF AMERICA TOWARD DEEP-WELL DISPOSAL OF LIQUID
AND GASEOUS RADIOACTIVE WASTES,

GEOLOGICAL SURVEY, WASHINGTON, D. C.

A. CLEBSCH, JR., AND E. H. BALTZ.

SYMP ON INT AT ENERGY AGENCY, VIENNA, AND EUROPE NUCL ENERGY AGENCY, MAY
29-JUNE 2, 1967, PP 591-605, 1967. 15 P, 33 REF.

DESCRIPTORS:

*INJECTION WELLS, *RADIOACTIVE WASTE DISPOSAL, UNITED STATES,
OBSERVATION WELLS, PUMPING, SAFETY, WATER QUALITY, AQUIFERS,
AQUICLUSES, AQUIFER CHARACTERISTICS, MATHEMATICAL MODELS.

IDENTIFIERS:

WASTE GAS INJECTION.

ABSTRACT:

THE BASIC TECHNOLOGY FOR DEEPWELL DISPOSAL OF LIQUID WASTES DEVELOPED
AND USED BY THE PETROLEUM INDUSTRY AND ADAPTED BY THE CHEMICAL INDUSTRY
IS DISCUSSED. REQUIREMENTS FOR DISPOSAL OF RADIOACTIVE WASTES INCLUDE
AN UNDERSTANDING OF PHYSICAL AND GEOLOGIC CHARACTERISTICS OF THE
DISPOSAL RESERVOIR, EFFECTS OF CHEMICAL REACTIONS BETWEEN WASTE AND
RESERVOIR ROCK, AND HYDRAULIC EFFECTS OF LONG-TERM INJECTION ON RATE
AND DIRECTION OF MASS TRANSPORT AND INTEGRITY OF GEOLOGIC UNITS
BOUNDING THE DISPOSAL RESERVOIR. DEEP-WELL DISPOSAL IS NOT FEASIBLE AT
MANY EXISTING WASTE-GENERATING SITES BECAUSE OF UNSUITABLE GEOLOGIC
ENVIRONMENTS. GAS INJECTION RESEARCH CONCERNS RAPID DISPOSAL OF
RELATIVELY LARGE VOLUMES OF FISSION-PRODUCTS INTO WATER-SATURATED OR
UNSATURATED ROCKS. MATHEMATICAL MODELS OF GAS FLOW, DEFINITION OF THE
PROBLEMS OF DISPERSION, LABORATORY STUDIES OF GAS SORPTION ON EARTH
MATERIALS, THE ROLE OF BAROMETRIC CHANGES IN BRINGING INJECTED GASES
BACK INTO THE ATMOSPHERE, ENGINEERING AND ECONOMIC EVALUATIONS, AND
FIELD TESTS OF THE METHOD HAVE ALL BEEN STUDIED. AS A SAFEGUARD FOR THE
RAPID DISPOSAL OF FISSION-PRODUCT GASES AND OTHER GASES AFTER MAJOR
REACTOR ACCIDENT, THE INJECTION METHOD IS SEVERELY LIMITED IN SATURATED
ROCKS BY DEPENDENCE ON FAVORABLE HYDROGEOLOGIC CONDITIONS, THE NEED TO
PREPARE THE DISPOSAL RESERVOIR IN ADVANCE AND MAINTAIN IT BY CONTINUOUS
INJECTION OF AIR, AND THE COST. THE PROSPECTS ARE BETTER FOR USING THE
METHOD IN UNSATURATED ROCKS AND FOR ROUTINE DISPOSAL OF WASTE GASES
THAT CAN BE SEPARATED AS A LOW-VOLUME STREAM. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W69-02688

SCIENTIFIC PREREQUISITES FOR UTILIZING DEEP-LYING FORMATIONS FOR BURYING LIQUID RADIOACTIVE WASTES,

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT FIZICHESKOI KHIMII.

V. I. SPITSYN, M. K. PIMENOV AND F. P. YUDIN.

PROC OF SYMP, INT AT ENERGY AGENCY, VIENNA, AND EUROPE NUCL ENERGY AGENCY, MAY 29-JUNE 2, 1967, PP 563-576, 1967. 14 P, 2 FIG, DISCUSS.

DESCRIPTORS:

*INJECTION WELLS, *RADIOACTIVE WASTE DISPOSAL, OBSERVATION WELLS, PUMPING, SAFETY, WATER QUALITY, AQUIFERS, AQUICLUSES, AQUIFER CHARACTERISTICS.

ABSTRACT:

THE SOVIET UNION IS PURSUING SEVERAL LINES OF RESEARCH ON DISPOSAL OF LIQUID RADIOACTIVE WASTES, INCLUDING THE INJECTION OF WASTES INTO DEEP GEOLOGICAL FORMATIONS. THE USE OF POROUS WATER-BEARING STRATA IN THE EARTH'S CRUST FAR ENOUGH BELOW THE SURFACE AND ISOLATED ABOVE AND BELOW BY THICK STRATA OF SPECIES THAT ARE IMPERMEABLE TO WATER IS CONSIDERED. THE MAIN FEATURES AND METHODS OF HYDROGEOLOGICAL SURVEYING AND THE VARIOUS RESEARCH PROJECTS THAT ARE NECESSARY TO ENSURE HEALTH AND RADIATION SAFETY ARE DESCRIBED, AND A NUMBER OF QUESTIONS RELATING TO THE PHYSICO-CHEMICAL PROCESSES WHICH OCCUR IN ABSORBING STRATA WHEN RADIOACTIVE WASTE IS INJECTED INTO THEM ARE CONSIDERED. THE PROCESSES DISCUSSED INCLUDE MIGRATION, RADIOLYSIS, EVOLUTION OF GAS AND HEATING OF THE SURROUNDING MEDIUM. IT IS SHOWN THAT, UNDER PARTICULAR GEOLOGICAL CONDITIONS, DEEP BURIAL OF RADIOACTIVE WASTE AFFORDS A PROMISING MEANS OF DISPOSAL THAT ENSURES HEALTH AND RADIATION SAFETY AND IS AT THE SAME TIME ECONOMICALLY ADVANTAGEOUS. IT IS ALSO DEMONSTRATED THAT THE WASTE IS DISTRIBUTED OVER A LIMITED AREA OF THE STRATUM, WHICH INVOLVES NO SERIOUS CHANGES IN THE HYDROGEOLOGICAL PATTERN OF THE REGION AND SO DOES NOT PREVENT THE FORMATION FROM BEING USED FOR OTHER PURPOSES. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W69-02692

MATHEMATICAL MODEL FOR UNDERGROUND DISCHARGE OF RADIOACTIVE GASES,

BATTELLE-NORTHWEST, RICHLAND, WASH. PACIFIC NORTHWEST LAB.

L. G. KING.

BATTELLE-PACIFIC NORTHWEST LAB REP, 21 P, MAR 1967.

DESCRIPTORS:

*MATHEMATICAL MODEL, *RADIOACTIVE WASTE DISPOSAL, *GASES, UNDERGROUND STORAGE, METHODOLOGY, STEADY FLOW, HOMOGENEITY, INJECTION WELLS, DARCYS LAW, SOIL MOISTURE.

IDENTIFIERS:

*RADIOACTIVE GASES, ISOTHERMAL FLOW, SYMMETRIC SYSTEM.

ABSTRACT:

INJECTION OF RADIOACTIVE GAS INTO THE PARTIALLY SATURATED SECTION ABOVE THE WATER TABLE WAS INVESTIGATED WITH MATHEMATICAL MODELS. ONE MODEL WAS USED DURING INJECTION AND ANOTHER AFTER CESSATION OF INJECTION. ASSUMPTIONS MADE WERE: THE GAS OBEYS THE DARCY EQUATION, SOIL MOISTURE IS IMMOBILE, FLOW IS ISOTHERMAL AND STEADY, SOIL IS HOMOGENEOUS AND ISOTROPIC, SOIL MOISTURE CONTENT IS UNIFORM, EQUATION OF STATE FOR DRY AIR IS SUFFICIENT TO DESCRIBE THE GAS, THE GAS IS COMPRESSIBLE, AND THE SYSTEM IS SYMMETRIC ABOUT THE AXIS OF THE INJECTION WELL. CALCULATED AND MEASURED VALUES WERE FOUND TO BE IN SATISFACTORY AGREEMENT.
(LANG-USGS)

FIELD 05B, 05E

ACCESSION NO. W69-02813

EXPERIENCE IN BURIAL OF LIQUID RADIOACTIVE WASTES IN DEEP GEOLOGICAL FORMATIONS,

F. P. YUDIN, M. K. PIMENOV, AND A. I. NAZAROV.

TRANSLATION FROM ATOMNAYA ENERGIYA, VOL 25, NO 2, PP 128-133, AUG 1968. U S
JOINT PUBLICATION RES SERV, PUB NO 46535, 10 P, SEPT 26, 1968. 1 FIG, 1
TAB, 10 REF.

DESCRIPTORS:

*RADIOACTIVE WASTE DISPOSAL, *INJECTION WELLS, RESEARCH AND
DEVELOPMENT, GEOHYDROLOGIC UNITS, HYDROLOGIC ASPECTS, ECONOMIC
FEASIBILITY.

IDENTIFIERS:

*USSR, *HYDROGEOLOGICAL CONDITIONS, RUSSIAN PLATFORM(GEOLOGIC).

ABSTRACT:

INVESTIGATIONS CONDUCTED ON THE DISPOSAL OF RADIOACTIVE WASTES BY
INJECTION WELLS IN LOWER CARBONIFEROUS SANDSTONES OF THE RUSSIAN
PLATFORM SHOW THAT INJECTION IS ECONOMICALLY FEASIBLE ON INDUSTRIAL
SCALES UNDER FAVORABLE GEOHYDROLOGICAL CONDITIONS. THE TOP OF THE
INJECTION ZONE IS AT A DEPTH OF 1,432 M AND ITS BOTTOM IS AT 1,508 M.
THE FORMATION WATER HAS A TOTAL DISSOLVED SOLIDS CONTENT OF 245 G/L,
MAINLY OF SODIUM AND CHLORIDE. THE ZONE HAS ALMOST NO HYDRAULIC
CONNECTION WITH OVERLYING AQUIFERS; IT IS SEPARATED FROM THEM BY A
MINIMUM OF 40 M OF CLAY. THE INJECTION WELL MAY BE FLUSHED BY PUMPING,
AND THE RADIOACTIVE WATER PUMPED OUT IS FILTERED AND RETURNED TO THE
WELL. OBSERVATION WELLS ARE 100, 500, 1300, AND 550 M FROM THE
INJECTION WELL. INJECTION AT 100-150 CU M PER DAY FOR A TOTAL OF 40,000
CU M DID NOT RESULT IN ANY DETECTED RADIOACTIVITY AT ANY OBSERVATION
WELL. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-03061

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. ORADOVSKAYA.

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

FEASIBILITY CRITERIA FOR SUBSURFACE WASTE DISPOSAL IN ILLINOIS,

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.

ROBERT E. BERGSTROM.

GROUND WATER, J TECH DIV NAT WATER WELL ASS, VOL 6, NO 5, PP 5-9, SEPT-OCT 1968. 5 P, 3 FIG, 1 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *ILLINOIS, AQUIFERS, AQUICLUDES, WELL REGULATIONS, WATER RESOURCES, GROUNDWATER.

IDENTIFIERS:

*SUBSURFACE WASTE DISPOSAL, FEASIBILITY INVESTIGATIONS.

ABSTRACT:

THE CRITERIA FOR FEASIBILITY OF WASTE DISPOSAL BY INJECTION WELLS IN ILLINOIS AND THE SUITABILITY OF VARIOUS GEOLOGIC FORMATIONS FOR DISPOSAL ARE REVIEWED. FAVORABLE GEOHYDROLOGIC CONDITIONS--SPECIFICALLY THE PRESENCE OF A VARIETY OF PERMEABLE FORMATIONS THAT CONTAIN NONPOTABLE WATER AND ARE WELL CONFINED FROM SHALLOW TO GREAT DEPTH - MAKE WASTE DISPOSAL BY WELLS FEASIBLE IN MUCH OF THE SOUTHERN TWO-THIRDS OF ILLINOIS. NATURAL SAFEGUARDS PERMIT DISPOSAL WELLS TO BE PLANNED WITH CONVENTIONAL ENGINEERING PRECAUTIONS AND ONLY A MINIMAL PROGRAM OF PREOPERATIONAL TESTING. IN MUCH OF THE NORTHERN THIRD OF THE STATE, THE PERMEABLE ROCKS CONTAIN POTABLE WATER TO GREAT DEPTH, AND THERE IS MODERATE TO HIGH DEVELOPMENT OF THE GROUNDWATER RESOURCE BECAUSE OF URBAN AND INDUSTRIAL CONCENTRATION. EXHAUSTIVE TESTING, SUBSTANTIAL PROOF OF ACCEPTABLE SITE CONDITIONS, AND INCORPORATION OF OPTIMUM ENGINEERING SAFEGUARDS ARE CONSIDERED NECESSARY BEFORE THE STATE REGULATORY AGENCY CAN AUTHORIZE INSTALLATION. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-03251

ROCK MECHANICS IN THE DISPOSAL OF RADIOACTIVE WASTES BY HYDRAULIC FRACTURING,
OAK RIDGE NATIONAL LAB., OAK RIDGE, TENN. HEALTH PHYSICS DIV.

W. C. MCCLAIN.

FELSMETRIK UND INGENIEURGEOL, J INT SOC ROCK MECH, VOL 6, NO 3, PP 139-161,
1968. 23 P, 11 FIG, 2 TAB, 16 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, *ROCK MECHANICS,
*FRACTURES(GEOLOGY), PERMEABILITY, POROSITY, STRESS.

IDENTIFIERS:

*HYDRAULIC FRACTURING.

ABSTRACT:

THE ULTIMATE CAPACITY OF A HYDRAULIC-FRACTURING WASTE DISPOSAL FACILITY IS GOVERNED PRIMARILY BY THE INTEGRITY OF THE ROCKS OVERLYING THE INJECTED WASTES. THE OBJECTIVE OF THE STUDY WAS TO ANALYZE THEORETICALLY THE STRESSES AND STRAINS GENERATED BY THE INJECTED WASTES SO THAT THE FAILURE MECHANISM COULD BE PREDICTED AND THE CAPACITY OF THE INJECTION WELL ESTIMATED. THE SURFACE UPLIFTS AT OAK RIDGE NATIONAL LABORATORY'S FRACTURING SITE WERE COMPARED WITH THEORETICAL CURVES OBTAINED BY ASSUMING THE UPLIFTS TO BE INVERSELY ANALOGOUS TO THE SUBSIDENCE WHICH OCCURS OVER MINING EXCAVATIONS. THE MOST PROBABLY MECHANISM OF FAILURE OF THE ROCK APPEARS TO BE BY THE FORMATION OF A VERTICAL INSTEAD OF A HORIZONTAL FRACTURE. FRACTURE ORIENTATION IS CONTROLLED PRIMARILY BY THE ORIENTATION OF THE PRINCIPAL STRESS FIELD IN THE ROCK. EACH SUCCESSIVE WASTE INJECTION SLIGHTLY MODIFIES THIS STRESS FIELD TOWARD A CONDITION MORE FAVORABLE TO THE FORMATION OF A VERTICAL FRACTURE. THE EFFECT OF REPEATED INJECTIONS WAS EVALUATED FOR VARIOUS ASSUMED ORIGINAL STRESSES AND THE MINIMUM ULTIMATE CAPACITY OF THE FORMATION WAS ESTIMATED AS 4 MILLION GAL. IT IS ALSO POSSIBLE TO MAKE RECOMMENDATIONS TO AVOID, AS FAR AS POSSIBLE, THE CONDITIONS LEADING TO FAILURE AND IN THIS WAY INCREASE THE FORMATION CAPACITY.

FIELD 08E, 02F, 05E

ACCESSION NO. W69-03522

WASTEWATER REUSE,

NEW YORK STATE DEPT. OF HEALTH, ALBANY. ENVIRONMENTAL HEALTH SERVICES
RESEARCH UNIT.

D. B. STEVENS.

J WATER POLLUT CONTR FEDERATION, VOL 40, NO 4, PP 677-683, APR 1968. 7 P, 2
FIG, 1 TAB, 15 REF.

DESCRIPTORS:

*WATER REUSE, NEW YORK, RECHARGE, INJECTION WELLS, ARTESIAN WELLS,
AQUIFERS, GROUNDWATER MOVEMENT, TERTIARY TREATMENT.

IDENTIFIERS:

LONG ISLAND(NEW YORK).

ABSTRACT:

IN THE POPULATION-CONCENTRATED EAST, WASTEWATER REUSE IS A NECESSITY
SIMPLY BECAUSE THERE IS NO SPACE WHERE WASTEWATER CAN BE DUMPED WITHOUT
AFFECTING WATER RESOURCES. NEW YORK STATE'S PROGRAM OF GROUNDWATER
RECHARGE AND TERTIARY TREATMENT OF WASTEWATER FOR GROUND INJECTION IS A
PLAN TO UTILIZE WASTEWATER AS A SOURCE OF SUPPLEMENTAL WATER SUPPLY. A
BACKGROUND OF THE PROBLEM IS DISCUSSED WITH A DESCRIPTION OF CURRENT
OPERATIONS AND FUTURE PLANS. HIGHEST-QUALITY EFFLUENTS WITH ULTIMATE
WASTE DISPOSAL ARE CONSIDERED.

FIELD 05D

ACCESSION NO. W69-03716

SOME BASIC FACTORS IN THE CONSIDERATION AND INSTALLATION OF DEEP WELL DISPOSAL SYSTEMS,

DOW CHEMICAL CO., MIDLAND, MICH.

J. S. TALBOT.

WATER AND SEWAGE WORKS, REFERENCE NO 1968, PP R213-R219, NOV 29, 1968. 7 P, 9 FIG, 4 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, LEGAL ASPECTS, SOCIAL ASPECTS, PUBLIC RIGHTS, GEOLOGY, HYDROLOGIC ASPECTS, WATER RESOURCES, WATER POLLUTION, GROUNDWATER MOVEMENT.

IDENTIFIERS:

DISPOSAL WELLS, PUBLIC RELATIONS.

ABSTRACT:

THE BASIC DISPOSAL FACTORS OF DEEP INJECTION WELLS AND THE HAZARDS OF WELL DISPOSAL ARE DISCUSSED WITH PARTICULAR ATTENTION TO PREVENTION OF DAMAGE TO POTABLE GROUNDWATER, COMMERCIAL MINERAL DEPOSITS, AND MINING ACTIVITIES. ECONOMIC, PUBLIC RELATIONS, AND LEGAL FACTORS ARE ALSO MAJOR CONSIDERATIONS FOR ANY WASTE DISPOSAL TECHNIQUES. MOST STATE AND FEDERAL LAWS EITHER ENCOURAGE OR DO NOT DISCOURAGE DEEP WELL DISPOSAL, BUT THE LEGAL ASPECTS OF TRESPASS ON UNDERGROUND PROPERTY AND DAMAGES TO PROPERTY BY DISPOSAL NEED LEGAL CLARIFICATION. WELL DESIGN AND SURFACE EQUIPMENT FOR DEEP WELL DISPOSAL ARE DESCRIBED. A METHOD FOR CALCULATING THE RADIUS OF INJECTION AND FORMATION CAPACITY FOR INJECTION IS GIVEN. GEOLOGICAL HAZARDS WHICH MIGHT CAUSE CONTAMINATION OF POTABLE WATER ARE BRIEFLY DESCRIBED. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W69-04228

TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,

MISSISSIPPI STATE UNIV., STATE COLLEGE. DEPT. OF SANITARY ENGINEERING.

ADNAN SHINDALA.

WATER AND SEWAGE WORKS, REFERENCE NO 1968, PP R210-R212, NOV 29, 1968. 3 P,
20 REF.

DESCRIPTORS:

*RADIOACTIVE WASTE DISPOSAL, *WASTE TREATMENT, EVAPORATION, CONCRETE MIXES, ADSORPTION, BURNING, INJECTION WELLS, STORAGE, DISPERSION, WASTE DILUTION, WASTE STORAGE.

IDENTIFIERS:

WASTE BURIAL, RADIOACTIVE WASTE STORAGE TANKS, DISPOSAL WELLS, RADIOACTIVE WASTE DECAY.

ABSTRACT:

RADIOACTIVE WASTES MAY BE TREATED AND DISPOSED OF BY CONCENTRATION AND STORAGE, DILUTION AND DISPERSION, AND STORAGE FOR DECAY. LIQUID WASTES MUST BE FIXED IN INERT SOLIDS TO PREVENT CONTAMINATION OF WATER. THEY MAY BE MADE INTO CONCRETE, DISSOLVED IN NON-LEACHABLE GLASS, CALCINED IN ALUMINUM NITRATE, ADSORBED ON CLAY, AND FUSED INTO CERAMIC GLAZE. THE MOST COMMONLY USED PROCESS IS FIXATION IN CONCRETE AND BURIAL. ION EXCHANGE EXTRACTION AND EVAPORATION ARE USED FOR RADIOACTIVE WASTE CONCENTRATION FOR MORE EFFICIENT HANDLING. DEEP WELL INJECTION ALLOWS VERY LONG-TERM DETENTION WHILE RADIOACTIVITY DECAYS. HYDRAULIC FRACTURING ALLOWS INJECTION INTO OTHERWISE IMPERMEABLE ROCKS SUCH AS SHALE, AND CAVITIES MAY BE DISSOLVED IN SALT BEDS FOR WASTE STORAGE. SEVERAL EXAMPLES OF RADIOACTIVE WASTE DISPOSAL SYSTEMS NOW IN OPERATION ARE BRIEFLY DESCRIBED. (KNAPP-USGS)

FIELD 05E, 05D

ACCESSION NO. W69-04229

FLUID MECHANICS OF DEEP-WELL DISPOSALS,

DEGOLYER AND MACNAUGHTON, DALLAS, TEX.

A. F. VAN EVERDINGEN.

AMER ASS PETROL GEOL MEM NO 10, PP 32-42, AUG 1968. 11 P, 3 FIG, 3 TAB, 7
REF, 1 APPEND.

DESCRIPTORS:

*FLUID MECHANICS, *GROUNDWATER MOVEMENT, *INJECTION WELLS, POROUS
MEDIA, WASTE DISPOSAL, GROUNDWATER BASINS, GEOLOGIC FORMATIONS,
AQUIFERS, PRESSURE HEAD, HYDROSTATIC PRESSURE, POROSITY, PERMEABILITY,
FRACTURES(GEOLOGY).

IDENTIFIERS:

INDUSTRIAL WASTE INJECTION WELLS, WELL STIMULATION, HYDRAULIC
FRACTURING, ACIDIZING, WELL SHOOTING, RESERVOIR PRESSURE.

ABSTRACT:

THE FUNDAMENTAL LAW WHICH GOVERNS THE FLOW OF SLIGHTLY COMPRESSIBLE
FLUIDS IN PERMEABLE FORMATIONS WAS USED TO COMPUTE THREE UNIT FUNCTIONS
USEFUL IN WELL OR RESERVOIR ANALYSIS. THESE UNIT FUNCTIONS GIVE
QUANTITATIVE INFORMATION ON (1) THE CHANGE OF PRESSURE IN THE WELL OR
FORMATION AS A RESULT OF UNIT RATE OF INJECTION DURING A PERIOD OF
TIME, (2) THE AMOUNT OF FLUID WHICH CAN BE DISPOSED OF PER UNIT
PRESSURE INCREASE IN A GIVEN TIME, AND (3) THE EFFECT OF AN ENLARGED
BOREHOLE ON THE INJECTION PRESSURE. ACCURATE PREDICTION OF PRESSURES
AND PRESSURE CHANGES IS NOW POSSIBLE PROVIDED SUFFICIENT INFORMATION IS
AVAILABLE ON THE PHYSICAL CHARACTERISTICS OF THE FORMATION, THE
FORMATION FLUIDS, AND THE INJECTED FLUIDS. THE NUMERICAL VALUES OF
THESE CHARACTERISTICS CAN VARY CONSIDERABLY. TO SIMPLIFY COMPUTATIONS,
CONVERSION FACTORS ARE USED SO THAT THE SOLUTIONS GIVEN HERE CAN BE
USED TO SOLVE MOST OF THE PROBLEMS IRRESPECTIVE OF THE NUMERICAL VALUES
OF THE CHARACTERISTICS ENCOUNTERED. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04928

SUBSURFACE DISPOSAL OF LIQUID INDUSTRIAL WASTES BY DEEP-WELL INJECTION,

ROBERT A. TAFT SANITARY ENGINEERING CENTER, CINCINNATI, OHIO. CINCINNATI
WATER RESEARCH LAB.

DON L. WARNER.

AMER ASS PETROL GEOL MEM NO. 10, PP 11-20, AUG 1968. 10 P, 2 FIG, 58 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, *LIQUID WASTES, GEOLOGIC FORMATIONS,
SANDSTONES, LIMESTONES, DOLOMITE, GROUNDWATER BASINS.

IDENTIFIERS:

INDUSTRIAL WASTE INJECTION WELLS.

ABSTRACT:

DEEP-WELL INJECTION OF CONCENTRATED, RELATIVELY UNTREATABLE LIQUID
WASTES IS DISCUSSED. THE FEASIBILITY OF DEEP-WELL INJECTION IS
DETERMINED BY STUDY OF SITE SUITABILITY, WASTE CHARACTERISTICS,
ECONOMICS, AND LEGAL FACTORS. CAREFUL GEOLOGIC EVALUATION IS NECESSARY
TO DETERMINE SITE SUITABILITY, ECONOMICS, AND SUITABILITY OF THE WASTE
FOR INJECTION. AT LEAST 110 DEEP INDUSTRIAL INJECTION WELLS ARE
PRESENTLY IN USE, INJECTING VARIOUS WASTES AT WIDELY DIFFERENT RATES
AND PRESSURES INTO SUBSURFACE RESERVOIRS, RANGING IN AGE FROM
PLEISTOCENE TO PRECAMBRIAN. MOST OF THE RESERVOIR ROCKS USED ARE
SANDSTONES, LIMESTONES, AND DOLOMITES. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04941

IMPORTANCE OF DEEP PERMEABLE DISPOSAL FORMATIONS IN LOCATION OF A LARGE
NUCLEAR-FUEL REPROCESSING PLANT,

OAK RIDGE NATIONAL LAB., OAK RIDGE, TENN. HEALTH PHYSICS DIV.

WALLACE DE LAGUNA.

AMER ASS PETROL GEOL MEM NO 10, PP 21-31, AUG 1968. 11 P, 3 TAB, 11 REF.

DESCRIPTORS:

*RADIOACTIVE WASTE DISPOSAL, *INJECTION WELLS, GEOLOGIC FORMATIONS,
AQUIFERS, MINING, RADIOACTIVE WASTES, SHALES, FRACTURES(GEOLOGY),
HYDRAULIC PROPERTIES, NUCLEAR WASTES.

IDENTIFIERS:

*HYDRAULIC FRACTURING, SALT BEDS, KRYPTON-85, HIGH-LEVEL WASTES,
LOW-LEVEL WASTES.

ABSTRACT:

THE MOST IMPORTANT DISPOSAL PROBLEM IN LOCATION OF A LARGE NUCLEAR-FUEL REPROCESSING PLANT IS THAT OF LOW-LEVEL WASTE. DISPOSAL INTO LARGE BODIES OF SURFACE WATER WAS ONCE COMMON, BUT UNDERGROUND DISPOSAL INTO DEEP PERMEABLE FORMATIONS SEEMS TO OFFER THE BEST POSSIBILITIES FOR DISPOSAL OF LOW-LEVEL WASTE. THE BEST METHOD FOR DISPOSAL OF MEDIUM-LEVEL WASTE IS INTO HYDRAULICALLY FRACTURED SHALE, WHICH IS GENERALLY FOUND IN BASIN AREAS. A FAVORED METHOD FOR DISPOSAL OF HIGH-LEVEL WASTE IS STORAGE IN SOLID FORM IN MINED CAVITIES IN SALT. THUS THE SELECTION OF A SITE THAT ALSO HAS SALT BEDS IS ADVANTAGEOUS, BUT NOT REQUIRED, BECAUSE ALTERNATE MEANS FOR DISPOSAL OF HIGH-LEVEL WASTE CAN BE FOUND. MAXIMUM PERMISSIBLE CONCENTRATIONS OF RADIOACTIVE NUCLIDES IN AIR AND WATER HAVE BEEN DETERMINED. AS MORE INFORMATION IS GAINED, THE VALUES MAY BE INCREASED OR DECREASED, AND THUS MAY ALTER THE REQUIREMENTS FOR A PLANT SITE. DISPOSAL OF RADIOACTIVE WASTES INTO DEEP PERMEABLE FORMATIONS IS NOW PRACTICABLE ONLY FOR LOW-LEVEL WASTE, BUT IT HOLDS POTENTIAL FOR DISPOSAL OF CERTAIN MEDIUM- AND HIGH-LEVEL WASTES, AND ALSO OF SUCH GASEOUS WASTES AS KRYPTON-85. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04942

POSSIBILITIES FOR DISPOSAL OF INDUSTRIAL WASTES IN SUBSURFACE ROCKS OF NORTH
FLANK OF APPALACHIAN BASIN IN NEW YORK,

SHELL CANADIAN EXPLORATION CO., HOUSTON, TEX.; TIDEWATER OIL CO., PITTSBURGH,
PA.; CONSOLIDATED GAS SUPPLY CORP., CLARKSBURG, W. VA.

THOMAS P. MCCANN, NORMAN C. PRIVRASKY, FREDERICK L. STEAD, AND JAMES E.
WILSON.

AMER ASS PETROL GEOL MEM NO 10, PP 43-92, AUG 1968. 49 P, 29 FIG, 2 TAB, 148
REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *NEW YORK, GEOLOGIC FORMATIONS,
GROUNDWATER BASINS, SANDSTONES, SHALES, FRACTURES(GEOLOGY), AQUIFERS,
POROSITY, PERMEABILITY.

IDENTIFIERS:

INDUSTRIAL WASTE INJECTION WELLS, APPALACHIAN BASIN9NY0, HYDRAULIC
FRACTURING, POTSDAM SANDSTONE, THERESA SANDSTONE, SALT BEDS.

ABSTRACT:

THE NORTH FLANK OF THE APPALACHIAN BASIN IN NEW YORK WAS STUDIED TO
DETERMINE THE SUITABILITY OF THE REGION FOR SUBSURFACE DISPOSAL OF
INDUSTRIAL WASTES, PARTICULARLY LIQUID WASTES. PERMEABLE SANDSTONE,
SALT BEDS THAT CAN PROVIDE LEAK-PROOF MAN MADE CAVERNS, AND SHALE THAT
CAN CONTAIN FLUIDS IN ARTIFICIALLY PRODUCED FRACTURES ARE ESPECIALLY
SIGNIFICANT. SUBSURFACE STRATE DIP SOUTHWARD AT RATES BETWEEN 50 AND
160 FT/MI. LOCAL DEFORMATIONS SUCH AS LOW-RELIEF ANTICLINES AND SMALL
DISPLACEMENT FAULTS ARE FEW. POTENTIAL RESERVOIRS FOR INJECTION OF
LIQUIDS ARE THE CAMBRIAN POTSDAM SANDSTONE, WITH 100 FT AND THE
CAMBRIAN THERESA SANDSTONE WITH A THICKNESS RANGE FROM 0 TO 1,500 FT.
DRILLING DEPTHS TO THE POTSDAM SANDSTONE, THE LOWEST POTENTIAL
RESERVOIR, RANGE FROM 1,000 TO 12,600 FT. OTHER POSSIBLE SANDSTONE
RESERVOIRS ARE PRESENT IN THE SILURIAN AND DEVONIAN SYSTEMS, BUT HAVE
LESS POTENTIAL BECAUSE OF VAGARIES IN POROSITY AND PERMEABILITY AND
BECAUSE OF THE POSSIBILITY OF LEAKAGE FROM NUMEROUS UNRECORDED BORINGS
IN THE SHALLOWER STRATA. SALT BEDS IN SILURIAN ROCKS AT DEPTHS BETWEEN
500 AND 4,000 FT OFFER SITES FOR CONSTRUCTION OF STORAGE CAVITIES.
SHALE SECTIONS THAT APPEAR TO BE SUITABLE FOR STORAGE OF GROUTED WASTES
IN HYDRAULICALLY PRODUCED FRACTURES ARE PRESENT IN UPPER DEVONIAN AND
UPPER ORDOVICIAN STRATA. THERE ARE THINNER SECTIONS OF POSSIBLE
INTEREST FOR THE SAME USE IN SILURIAN AND MIDDLE ORDOVICIAN ROCKS.
(KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04943

POSSIBILITIES FOR SUBSURFACE WASTE DISPOSAL IN A STRUCTURAL SYNCLINE IN PENNSYLVANIA,

PRINCETON UNIV., N. J. DEPT. OF GEOLOGICAL ENGINEERING; ATOMIC ENERGY COMMISSION, WASHINGTON, D. C.

JOHN E. HARDAWAY.

AMER ASS PETROL GEOL MEM NO 10, PP 93-127, AUG 1968. 35 P, 14 FIG, 4 TAB, 99 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *PENNSYLVANIA, GEOLOGIC FORMATIONS, GROUNDWATER BASINS, SANDSTONES, SHALES, FRACTURES(GEOLOGY), AQUIFERS, POROSITY, PERMEABILITY.

IDENTIFIERS:

INDUSTRIAL WASTE INJECTION WELLS, BEDFORD(PA), SYNCLINES, HYDRAULIC FRACTURING.

ABSTRACT:

RESULTS OF A STUDY OF A SMALL STRUCTURAL SYNCLINE ON THE WESTERN PERIMETER OF THE CENTRAL APPALACHIAN MOUNTAINS OF PENNSYLVANIA SUGGEST THAT THE AREA MAY BE SUITABLE FOR THE INJECTION OF LIQUID WASTES INTO DEEP SUBSURFACE RESERVOIRS. THE BOWL-SHAPED SYNCLINE FORMS A BASIN JUST NORTH OF BEDFORD, BEDFORD COUNTY, AND OCCUPIES ABOUT 45 SQ MI (116.5 SQ KM) OF THE COUNTY. THE TOTAL THICKNESS OF PALEOZOIC STRATA IS MORE THAN 7,000 FT (2,134 M). THE RESERVOIR AQUIFER CONSIDERED SUITABLE FOR DISPOSAL IS THE LOWER SILURIAN TUSCARORA SANDSTONE, A CLEAN QUARTZOSE SANDSTONE. THE INVESTIGATION SHOWED THAT THE SYNCLINE HAS SUFFICIENT STRUCTURAL CLOSURE TO WARRANT CONSIDERATION AS A RESERVOIR. THE SELECTED SANDSTONE AQUIFER CROPS OUT ALONG TWO-THIRDS OF THE SYNCLINE'S PERIMETER AND IS APPROXIMATELY 3,700 FT (1,128 M) BENEATH THE CENTER OF THE BASIN. IT APPARENTLY IS NOT FAULTED, AND IT MAY BE TREATED AS A CONFINED AQUIFER BECAUSE IT IS BOUNDED BY SHALE AND SHALY, SILTY SANDSTONE WHICH PROBABLY HAVE MUCH LOWER PERMEABILITY. POROSITY MEASUREMENTS OF TUSCARORA AND JUNIATA SANDSTONES GAVE VALUES OF 15 AND 10 PERCENT, RESPECTIVELY. THE PROBABILITY OF THE PRESENCE OF CONNATE BRINE IN THE TUSCARORA IS ENHANCED BY THE FACT THAT IT IS PRESENT IN A DEEP WELL NEAR BEDFORD. THE TUSCARORA STRATA ARE DESCRIBED AS A 'SALAQUIFER' WHICH WILL NOT PROMOTE HARMFUL CHEMICAL INTERACTIONS. THE SHALE BEDS OF THE AREA WERE STUDIED SIMILARLY AND ARE REGARDED AS FAVORABLE FOR THE INJECTION, INTO ARTIFICIALLY CREATED FRACTURES, OF WASTES THAT HAVE BEEN INCORPORATED IN CEMENT SLURRIES. HOWEVER, GROUTING IN SHALE APPEARS LESS PROMISING FOR LARGE-SCALE INJECTION THAN DISPOSAL IN PERMEABLE SANDSTONE. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04944

GEOLOGY OF SUBSURFACE WASTE DISPOSAL IN MICHIGAN BASIN,

MICHIGAN UNIV, ANN ARBOR.

LOUIS L. BRIGGS, JR.

AMER ASS PETROL GEOL MEM NO 10, PP 128-153, AUG 1968. 26 P, 18 FIG, 3 TAB, 12 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *MICHIGAN, GROUNDWATER BASINS, GEOLOGIC FORMATIONS, AQUIFERS, SANDSTONES, LIMESTONES, SHALES, POROSITY, PERMEABILITY, FRACTURES(GEOLOGY).

IDENTIFIERS:

MICHIGAN BASIN, INDUSTRIAL WASTE INJECTION WELLS, SYNCLINES, SALT BEDS.

ABSTRACT:

A STUDY WAS MADE OF THE SUITABILITY OF ROCKS IN THE MICHIGAN BASIN FOR DISPOSAL OF WASTE BY INJECTION WELLS. THE ALMOST CIRCULAR AND SYMMETRICAL STRUCTURAL BASIN CONTAINS IN THE DEEPEST PART APPROXIMATELY 14,000 FT OF PALEOZOIC SEDIMENTARY ROCKS. THE AUTOGEOSYNCLINE DEVELOPED AS A TECTONIC ELEMENT IN LATE SILURIAN TIME, DURING WHICH THE MIDDLE THIRD OF THE SEDIMENTARY SECTION WAS DEPOSITED. THE STRATO DIP GENERALLY LESS THAN 1 DEG TOWARD THE CENTER OF THE BASIN, ALTHOUGH LOCALLY THERE ARE GENTLE OPEN FOLDS AND A FEW HIGH-ANGLE FULTS. THE SEDIMENTARY FORMATIONS CAN BE CLASSIFIED INTO 4 GENERALIZED SEQUENCES (1) THE SANDSTONE SEQUENCE OF THE CAMBRIAN, (2) THE CARBONATE-EVAPORITE SEQUENCE OF THE ORDOVICIAN TO MIDDLE DEVONIAN, (3) THE SHALE-SANDSTONE SEQUENCE OF THE LATE DEVONAIN TO MISSISSIPPIAN, AND (4) THE COAL-BEARING SEQUENCE OF THE PENNSYLVANIAN. THE CAMBRIAN SANSTONES (MOUNT SIMON) HAVE THE MOST FAVORABLE PROPERTIES FOR HIGH-VOLUME LIQUID-WASTE DISPOSAL. THEY ARE SUTIABLE THICK AND REASONABLE SHALLOW PRINCIPALLY IN SOUTHEASTERN MICHIGAN NEAR DETROIT. THE MOUNT SIMON IS A TYPICAL BLANKET FELDSPATHIC, QUARTZOSE SANDSTONE; IT IS CHARACTERIZED BY QUARTZ AND FELDSPAR CEMENT, PRESENT AS GRAIN OVERGROWTHS, AND DETRITAL AND MATRIX CARBONATE MINERALS. WHERE MEASURED, THE POROSITY AVERAGES ABOUT 10% AND THE PERMEABILITY ABOUT 30 MD. THE CAMBRIAN SANDSTONE BEDS ARE OVERLAIN BY A THICK, EXTENSIVE SHALE LAYER (UTICA) AND SALT BEDS (SALINA), WHICH ARE OF SECONDARY IMPORTANCE TO LIQUID- AND SOLID-WASTE DISPOSAL. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04945

SUBSURFACE WASTE-DISPOSAL POTENTIAL IN SALINA BASIN OF KANSAS,

AUGUSTANA COLL., ROCK ISLAND, ILL.; KANSAS STATE GEOLOGICAL SURVEY, LAWRENCE.

R. W. EDMUND, AND EDWIN D. GOEBEL.

AMER ASS PETROL GEOL MEM NO 10, PP 154-164, AUG 1968. 11 P, 7 FIG, 11 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *KANSAS, GROUNDWATER BASINS,
GEOLOGIC FORMATIONS, AQUIFERS, SANDSTONES, DOLOMITE, LIMESTONES,
SHALES, POROSITY, PERMEABILITY.

IDENTIFIERS:

SALINA BASIN(KAN), INDUSTRIAL WASTE INJECTION WELLS, SYNCLINES, SALT
BEDS.

ABSTRACT:

THE SALINA BASIN, KANSAS, WAS STUDIED TO DETERMINE ITS SUITABILITY FOR
WASTE DISPOSAL BY INJECTION WELLS. CAMBRIAN SANDSTONES, PENNSYLVANIAN
SHALES, AND PERMIAN SALT BEDS ARE GOOD POTENTIAL STORAGE RESERVOIRS.
THE DIRECTION OF NATURAL FLUID FLOW IN THE BASIN APPEARS TO BE
SOUTHWARD. THE BASIN IS A SIMPLE ASYMMETRIC SYNCLINE WITH A UNIFORM
GENTLE SOUTHWARD AXIAL TILT, AND IS DEEPEST ON THE SW FLANK. IN MOST OF
THE BASIN, PENNSYLVANIAN AND PERMIAN ROCKS CROP OUT. BASIN ROCKS RANGE
IN AGE FROM WATER IS FOUND IN ALL DEEP POROUS ROCKS PENETRATED BY
EXPLORATORY DRILLING. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04946

POTENTIAL OF DENVER BASIN FOR DISPOSAL OF LIQUID WASTES,

SUN OIL CO., DENVER, COLO.; WOLF EXPLORATION CO., DALLAS, TEX.

GEORGE S. GARBARINI, AND HARRY K. VEAL.

AMER ASS PETROL GEOL MEM NO 10, PP 165-185, AUG 1968. 21 P, 12 FIG, 1 TAB, 47 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *COLORADO, WYOMING, GROUNDWATER BASINS, GEOLOGIC FORMATIONS, AQUIFIERS, SANDSTONES, SHALES, POROSITY, PERMEABILITY, FRACTURES(GEOLOGY), EARTHQUAKES.

IDENTIFIERS:

*DENVER BASIN, INDUSTRIAL WASTE INJECTION WELLS, HYDRAULIC FRACTURING, SYNCLINES, INJECTION-INDUCED EARTHQUAKES.

ABSTRACT:

A RECONNAISSANCE SUBSURFACE GEOLOGIC STUDY SHOWS THAT 3 TYPES OF RESERVOIRS ARE AVAILABLE FOR LIQUID-WASTE DISPOSAL IN THE DENVER BASIN-FRACTURED PRECAMBRIAN ROCKS, POROUS SANDSTONE RESERVOIRS, AND THICK SHALE SUITABLE FOR DISPOSAL BY THE HYDRAULIC-FRACTURING TECHNIQUE. FROM EARLY 1962 THROUGH EARLY 1966, FRACTURED PRECAMBRIAN ROCKS AT A DEPTH OF 12,000 FT WERE USED AS A DISPOSAL RESERVOIR FOR TOXIC EFFLUENT PRODUCED AT THE ROCKY MOUNTAIN ARSENAL NEAR DENVER. THE DISPOSAL WELL IS NOW SHUT IN, PENDING INVESTIGATION OF THE POSSIBLE RELATIONSHIP OF WASTE INJECTION TO DENVER-AREA EARTHQUAKES WHICH INCREASED IN FREQUENCY AND MAGNITUDE DURING THE INJECTION PERIOD. SANDSTONE RESERVOIRS MOST FAVORABLE FOR WASTE DISPOSAL ARE THE PERMIAN LYONS SANDSTONE, THE TRIASSIC DOCKUM, THE TRIASSIC-JURASSIC JELM-ENTRADA, AND SANDSTONES IN THE CRETACEOUS DAKOTA GROUP AND THE 'HYGIENE ZONE' OF THE PIERRE SHALE. THE LYONS, DOCKUM, AND DAKOTA ARE BEST SUITED FOR WASTE DISPOSAL IN THE SOUTHERN PART OF THE BASIN. THE DOCKUM SANDSTONE, POTENTIALLY THE BEST DISPOSAL RESERVOIR VOLUMETRICALLY, IS LIMITED TO THE SOUTHEAST PART OF THE BASIN. THE JELM-ENTRADA AND HYGIENE-ZONE SANDSTONES ARE POTENTIAL DISPOSAL RESERVOIRS ALONG THE HEAVILY POPULATED STRIP BETWEEN DENVER AND CHEYENNE. CRETACEOUS MARINE BLACK SHALE SUITABLE FOR DISPOSAL BY THE HYDRAULIC-FRACTURING TECHNIQUE IS PRESENT EVERYWHERE IN THE BASIN. THE SHALE CROPS OUT OVER LARGE AREAS. BENEATH THE POPULOUS STRIP ALONG THE FRONT RANGE, THE SHALE IS COVERED LOCALLY BY AS MUCH AS 2,000 FT OF UPPER CRETACEOUS AND TERTIARY TRANSITIONAL TO CONTINENTAL STRATA. THE BASIN HAS GOOD POTENTIAL FOR DISPOSAL OF LIQUID WASTES THROUGH WELLS. (LANG-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04947

SEDIMENTARY HISTORY AND ECONOMIC GEOLOGY OF SAN JUAN BASIN, NEW MEXICO AND COLORADO,

MONTANA STATE UNIV., MISSOULA; EL PASO NATURAL GAS CO., TEX.; TEXACO, INC., FARMINGTON, N. MEX.

JAMES A. PETERSON, ALLAN J. LOLEIT, CHARLES W. SPENCER, AND RICHARD A. ULLRICH.

AMER ASS PETROL GEOL MEM NO 10, PP 186-231, AUG 1968. 45 P, 24 FIG, 61 REF.

DESCRIPTORS:

*STRATIGRAPHY, *BASINS, *COLORADO, *NEW MEXICO, *INJECTION WELLS, WASTE DISPOSAL, GROUNDWATER BASINS, GEOLOGIC FORMATIONS, AQUIFERS, SANDSTONES, SHALES, LIMESTONES, POROSITY, PERMEABILITY, FRACTURES(GEOLOGY), MINING, OIL FIELDS, OIL RESERVOIRS.

IDENTIFIERS:

*SAN JUAN BASIN, INDUSTRIAL WASTE INJECTION WELLS, SYNCLINES.

ABSTRACT:

THE STRATIGRAPHY OF THE SAN JUAN BASIN OF COLORADO AND NEW MEXICO IS DISCUSSED IN DETAIL AND THE PROPERTIES OF THE ROCKS ARE REVIEWED FOR SUITABILITY AS WASTE INJECTION RESERVOIRS. THE BASIN CONTAINS UP TO 15,000 FT OF SEDIMENTARY ROCKS FROM CAMBRIAN TO RECENT. DEVELOPMENT OF THE AREA AS A SEDIMENTARY BASIN APPARENTLY TOOK PLACE IN PENNSYLVANIAN TIME; THE BASIN WAS MAINTAINED WITH CHANGING RATES OF SUBSIDENCE AND FILLING THROUGH THE REMAINDER OF GEOLOGIC TIME. DOMINANTLY CYCLIC MARINE CARBONATE DEPOSITION DURING THE EARLY PHASES PRECEDED THE INFILLING OF THE TROUGH WITH COARSE CLASTICS. THE EARLY MESOZOIC IS CHARACTERIZED BY FLUVIAL AND EOLIAN ENVIRONMENTS, INTERRUPTED PERIODICALLY BY THIN MARINE TRANSGRESSIVE DEPOSITS OF NEARSHORE REDBEDS, WITH A FINAL WIDESPREAD LATE CRETACEOUS MARINE THICK CYCLIC SEQUENCE OF GRAY SHALE AND SANDSTONE, INTERBEDDED WITH COAL. MAJOR RESERVES OF PETROLEUM ARE IN CRETACEOUS AND PENNSYLVANIAN ROCKS, COAL IN CRETACEOUS, AND URANIUM IN JURASSIC AND CRETACEOUS. MUCH OF THE SAN JUAN BASIN IS CONSIDERED POTENTIALLY SUITABLE FOR WASTE DISPOSAL, CONTINGENT UPON SUCH FACTORS AS DEPTH, VOLUME OF WASTE, PETROLEUM AND MINING ACTIVITIES, PRESENT AND FUTURE GROUNDWATER NEEDS, AND OTHER INDUSTRIAL AND CULTURAL CONSIDERATIONS. THE CHACO SLOPE PROBABLY IS THE MOST FAVORABLE AREA FOR WASTE DISPOSAL. (LANG-USGS)

FIELD 05E, 02F

ACCESSION NO. W69-04948

THE FEASIBILITY OF DEEP-WELL INJECTION OF WASTE BRINE FROM INLAND DESALTING PLANTS,

OAK RIDGE NATIONAL LABORATORY, TENN.

W. J. BOEGLY, JR., D. J. JACOBS, T. F. LOMENICK, AND O. M. SEALAND.

OFFICE OF SALINE WATER, RESEARCH AND DEVELOPMENT PROGRESS REPORT NO. 432,
MARCH 1969. 76 P. OSW-14-01-0001-534.

DESCRIPTORS:

*BRINE DISPOSAL, *BRINES, *SALINE WATER, *DEEP WELLS, *INJECTION WELLS,
WASTE DISPOSAL, SUBSURFACE INVESTIGATIONS, DESALINATION.

IDENTIFIERS:

*DEEP WELL DISPOSAL, DEEP WELL USAGE, GEOLOGIC CONSIDERATIONS,
DESALTING.

ABSTRACT:

LITERATURE PERTAINING TO THE USE OF DEEP-WELL INJECTION HAS BEEN REVIEWED TO DETERMINE THE FEASIBILITY OF ITS USE FOR DISPOSING OF BRINE EFFLUENTS FROM INLAND DESALTING PLANTS. DEEP WELL INJECTION WAS FOUND TO BE TECHNICALLY FEASIBLE IF SATISFACTORY PRETREATMENT IS PROVIDED. BRINE DISPOSAL FROM OIL-FIELD OPERATIONS RANGED FROM \$0.25 TO \$0.75 PER 1000 GALLONS OF BRINE. A SUITABLE SITE FOR DEEP-WELL INJECTION REQUIRES A PERMEABLE SEDIMENTARY FORMATION, SUCH AS SANDSTONE OR LIMESTONE, CAPPED BY AN IMPERMEABLE FORMATION, SUCH AS SHALE, TO PREVENT POLLUTION OF NEIGHBORING POTABLE WATERS. DETAILED GEOLOGIC AND HYDROLOGIC INVESTIGATIONS WILL BE REQUIRED TO ASSURE THAT THE SITE IS SATISFACTORY AND TO PROVIDE DATA TO BE USED FOR DESIGNING AN INJECTION SYSTEM.
(GRANSEE-OFFICE OF SALINE WATER)

FIELD 05E, 03A

ACCESSION NO. W69-06286

UNDERGROUND WASTE DISPOSAL,

BRADLEY OIL CORP., TULSA, OKLA.

J. L. WRIGHT.

IND WATER ENG, VOL 6, NO 5, PP 24-27, MAY 1969. 4 P, 8 FIG, 4 TAB, 5 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INDUSTRIAL WASTES, *INJECTION WELLS, AQUIFERS, WATER QUALITY, LEGAL ASPECTS, POROSITY, PERMEABILITY, COSTS, ECONOMICS.

IDENTIFIERS:

DEEP-WELL WASTE DISPOSAL.

ABSTRACT:

DEEP-WELL DISPOSAL OF INDUSTRIAL WASTES IS RECOMMENDED FOR AREAS WHERE LAWS AND GEOLOGICAL FORMATIONS ARE FAVORABLE. THE GEOLOGY OF SEVERAL AREAS WITH FAVORABLE GEOLOGIC CONDITIONS IS DISCUSSED AND ESTIMATED COSTS OF INJECTION AND SURFACE DISPOSAL ARE TABULATED. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W69-06943

DEEP WELL INJECTION OF INDUSTRIAL WASTES,

HYDRO-DEVELOPMENT, INC., BAKERSFIELD, CALIF.

JOHN C. MANNING.

SEE ALSO W69-07110. PROC OF 23RD IND WASTE CONF, MAY 7-9, 1968, PURDUE UNIV, PART 2, PP 655-666, 1969. 12 P, 7 FIG.

DESCRIPTORS:

*INJECTION WELLS, *WASTE DISPOSAL, *INDUSTRIAL WASTES, AQUIFERS, GROUNDWATER MOVEMENT, WASTE WATER DISPOSAL, WATER QUALITY, WASTE WATER TREATMENT, WATER LEVELS, PERMEABILITY, POROSITY.

IDENTIFIERS:

WASTE WATER INJECTION.

ABSTRACT:

WHEN WATER IS INJECTED INTO A CONFINED SUBSURFACE FORMATION, THE PRESSURE IN THE FORMATION IS INCREASED, AND THE FORMATION TENDS TO DILATE. THERE IS AMPLE SPACE IN THE SUBSURFACE RESERVOIR FOR INJECTION OF LARGE QUANTITIES OF FLUID SO LONG AS AN AREALLY EXTENSIVE INJECTION FORMATION IS AVAILABLE. ALMOST ANY AREA UNDERLAIN BY SEDIMENTARY ROCKS COULD HAVE POTENTIAL DISPOSAL RESERVOIRS. IGNEOUS OR METAMORPHIC ROCKS MIGHT HAVE FAVORABLY SITUATED SUBSURFACE ZONES, BUT GENERALLY THESE WILL NOT BE AS FAVORABLE AS WILL THE SEDIMENTARY ROCKS. ANY WASTE FLUID THAT IS FREE OF PARTICULATE MATTER AND THAT, AFTER REASONABLE TREATMENT, WILL NOT CAUSE UNDESIRABLE REACTIONS WITH THE SOLID MATRIX OF THE DISPOSAL FORMATION OR ITS ORIGINAL FLUID SHOULD BE SUITABLE FOR INJECTION DISPOSAL. HOWEVER, INJECTION DISPOSAL IS EXPENSIVE AND IS BEST SUITED FOR RELATIVELY SMALL QUANTITIES OF PARTICULARLY NOXIOUS WASTES. ALL TYPES OF WATER DESALINATION SCHEMES HAVE THE PROBLEM OF CONCENTRATED BRINE DISPOSAL, AND WHERE THERE IS NO CONVENIENT OCEAN, AN INJECTION WELL MIGHT PROVIDE A SAFE AND CONVENIENT DISPOSAL.

FIELD 05E

ACCESSION NO. W69-07117

GEOPHYSICAL AND GEOLOGICAL STUDIES OF THE RELATIONSHIPS BETWEEN THE DENVER
EARTHQUAKES AND THE ROCKY MOUNTAIN ARSENAL WELL, PART A,

COLORADO SCHOOL OF MINES, GOLDEN. DEPT. OF GEOPHYSICS; AND COLORADO SCHOOL OF
MINES, GOLDEN. DEPT. OF GEOLOGY.

JOHN C. HOLLISTER, AND ROBERT J. WEIMER.

COLO SCHOOL MINES QUART, VOL 63, NO 1, JAN 1968. 251 P, 9 PAP.

DESCRIPTORS:

*EARTHQUAKES, *INJECTION WELLS, *WASTE DISPOSAL, *COLORADO, HYDROSTATIC
PRESSURE, FRACTURES(GEOLOGY), FAULTS(GEOLOGY), GROUNDWATER BASINS,
AQUIFERS, STRUCTURAL GEOLOGY, PORE PRESSURE.

IDENTIFIERS:

DENVER(COLO), ROCKY MOUNTAIN ARSENAL.

ABSTRACT:

EARTHQUAKES AT DENVER, COLORADO CAUSE PUBLIC CONCERN BECAUSE THEY ARE
APPARENTLY RELATED TO THE OPERATION OF A DEEP WASTE-DISPOSAL WELL AT
THE ROCKY MOUNTAIN ARSENAL. SEISMOGRAPH STUDIES, GEOLOGICAL
INVESTIGATIONS, AND STUDY OF DEEP-WELL RECORDS WERE FINANCED AND MADE
TO DETERMINE THE ORIGIN AND MECHANISMS OF THE EARTHQUAKES. IT IS THE
BELIEF OF THE MAJORITY OF THE INVESTIGATORS THAT INJECTION OF LIQUID
WASTES CONTRIBUTES TO EARTHQUAKE ACTIVITY. THE EFFECT OF INJECTION ON
EARTHQUAKES COULD NOT HAVE BEEN PREDICTED WHEN THE WELL WAS DRILLED IN
1961. THE RESERVOIR SHOULD BE ALLOWED TO COME TO EQUILIBRIUM WITHOUT
FURTHER INJECTION OR WITHDRAWAL OF FLUIDS. (KNAPP-USGS)

FIELD 02F, 05E

ACCESSION NO. W69-07410

PROPERTIES OF THE ROCKY MOUNTAIN ARSENAL DISPOSAL RESERVOIR AND THEIR RELATION
TO DERBY EARTHQUAKES,

COLORADO SCHOOL OF MINES, GOLDEN. DEPT. OF GEOPHYSICS.

G. R. PICKETT.

COLO SCHOOL MINES QUART, VOL 63, NO 1, PP 73-100, JAN 1968. 28 P, 12 FIG, 6
TAB, 10 REF, 1 APPEND.

DESCRIPTORS:

*EARTHQUAKES, *INJECTION WELLS, *WASTE DISPOSAL, *COLORADO, HYDROSTATIC
PRESSURE, FRACTURES(GEOLOGY), FAULTS(GEOLOGY), GROUNDWATER BASINS,
AQUIFERS, POROSITY, PERMEABILITY, STRUCTURAL GEOLOGY, PORE PRESSURE.

IDENTIFIERS:

*ROCKY MOUNTAIN ARSENAL, DENVER(COLO).

ABSTRACT:

INJECTION PRESSURE AND VOLUME DATA OF THE ROCKY MOUNTAIN ARSENAL
DISPOSAL WELL WERE STUDIED TO LEARN THE PHYSICAL PROPERTIES OF THE
RESERVOIR AND TO CORRELATE RESERVOIR PROPERTIES WITH THE EARTHQUAKE
HISTORY OF THE AREA. THE ROCKY MOUNTAIN DISPOSAL RESERVOIR CONTAINS A
TOTAL FLUID VOLUME BETWEEN 0.6 AND 1.9 X 10 BILLION BARRELS. THE TOTAL
RESERVOIR CONSISTS OF SEVERAL PARTS WHICH HAVE SIGNIFICANTLY DIFFERENT
FLUID PERMEABILITIES. THE RESERVOIR PRESSURE BEFORE START OF INJECTION
IN 1962 WAS BETWEEN 300 AND 1400 PSI SUBHYDROSTATIC. AFTER CESSATION OF
INJECTION IN 1966, THE DIFFERENT PARTS OF THE RESERVOIR WERE AT
DIFFERENT PRESSURES, THE MOST PERMEABLE PART HAVING THE HIGHEST
PRESSURE (ABOUT 100 PSI SUBHYDROSTATIC). AN EMPIRICAL CORRELATION
EXISTS FOR THE INJECTION HISTORY OF THE ARSENAL WELL BETWEEN CUMULATIVE
NUMBER OF EARTHQUAKES AND CALCULATED STATIC RESERVOIR PRESSURE. A MEANS
FOR PREDICTING THE TOTAL NUMBER OF EARTHQUAKES TO BE ANTICIPATED BEFORE
THE RESERVOIR COMES TO PRESSURE EQUILIBRIUM IS SUGGESTED. EMPIRICAL
COMPARISON OF INJECTION ENERGY WITH EARTHQUAKE MAGNITUDE SHOWS THAT IF
INJECTION ENERGY IS RETURNED AS EARTHQUAKE ENERGY, IT IS STORED FOR
SIGNIFICANT LENGTHS OF TIME BEFORE RELEASE. IF IT IS ASSUMED THAT ALL
INJECTION ENERGY HAS NOW BEEN RETURNED AS EARTHQUAKE ENERGY, THEN THE
TOTAL ENERGY MAGNITUDE IS CONSISTENT WITH ENERGY-EARTHQUAKE MAGNITUDE
RELATIONS PROPOSED BY RICHTER. (KNAPP-USGS)

FIELD 02F, 05E

ACCESSION NO. W69-07411

HYDRAULIC CHARACTER OF FRACTURED METAMORPHIC ROCKS OF THE FRONT RANGE AND
IMPLICATIONS TO THE ROCKY MOUNTAIN ARSENAL WELL,

COLORADO SCHOOL OF MINES, GOLDEN. DEPT. OF GEOLOGY.

DAVID T. SNOW.

COLO SCHOOL MINES QUART, VOL 63, NO 1, PP 167-199, JAN 1968. 33 P, 13 FIG, 27
REF.

DESCRIPTORS:

*EARTHQUAKES, *INJECTION WELLS, *WASTE DISPOSAL, *COLORADO, HYDROSTATIC
PRESSURE, FRACTURES(GEOLOGY), FAULTS(GEOLOGY), GROUNDWATER BASINS,
AQUIFERS, POROSITY, PERMEABILITY, TRANSMISSIVITY, AQUICLUDES,
STRUCTURAL GEOLOGY, PORE PRESSURE.

IDENTIFIERS:

ROCKY MOUNTAIN ARSENAL, DENVER(COLO).

ABSTRACT:

HYDRAULIC AND GEOMETRICAL PROPERTIES OF FRACTURED METAMORPHIC ROCKS OF
THE FRONT RANGE OF COLORADO ARE DETERMINED FROM DAMSITE
PRESSURE-INJECTION TESTS AND RECORDS OF DOMESTIC WATER WELLS. SINCE
THESE SAME ROCKS BENEATH THE DENVER BASIN COMPRISE THE RESERVOIR INTO
WHICH FLUID WASTES HAVE BEEN INJECTED AT THE ROCKY MOUNTAIN ARSENAL
WELL, THE FRONT RANGE PROPERTIES ARE APPLICABLE TO STUDIES OF THE
ARSENAL WELL INJECTION PERFORMANCE AND THE POSSIBLE EARTHQUAKE
RESPONSE. FRACTURE PERMEABILITY MAY BE OF LIKE ORIGIN IN BOTH CASES:
FAULTING, WEATHERING AND EROSIONAL STRESS RELEASE BENEATH A SURFACE OF
EROSION. AT DAMSITES IN THE FRONT RANGE METAMORPHIC ROCKS, FRACTURE
SPACING IS ABOUT 5 TO 10 FT NEAR THE GROUND SURFACE, INCREASING TO
ABOUT 15 TO 35 FT AT THE 200-FT LEVEL. WATER WELLS INTERCEPT EVEN FEWER
SIGNIFICANT FRACTURES. OPENINGS CLOSE FROM ABOUT 200 MICRONS TO ABOUT
70 MICRONS BETWEEN THE NEAR-SURFACE AND 200-FT DEPTH AND POROSITIES
DECREASE FROM ABOUT 0.04% TO 0.001%. THE LOGARITHM OF PERMEABILITY
DECREASES LINEARLY WITH THE LOGARITHM OF DEPTH. THE FRACTURED AQUIFER
IS A THIN SKIN DRAPED OVER THE TERRANE. TEST DATA SUGGEST THAT THE
AQUIFER IS BOUNDED BY VANISHING PERMEABILITY AT ABOUT 200 FT, THOUGH
OPEN FAULT ZONES MAY EXTEND TO GREATER DEPTHS. DIFFERENT LITHOLOGIC
UNITS HAVE DIFFERENT TRANSMISSIBILITIES. THESE EXCEED THE
TRANSMISSIBILITIES DEDUCTED FROM ARSENAL WELL FLOW, SO THE
PRE-PENNSYLVANIAN SOILS AND SEDIMENTS RESTING ON THE GNEISS AT THE WELL
SITE MAY EFFECTIVELY CONFINE FLOW TO THE FRACTURED BASEMENT.
(KNAPP-USGS)

FIELD 02F, 05E

ACCESSION NO. W69-07412

FRACTURE DEFORMATION AND CHANGES OF PERMEABILITY AND STORAGE UPON CHANGES OF
FLUID PRESSURE,

COLORADO SCHOOL OF MINES, GOLDEN, DEPT. OF GEOLOGY.

DAVID T. SNOW.

COLO SCHOOL MINES QUART, VOL 63, NO 1, PP 201-244, JAN 1968. 44 P, 10 FIG, 43
REF.

DESCRIPTORS:

*EARTHQUAKES, *INJECTION WELLS, *WASTE DISPOSAL, *COLORADO, HYDROSTATIC
PRESSURE, FRACTURES(GEOLOGY), FAULTS(GEOLOGY), STRESS, GROUNDWATER
BASINS, AQUIFERS, POROSITY, PERMEABILITY, WATER STORAGE,
TRANSMISSIVITY, AQUICLUDES, STRUCTURAL GEOLOGY, PORE PRESSURE.

IDENTIFIERS:

ROCKY MOUNTAIN ARSENAL, DENVER(COLO).

ABSTRACT:

FRACTURES ARE NON-RIGID FLUID CONDUCTORS OF SUCH SMALL SIZE THAT
CHANGES OF THE OPENINGS WITH CHANGES OF PRESSURE RESULT IN APPRECIABLE
CHANGES OF PERMEABILITY AND ACCOUNT FOR THE MAJOR PORTION OF STORAGE.
PLANE VERTICAL STRAIN IS ASSUMED IN THE DERIVATION OF AN EQUATION OF
TRANSIENT FLOW, BUT IN RADIAL CASES, SUCH AS THE ROCKY MOUNTAIN ARSENAL
WELL INJECTION, THE DISTRIBUTIONS OF STRESS, PERMEABILITY, AND
HYDRAULIC POTENTIAL ARE INTERRELATED. A DEFORMABILITY COEFFICIENT FOR
FRACTURES IN THE FRONT RANGE METAMORPHIC ROCKS AT BERGEN PARK,
COLORADO, IS DEDUCED FROM STRAIN MEASUREMENTS NEAR A WATER-SUPPLY WELL
WHICH DRAINS THE FRACTURE SYSTEM. EFFECTIVE STRESS CHANGES CONSEQUENT
TO FLUID-PRESSURE CHANGES MAY HAVE SIGNIFICANCE TO THE QUESTION OF THE
EARTHQUAKE MECHANISM, ESPECIALLY IF GEOLOGICAL EVIDENCE, SUCH AS
FAULTING, POINTS TO A CRITICAL STATE OF TECTONIC STRESS. FROM THE TIME
OF LATEST FAULTING IN THE DENVER BASIN PROBABLY CRITICALITY MAY HAVE
BEEN MAINTAINED BY EROSIONAL RELEASE OF CONFINEMENT, SUGGESTING THAT
THE FRACTURED BASEMENT IS PRONE TO FAILURE UPON INJECTION OF FLUIDS.
(KNAPP-USGS)

FIELD 02F, 05E

ACCESSION NO. W69-07413

HYDRODYNAMIC STUDY OF THE WESTERN DENVER BASIN, COLORADO,

PETROLEUM RESEARCH CORP., DENVER, COLO.

ROGER L. HOEGER.

COLO SCHOOL MINES QUART, VOL 63, NO 1, PP 245-251, JAN 1968. 7 P.

DESCRIPTORS:

*EARTHQUAKES, *INJECTION WELLS, *WASTE DISPOSAL, *COLORADO, HYDROSTATIC PRESSURE, POTENTIOMETRIC LEVEL, FRACTURES(GEOLOGY), FAULTS(GEOLOGY), GROUNDWATER MOVEMENT, STRESS, GROUNDWATER BASINS, AQUIFERS, POROSITY, TRANSMISSIVITY, AQUICLUDES, STRUCTURAL GEOLOGY, PORE PRESSURE.

IDENTIFIERS:

ROCKY MOUNTAIN ARSENAL, DENVER(COLO).

ABSTRACT:

THE ORIGINAL HYDROSTATIC PRESSURE IN THE FRACTURE SYSTEM OF PRECAMBRIAN BASEMENT ROCKS IN THE ROCKY MOUNTAIN ARSENAL WELL WAS FAR BELOW NORMAL. IN AN EFFORT TO UNDERSTAND THE REASONS FOR THE SUBNORMAL PRESSURE, A STUDY OF HYDRODYNAMIC PRESSURE GRADIENTS IN OVERLYING SEDIMENTARY ROCKS OF THE WESTERN DENVER BASIN WAS CONSIDERED NECESSARY. AN ANALYSIS OF ALL AVAILABLE DATA ON THE MAJOR DEEP AQUIFERS IS PRESENTED. A BARRIER TREND, WHICH MAY BE CAUSED BY A FAULT SYSTEM OF REGIONAL EXTENT, IS PRESENT BETWEEN THE AREAS OF HIGH POTENTIAL AND THE MAJORITY OF THE AREA STUDIED WHICH IS TYPICALLY AT MUCH LOWER POTENTIAL. (KNAPP-USGS)

FIELD 02F, 05E

ACCESSION NO. W69-07414

WASTE WATER RECHARGE AND DISPERSION IN POROUS MEDIA,

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

JOHN AUSTIN HOOPES, 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

STATUS OF RADIOACTIVE WASTE DISPOSAL IN U.S.A.,

VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF SANITARY AND WATER RESOURCES
ENGINEERING.

FRANK L. PARKER.

ASCE PROC, J SANIT ENG DIV, VOL 95, NO SA3, PAP NO 6597, PP 439-464, JUNE
1969. 26 P, 9 FIG, 5 TAB, 60 REF.

DESCRIPTORS:

*RADIOACTIVE WASTE DISPOSAL, *REVIEWS, *BIBLIOGRAPHIES, SYSTEMS
ANALYSIS, WASTE DISPOSAL, INJECTION WELLS, MONITORING, REGULATION,
RADIOCHEMICAL ANALYSIS, POLLUTANT IDENTIFICATION, WATER POLLUTION
CONTROL.

IDENTIFIERS:

UNDERGROUND GROUTING(DISPOSAL).

ABSTRACT:

THE PRESENT STATE OF RADIOACTIVE WASTE DISPOSAL PRACTICES IS REVIEWED.
THE MAIN EMPHASIS IN RESEARCH IN LIQUID RADIOACTIVE WASTE MANAGEMENT
HAS BEEN ON THE FEASIBILITY OF CONVERSION OF LIQUIDS TO SOLID FORM
BEFORE DISPOSAL AND IN PLACE UNDERGROUND, AND MONITORING OF DISPOSAL
AND POLLUTION EFFECTS. FOR GASEOUS WASTES, THE EMPHASIS HAS BEEN ON THE
REMOVAL OF THE VARIOUS FORMS OF IODINE IN THE OFF-GAS SYSTEMS AND THE
DEVELOPMENT OF NEW METHODS FOR NOBLE GAS REMOVAL. FOR SOLID WASTE
DISPOSAL, BETTER CONTAINMENT HAS BEEN SOUGHT, AND PRIVATE BURIAL
OPERATIONS HAVE BEEN TRANSFERRED TO COMMERCIAL BURIAL GROUNDS. THE
MANAGEMENT OF RADIOACTIVE WASTES HAS NOT PROVEN TO BE A DETERENT TO A
NUCLEAR POWER ECONOMY. THE MAJOR PROBLEMS REMAINING ARE METHODS OF THE
REMOVAL OF NOBLE GASES AND TRITIUM, DEVELOPMENT OF METHODS OF FUEL
REPROCESSING, AND UNDERSTANDING OF THE MOVEMENTS OF RADIONUCLIDES IN
THE ENVIRONMENT. (KNAPP-USGS)

FIELD 05E, 05B

ACCESSION NO. W69-08214

SUBSURFACE DISPOSAL: PRECAUTIONARY MEASURES,

DEPARTMENT OF ENERGY, MINES AND RESOURCES (CANADA).

D. D. MCLEAN.

IND WATER ENG, VOL 6, NO 8, P 20-22, AUG 1969. 3 P, 3 FIG, 1 TAB.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, AQUIFERS, AQUICLUDES, PERMEABILITY, POROSITY, WATER CHEMISTRY, INDUSTRIAL WASTES, CHEMICAL WASTES, WASTE WATER DISPOSAL, WASTE WATER TREATMENT.

IDENTIFIERS:

INJECTION WELL OPERATION AND DESIGN.

ABSTRACT:

RULES FOR THE DEPENDABLE CONSTRUCTION, INSTALLATION, AND OPERATION OF WASTE INJECTION WELLS ARE OUTLINED. ONE OF THE MOST IMPORTANT AND LEAST UNDERSTOOD CONSIDERATIONS IS THE HISTORY AND EFFECT OF THE LIQUID WASTE AFTER IT IS INJECTED INTO ITS RECEIVING FORMATION. IDEALLY, THE SEDIMENTARY FORMATION SHOULD BE UNIFORM SANDSTONE, LIMESTONE, DOLOMITE, OR FRACTURED SHALE OF LARGE AREAL EXTENT WITH SUFFICIENT THICKNESS, POROSITY, AND PERMEABILITY. INJECTION HORIZONS SHOULD HAVE ADEQUATE OVERLYING AND UNDERLYING AQUICLUDES, LOW PRESSURE, AND BE SEPARATED FROM FRESHWATER HORIZONS. FORMATION FLUIDS SHOULD BE COMPATIBLE WITH INJECTED FLUIDS AND NO UNPLUGGED WELLS SHOULD PENETRATE THE INJECTION FORMATION NEAR THE DISPOSAL WELL. THE SIZE AND WEIGHT OF THE CASING IS IMPORTANT DEPENDING ON THE PRESSURES AND DEPTHS ENCOUNTERED AND THE VOLUME OF FLUID TO BE INJECTED. LARGER INJECTION STRINGS REDUCE WELLHEAD INJECTION PRESSURES, BUT OVERSIZE HOLES ARE MORE COSTLY TO DRILL. INJECTION RATES CAN BE INCREASED VIA CHEMICAL OR MECHANICAL STIMULATION. SUCH METHODS NOT ONLY EFFECTIVELY INCREASE THE POROSITY OF THE CRITICAL REGION OF THE WELL BORE BUT ALSO REDUCE THE CHANCE OF PLUGGING. TO ACCURATELY EVALUATE THE HYDROLOGIC PROPERTIES OF THE DISPOSAL FORMATION, INJECTIVITY TESTS SHOULD BE MADE. A DISPOSAL OPERATION MUST INCLUDE A PROPERLY DESIGNED MONITOR PROGRAM TO DETECT FAILURE OF VARIOUS COMPONENTS. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W69-09234

AQUIFER BEHAVIOR WITH INJECTION,

PETROBRAS CO., AND TEXAS A AND M UNIV., COLLEGE STATION.

E. J. BONET, AND PAUL B. CRAWFORD.

J PETROL TECHNOL, P 1210-1216, SEPT 1969. 7 P, 6 FIG, 13 REF, APPEND.

DESCRIPTORS:

*INJECTION WELLS, *MATHEMATICAL STUDIES, GROUNDWATER MOVEMENT, FLOW,
FLOW RATES, AQUIFERS, OIL RESERVOIRS, RECHARGE, SECONDARY
RECOVERY(OIL).

IDENTIFIERS:

LINEAR CLOSED AQUIFER ANALYSIS.

ABSTRACT:

WATER INJECTION FLOW WAS ANALYZED MATHEMATICALLY AND THE RESULTS ARE
PRESENTED IN TERMS OF DIMENSIONLESS VARIABLES. IN INJECTION INTO LINEAR
CLOSED AQUIFERS THE TOTAL FLOW ACROSS A SECTION DEPENDS ONLY ON
PROXIMITY TO THE INJECTION WELL AND HAS NO RELATION TO THE WELL'S
DISTANCE FROM AQUIFER BOUNDARIES. (KNAPP-USGS)

FIELD 04B, 02F, 05B

ACCESSION NO. W69-09650

TREATMENT AND DISPOSAL OF RADIOACTIVE WASTES,

E. YA. SPITSYN.

TRANSL FROM ATOMIZDAT, MOSKVA, 1965. 102 P, 40 FIG, 15 TAB, 44 REF, 1 APPEND.
AVAILABLE FROM THE CLEARINGHOUSE AS TT NO 68-50326, \$3.00 IN PAPER COPY,
\$0.65 MICROFICHE.

DESCRIPTORS:

*RADIOACTIVE WASTE DISPOSAL, *WASTE TREATMENT, COAGULATION, ION
EXCHANGE, BIODEGRADATION, EVAPORATION, UNDERGROUND STORAGE, INJECTION
WELLS, SAFETY, WASTE DILUTION, NUCLEAR WASTES, WASTE DUMPS, WASTE
STORAGE, SOLID WASTES.

IDENTIFIERS:

*USSR, RADIOACTIVE WASTE HANDLING.

ABSTRACT:

THE DISPOSAL OF RADIOACTIVE WASTES HAS ALWAYS RECEIVED CONSIDERABLE
ATTENTION AND SUPERVISION IN THE USSR. NORMS WERE INTRODUCED AND BASIC
REGULATIONS PROMULGATED FOR THE DISPOSAL OF RADIOACTIVE WASTES INTO THE
ATMOSPHERE, WATER BODIES, AND INTO THE SOIL. THE CONSIDERABLE
EXPERIENCE THAT HAS SINCE BEEN ACCUMULATED IN THE USSR IN THE DESIGN
AND CONSTRUCTION OF THE NECESSARY RADIOACTIVE-WASTE DISPOSAL
INSTALLATIONS AND STRUCTURES IS DISCUSSED IN A TEXTBOOK WHICH INCLUDES
DESCRIPTIONS OF THE TECHNIQUES FOR THE COLLECTION, PROCESSING,
TRANSPORTATION, AND BURIAL OF SOLID AND LIQUID RADIOACTIVE WASTES. SOME
ELEMENTARY CONCEPTS OF NUCLEAR PHYSICS, BASIC DEFINITIONS, AND
TERMINOLOGY ARE GIVEN. THE TECHNIQUES OF PROCESSING LIQUID AND SOLID
WASTES ARE DESCRIBED AND TECHNICAL ASPECTS AND HEALTH HAZARDS ARE
DISCUSSED. RECOMMENDATIONS FOR THE SELECTION OF EQUIPMENT AND EXAMPLES
OF VARIOUS CALCULATIONS ARE GIVEN. THE SELECTION ON 'COOLING' OF
RADIOACTIVE WASTES IS MORE DETAILED THAN THE REST OF THE CHAPTER SINCE
THE PUBLISHED INFORMATION ON THIS SUBJECT IS NOT SUFFICIENT FOR
PRACTICAL PURPOSES. THE TRANSPORTATION AND BURIAL TECHNIQUES OF
RADIOACTIVE WASTES ARE DESCRIBED FROM DESIGN DATA AS WELL AS FROM DATA
PROVIDED BY THE EXISTING BURIAL GROUNDS FOR RADIOACTIVE WASTES.
(KNAPP-USGS)

FIELD 05D, 05E

ACCESSION NO. W69-09717

REDUCING LAND SUBSIDENCE IN THE WILMINGTON OIL FIELD BY THE USE OF SALINE
WATERS,

LONG BEACH DEPT. OF OIL PROPERTIES, CALIF.

ROBERT L. PIERCE.

PROC AMER GEOPHYS UNION MEETING, APR 21-25, 1969, PAP H-68, 1969. 11 P, 10
EXHIBITS, 5 REF.

DESCRIPTORS:

*INJECTION WELLS, *SEA WATER, *OIL FIELDS, *SUBSIDENCE, *CALIFORNIA,
LAND SUBSIDENCE, WITHDRAWAL, COSTS, WATER POLLUTION CONTROL.

IDENTIFIERS:

OIL FIELD SUBSIDENCE CORRECTION, WATER FLOODING(OILFIELD).

ABSTRACT:

THE SUBSIDENCE AT LONG BEACH, CALIFORNIA ATTRIBUTED TO THE WILMINGTON
OIL FIELD DEVELOPMENT ENCOMPASSED AN AREA OF 22 SQ MI. SUBSIDENCE
RANGED FROM 2 FT TO 30 FT, BUT THE OIL FIELD IS PARTIALLY IN THE
TIDELANDS OF LONG BEACH, CALIFORNIA, AND THE PACIFIC OCEAN PROVIDED A
CONVENIENT SUPPLY OF SALINE WATER NECESSARY TO CORRECT SUBSIDENCE BY
INJECTION OF SEA WATER. THE INJECTION OF SALINE WATER HAS SUCCESSFULLY
STOPPED THE LONG BEACH HARBOR AREA SUBSIDENCE. BY 1968, 2.1 BILLION
BARRELS OF SALINE WATER WERE INJECTED INTO THE WILMINGTON OIL FIELD.
THE BULK OF THIS WAS OCEAN WATER PRODUCED FROM SOURCE WELLS OPEN TO
SANDS 200 FT TO 400 FT DEEP. THE CURRENT INJECTION RATE OF THE FIELD IS
1.1 MILLION BARRELS PER DAY. EXPANDED USE OF THE OIL FIELD'S PRODUCED
BRINE FOR INJECTION IS TAKING PLACE AND 550,000 BARRELS PER DAY OF THIS
BRINE WILL REPLACE SOURCE WELL WATER DURING 1969. THE METHODS BEING
USED TO CLEAN THE OIL FIELD'S PRODUCED BRINE INCLUDE: (1) FILTRATION,
(2) RE-CYCLING THROUGH THE SHALLOW SOURCE WATER BEDS, AND (3) BLENDING
WITH FRESH OR OTHER SALINE WATERS. (KNAPP-USGS)

FIELD 05G, 02F

ACCESSION NO. W70-00447

OIL FIELDS YIELD NEW DEEP-WELL DISPOSAL TECHNIQUE,

HALLIBURTON CO., DUNCAN, OKLA. DEPT. OF CHEMICAL RESEARCH AND DEVELOPMENT.

K. A. SLAGLE, AND J. M. STOGNER.

WATER AND SEWAGE WORKS, VOL 116, NO 6, P 238-244, JUNE 1969. 7 P, 5 FIG, 13 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, FRACTURES(GEOLOGY), PERMEABILITY, WELL CASINGS, MONITORING, OIL INDUSTRY, GEOLOGY, WASTE TREATMENT, WASTE WATER DISPOSAL, SOLID WASTES.

IDENTIFIERS:

*WELL CONSTRUCTION.

ABSTRACT:

THE PREDOMINANT PRACTICE OF INJECTING LIQUID WASTES INTO PERMEABLE OR NATURALLY FRACTURED SUBSURFACE STRATA IS NOT THE ONLY METHOD FOR THE DISPOSAL OF POLLUTANTS IN DEEP WELLS. UTILIZING OTHER OIL FIELD OPERATIONS SUCH AS HYDRAULIC FRACTURING AND OTHER MODIFICATIONS MAY ELIMINATE SOME COMMON OBJECTIONS TO THIS PROCEDURE-- LACK OF SUITABLE FORMATIONS, EXPENSIVE PRE-INJECTION EQUIPMENT AND TREATMENT, AND PRODUCTION OF A SECONDARY WASTE PRESENTING IN ITSELF A DISPOSAL PROBLEM. EACH PARTICULAR WASTE DISPOSAL PROBLEM SHOULD BE TREATED AS A SEPARATE ENTITY SINCE THE PROBLEMS INVOLVED ARE SO DIFFERENT THROUGHOUT THE VARIOUS INDUSTRIES. A SECOND WASTE DISPOSAL WELL, OR A STAND-BY WELL, SHOULD BE CONSIDERED IF THE PRODUCTION OF WASTE IS SUCH THAT GENERAL PLANT PRODUCTION MAY BE INTERRUPTED OR THERE IS A POSSIBILITY OF DISCHARGING EFFLUENT INTO PUBLIC STREAMS OR WATERS. A MONITORING WELL SYSTEM SHOULD BE INCLUDED TO HELP DETECT OR DETERMINE POSSIBLE CONTAMINATION OR DAMAGE TO FRESH WATER AQUIFERS AND OTHER MINERALS. DESIGN OF THE WELL CASING AND EQUIPMENT SHOULD BE GIVEN SERIOUS CONSIDERATION AND THE UTMOST IN DESIGN PRECAUTIONS TAKEN TO PROVIDE MAXIMUM PROTECTION AND LONGEVITY. UNDER NORMAL LOW PRESSURE DISPOSAL OPERATION WHERE NATURALLY FRACTURED FORMATIONS ARE USED, LOW PRESSURE EQUIPMENT MAY BE UTILIZED WITH PRE-INJECTION TREATMENT FACILITIES. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W70-00990

A STUDY OF DEEP WELL DISPOSAL OF DESALINATION BRINE WASTE,

DOW CHEMICAL CO., FREEPORT, TEX.

P. G. LEGROS, C. E. GUSTAFSON, G. L. NEVILL, E. C. MAJESKE, AND R. D. MATHEWS.

OFFICE OF SALINE WATER RESEARCH AND DEVELOPMENT PROGRESS REPORT NO 456. JUNE 1969. 259 P. OSW CONTRACT 14-01-0001-1691.

DESCRIPTORS:

*BRINE DISPOSAL, *BRINES, *SALINE WATER, *DEEP WELLS, *INJECTION WELLS, WASTE DISPOSAL, SUBSURFACE INVESTIGATIONS, DESALINATION.

IDENTIFIERS:

*DEEP WELL DISPOSAL, DEEP WELL USAGE, GEOLOGIC CONSIDERATIONS, DESALTING.

ABSTRACT:

SEVEN INLAND U.S. COMMUNITIES WERE SELECTED AS EXAMPLES FOR THE DESIGN OF DEEP WELL DISPOSAL FACILITIES FOR THE DESALINATION WASTE BRINES. THE WATER NEEDS, THE GEOLOGICAL STRUCTURES, AND OTHER PERTINENT DATA WERE ACCUMULATED FOR EACH OF THE SEVEN COMMUNITIES. ACTUAL VALUES WERE USED WHEREVER AVAILABLE. INJECTION WELLS AND SURFACE EQUIPMENT WERE DESIGNED FOR EACH COMMUNITY, AND ESTIMATES WERE MADE OF THE COST OF CONSTRUCTION AND OPERATION OF THE DESIGNED DISPOSAL SYSTEM IN EACH. THE DEVELOPED COSTS VARY FROM A LOW OF 2.5 CENTS PER 1000 GALLONS OF PRODUCT WATER AT ARKANSAS CITY TO A HIGH OF 35.1 CENTS AT FORT MORGAN. THIS SPREAD IN COSTS REPRESENTS THE EXPECTED RANGES DUE TO VARIATIONS IN GEOLOGY, GEOGRAPHY AND PLANT SIZE. (GRANSEE-OFFICE OF SALINE WATER)

FIELD 05E

ACCESSION NO. W70-01480

BEHAVIOR OF XENON 133 GAS AFTER INJECTION UNDERGROUND,

GEOLOGICAL SURVEY, IDAHO FALLS, IDAHO.

J. B. ROBERTSON.

AVAILABLE FROM THE CLEARINGHOUSE AS IDO-22051, TID-4500, \$3.00 FOR PAPER COPY; \$0.65 IN MICROFICHE. GEOL SURV OPEN-FILE REP, REF NO IDO-22051, JULY 1969. 37 P, 14 FIG, 2 TAB, 10 REF.

DESCRIPTORS:

*INJECTION WELLS, *TRACERS, *RADIOISOTOPES, *DISPOSAL, *RADIOACTIVE WASTES, GASES, TRACKING TECHNIQUES, MONITORING, PERMEABILITY, AQUIFERS, AQUICLUDES, DIFFUSION, SEEPAGE, PRESSURE, MATHEMATICAL MODELS, ON-SITE TESTS, ON-SITE INVESTIGATIONS.

IDENTIFIERS:

GAS INJECTION.

ABSTRACT:

XE-133 GAS WAS INJECTED RAPIDLY UNDER PRESSURES OF 1.5 TO 1.65 PSIG WITH ONE MILLION CUBIC FEET OF AIR INTO PERMEABLE BASALT STRATA AT THE NATIONAL REACTOR TESTING STATION, IDAHO. THE SUBSURFACE XE-133 WAS MONITORED BY GEIGER-MULLER DETECTORS AND BY AIR SAMPLES FROM OBSERVATION WELLS SURROUNDING THE INJECTION WELL. UNDERGROUND DISTRIBUTION PATTERNS AFTER INJECTION PRESSURES HAD DISSIPATED WERE EVALUATED BY MATERIALS-BALANCE ANALYSES. MOLECULAR DIFFUSION RATES OF XE-133 FROM THE GROUND WERE ESTIMATED USING A SIMPLIFIED NUMERICAL MODEL. A MAXIMUM FLUX RATE OF 2,560 MICRO/CI/HR FROM A GROUND-ATMOSPHERE INTERFACE OF 2.88 MILLION SQ FT WAS CALCULATED FOR THE FIRST DAY AFTER INJECTION. TOTAL DIFFUSION LOSS WAS ESTIMATED TO BE 0.37 CI FOR THE TOTAL AREA DURING THE 26-DAY OBSERVATION PERIOD. THE CALCULATED RATES HAD FAIRLY GOOD AGREEMENT WITH THE FLUX RATES AT THE GROUND SURFACE. MOLECULAR DIFFUSION AND BAROMETRIC EFFECTS COULD PRODUCE THE FLUX RATES MEASURED; HOWEVER, THE RATES WERE TOO LOW TO REMOVE A SIGNIFICANT PORTION OF THE 987 CI OF XE-133, NEARLY ALL OF WHICH REMAINED UNDERGROUND AND DECAYED. THE GENERAL METHODS AND TECHNIQUES USED FOR THE DIFFUSION, MATERIALS BALANCE, AND BAROMETRIC ANALYSES WERE GENERALLY SATISFACTORY AND BE APPLIED TO FUTURE UNDERGROUND GAS-INJECTION PROBLEMS. (KNAPP-USGS)

FIELD 05A, 05E

ACCESSION NO. W70-02072

INJECTION OF GAS INTO THE LITHOSPHERE AT THE NATIONAL REACTOR TESTING STATION.

IDAHO OPERATIONS OFFICE (AEC), IDAHO FALLS. HEALTH SERVICES LAB.

BRUCE L. SCHMALZ, COMPILER. ATOMIC ENERGY RES AND DEVELOP REP IDO-12069,
IDAHO OPER OFFICE, JUNE 1969. 166 P, 79 FIG, 27 TAB, 21 REF, 3 REF, 3
APPEND.

DESCRIPTORS:

*WASTE DISPOSAL, *RADIOACTIVE WASTE DISPOSAL, *GASES, *INJECTION WELLS,
*IDAHO, NUCLEAR WASTES, RADIOACTIVE WASTES, AIR POLLUTION,
PERMEABILITY, DIFFUSION, MIXING, TRACERS, MONITORING, TRACKING
TECHNIQUES.

IDENTIFIERS:

GAS INJECTION.

ABSTRACT:

TO STUDY THE FEASIBILITY OF DISPOSING OF RADIOACTIVE GAS WASTES IN
INJECTION WELLS AT THE NATIONAL REACTOR TEST STATION, A TEST WAS
CONDUCTED BY INJECTING 1 MILLION CU FT OF AIR, CONTAINING 1,000 CI
XENON-133, INTO A POROUS ZONE 120 FEET BELOW THE LAND SURFACE. THE
MOVEMENT OF THIS GAS WAS STUDIED BY MEANS OF AIR SAMPLES AND RADIATION
DETECTION EQUIPMENT PLACED IN SURROUNDING MONITORING WELLS. AIR SAMPLES
ALSO WERE COLLECTED AT THE LAND SURFACE AND FROM STRATEGIC LOCATIONS IN
THE ATMOSPHERE. ANALYSIS OF THE RESULTS USING DIFFUSION EQUATIONS
VERIFIED THAT THE MOVEMENT COULD BE EXPLAINED ON THIS BASIS. VARIATION
OF ESTIMATED FLUX FROM THAT MEASURED WAS EXPLAINED ON THE BASIS OF
BAROMETRIC INFLUENCES. IT WAS ESTIMATED THAT 0.5 OF 1,000 CI INJECTED
ESCAPED TO THE ATMOSPHERE DURING A 24-DAY PERIOD. THIS AMOUNT RESULTED
IN CONCENTRATIONS THAT WERE LESS THAN THE MEAN CONCENTRATION OF
XENON-133 IN THE INJECTED AIR BY A FACTOR OF 100,000,000. MATHEMATICAL
MODELS DESCRIBING THE FLOW BY CONVECTIVE FORCES CREATED BY INJECTION
ALSO WERE TESTED AND FOUND ADEQUATE FOR MAKING ENGINEERING ESTIMATES.
(KNAPP-USGS)

FIELD 05B, 05G

ACCESSION NO. W70-02321

DEEP WELL DISPOSAL OF WASTEWATERS IN SALINE AQUIFERS OF SOUTH FLORIDA,

J. I. GARCIA-BENGOCHEA, AND R. O. VERNON.

PAPER PRESENTED AT 50TH ANNUAL MEETING, AMERICAN GEOPHYSICAL UNION, WASH DC,
APR 21-25, 1969. 15 P, 4 PLATE, 1 TAB, 7 REF.

DESCRIPTORS:

*INJECTION WELLS, *DEEP WELLS, *WASTE WATER DISPOSAL, *FLORIDA, SALINE
WATER SYSTEMS, AQUIFERS, GROUNDWATER MOVEMENT, BRACKISH WATER, WATER
UTILIZATION, RESERVOIRS, WATER STORAGE, RESEARCH AND DEVELOPMENT.

IDENTIFIERS:

BELLE GLADE, SOUTH FLORIDA.

ABSTRACT:

A DEEP-WELL DISPOSAL SYSTEM WAS OPERATED FOR THREE YEARS IN THE HIGHLY
SALINE BOULDER ZONE OF THE FLORIDAN AQUIFER IN SOUTH FLORIDA AT BELLE
GLADE. NO TRACE OF CONTAMINATION WAS DETECTED IN AN OVERLYING,
INTERMEDIATE SALINE AQUIFER. IF THE HYDROGEOLOGICAL CONDITIONS FOUND IN
BELLE GLADE EXTEND THROUGHOUT SOUTHERN PENINSULAR FLORIDA, AN IDEAL
SITUATION IS AVAILABLE FOR USE OF THE DEEPER OR BOULDER ZONE OF THE
FLORIDAN AQUIFER AS A RECEIVING ZONE OF WASTE DISPOSAL. GROUNDWATER
FLOW IS TO THE SURROUNDING SEAS, DISCHARGING AT CONSIDERABLE DEPTH AND
AWAY FROM SHORELINES. THE LESS SALINE WATER OF THE UPPER PART OF THE
ARTESIAN AQUIFER CAN BE USED AS A SOURCE OF BRACKISH WATER FOR FUTURE
USES, OR AS AN ARTIFICIALLY RECHARGED FRESH-WATER STORAGE RESERVOIR.
(CARSTEA-USGS)

FIELD 05E

ACCESSION NO. W70-02468

INJECTION WELL EXPERIENCE AT RIVERHEAD, N.Y.,

BAFFA (JOHN J.), NEW YORK.

JOHN J. BAFFA.

JOURNAL OF AMERICAN WATER WORKS ASSOCIATION, VOL 62, NO 1, P 41-46, JAN 1970.
6 P, 9 FIG, 5 REF.

DESCRIPTORS:

*INJECTION WELLS, *WATER REUSE, *RECHARGE WELLS, MODEL STUDIES,
RECLAIMED WATER, AQUIFERS, WATER YIELD, PERMEABILITY, RECHARGE,
ARTIFICIAL RECHARGE.

IDENTIFIERS:

WELL CLOGGING, WELL PERFORMANCE.

ABSTRACT:

INJECTION OF FRESH POTABLE WATER WAS STUDIED IN THE FIELD AND LABORATORY TO COMPARE THE HYDRAULIC CHARACTERISTICS OF THE INJECTION MOUND WITH THE PUMPING DRAWDOWN CHARACTERISTICS. INJECTION REQUIRES ESTABLISHMENT OF A BOUNDARY PRESSURE FOR ENTRANCE OF THE INJECTION WATER INTO THE AQUIFER PORES. INJECTION WAS ACCOMPLISHED IN TWO GROUND WELLS OF DIFFERENT DESIGN AND IN TWO WELLS CONTAINED IN A GROUND SIMULATOR TANK SO CONSTRUCTED AS TO PERMIT THE SAMPLING OF THE AQUIFER MATERIAL OPPOSITE THE WELL SCREEN AFTER PUMPING, INJECTION AND REDEVELOPMENT. THE CLOGGING RATE OF THE DOUBLE-CASED WELL WAS LESS THAN THAT OF THE SINGLE-CASED WELL BY 0.06 FT PER DAY AS MEASURED BY THE WATER LEVEL INSIDE THE CASING. THE INITIAL SPECIFIC CAPACITY OF THE DOUBLE-CASED WELL WAS ABOUT HALF OF THE WELL WITH THE GRAVEL PACK, BUT AFTER FRESH WATER INJECTION AND RECLAIMED WASTE WATER INJECTION IT WAS POSSIBLE TO RESTORE ITS INITIAL CAPACITY BY SURGING AND PUMPING. AFTER RECLAIMED WASTE WATER INJECTION INTO THE SINGLE-CASED WELL ITS SPECIFIC CAPACITY WAS MARKEDLY REDUCED AND COULD NOT BE RESTORED. (KNAPP-USGS)

FIELD 04B, 05D

ACCESSION NO. W70-03249

DISPOSAL OF LIQUID WASTES BY INJECTION UNDERGROUND - NEITHER MYTH NOR
MILLENNIUM,

GEOLOGICAL SURVEY, CARMEL, CALIF.

ARTHUR M. PIPER.

REPORT AVAILABLE AT NO COST FROM US GEOLOGICAL SURVEY, WASH, DC 20242.
GEOLOGICAL SURVEY CIRCULAR 631, 1969. 15 P, 2 TAB, 94 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, *WELL REGULATIONS, AQUIFERS, WATER
QUALITY, EARTHQUAKES, WATER STORAGE, WATER POLLUTION SOURCES, WATER
POLLUTION CONTROL, SURVEYS, LEGISLATION, LEGAL ASPECTS, ECONOMICS,
REGULATION, ADMINISTRATIVE AGENCIES, MANAGEMENT.

IDENTIFIERS:

WASTE DISPOSAL WELLS.

ABSTRACT:

INJECTING LIQUID WASTES DEEP UNDERGROUND IS AN ATTRACTIVE BUT NOT
NECESSARILY PRACTICAL MEANS FOR DISPOSING OF THEM. FOR DECADES,
IMPRESSIVE VOLUMES OF UNWANTED OIL-FIELD BRINE HAVE BEEN INJECTED,
CURRENTLY ABOUT 10,000 ACRE-FEET YEARLY. RECENTLY, LIQUID INDUSTRIAL
WASTES ARE BEING INJECTED IN EVER-INCREASING QUANTITY. EFFECTS OF DEEP
INJECTION ARE COMPLEX AND NOT ALL ARE UNDERSTOOD CLEARLY. IN A
RESPONSIBLE SOCIETY, INJECTION CANNOT BE ALLOWED TO PUT WASTES OUT OF
MIND. INJECTION IS NO MORE THAN STORAGE--FOR ALL TIME IN THE CASE OF
THE MOST INTRACTABLE WASTES--IN UNDERGROUND SPACE OF WHICH LITTLE IS
ATTAINABLE IN SOME AREAS AND WHICH IS EXHAUSTIBLE IN MOST AREAS.
STANDARDS BY WHICH TO CATEGORIZE THE WASTES ARE URGENTLY DESIRABLE. TO
THE END THAT INJECTION MAY BE PLANNED AND ADMINISTERED, THERE IS
PROPOSED AN IMMEDIATE AND COMPREHENSIVE CANVASS OF ALL THE UNITED
STATES. SUCH A CANVASS WOULD CONSIDER (1) NATURAL ZONES OF GROUNDWATER
CIRCULATION, FROM RAPID TO STAGNANT, (2) REGIONAL HYDRODYNAMICS, (3)
SAFE INJECTION PRESSURES, AND (4) GEOCHEMICAL ASPECTS. ONLY MISSOURI,
OHIO, AND TEXAS HAVE STATUTES SPECIFICALLY TO REGULATE INJECTION OF
INDUSTRIAL WASTES. SOME NEW, FULLY COMPETENT INSTITUTIONAL ARRANGEMENT
APPEARS TO BE ESSENTIAL, UNDER A UNIFIED POLICY. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W70-04103

ENGINEERING ECONOMIC STUDY OF MINE DRAINAGE CONTROL TECHNIQUES.

RICE (CYRUS WM.) AND CO., PITTSBURGH, PA.

APPALACHIAN REGIONAL COMMISSION REPORT ON ACID MINE DRAINAGE IN APPALACHIA, APPENDIX B, 1969. 281 P, 42 FIG, 54 TAB, 269 REF. ARC CONTRACT NO 69-12.

DESCRIPTORS:

*ACID MINE WATER, *WATER POLLUTION CONTROL, *WATER POLLUTION TREATMENT, *APPALACHIAN MOUNTAIN REGION, WATER COSTS, WATER TREATMENT, WASTE WATER TREATMENT, ACIDIC WATER, IRON, SULFATES, NEUTRALIZATION, REVERSE OSMOSIS, INJECTION WELLS, WASTE WATER DISPOSAL.

IDENTIFIERS:

ACID MINE DRAINAGE.

ABSTRACT:

A SERIES OF COST CURVE GRAPHS WERE DEVELOPED TO SERVE AS A METHOD FOR DETERMINING THE COSTS OF APPLYING VARIOUS TECHNIQUES OF CONTROLLING ACID MINE DRAINAGE POLLUTION. WHEREVER POSSIBLE, CURVES HAVE BEEN PRESENTED FOR CHANGES IN CAPITAL, OPERATING, AND MAINTENANCE COSTS WHERE THESE ARE DEPENDENT UPON THE SCALE OF APPLICATION UNDER THE VARYING SETS OF GENERAL CONDITIONS CHARACTERISTIC OF MINE DRAINAGE POLLUTED AREAS IN THE APPALACHIAN REGION. THE EFFECTIVENESS OF EACH OF THE CONTROL TECHNIQUES WAS STUDIED IN TERMS OF THE DEGREE TO WHICH MINE DRAINAGE POLLUTION IS CONTROLLED, AND THE QUALITY CHARACTERISTICS OF THE POST-TECHNIQUE WATER. THE TECHNIQUES IN THE PROPOSED OR EXPERIMENTAL STAGE THAT OFFER THE GREATEST PROMISE AND THUS WARRANT FURTHER RESEARCH AND DEVELOPMENT ARE RECOMMENDED. THE RECOMMENDED TECHNIQUES ARE NEUTRALIZATION, REVERSE OSMOSIS, STREAMFLOW REGULATION, DEEP WELL DISPOSAL, LAND RECLAMATION, REVEGETATION, PUMPING AND DRAINAGE, WATER DIVERSION, MINE SEALING, REFUSE TREATMENT, AND IMPOUNDMENT OF ACID WATER. (SEE W70-04328). (KNAPP-USGS)

FIELD 05G

ACCESSION NO. W70-04330

ARTIFICIAL-RECHARGE EXPERIMENTS UTILIZING RENOVATED SEWAGE-PLANT EFFLUENT - A
FEASIBILITY STUDY AT BAY PARK, NEW YORK, U.S.A.,

GEOLOGICAL SURVEY, MINEOLA, N.Y.

PHILIP COHEN, AND C. N. DURFOR.

ARTIFICIAL RECHARGE AND MANAGEMENT OF AQUIFERS, SYMPOSIUM OF HAIFA (MARCH
19-26, 1967), INTERNATIONAL ASSOCIATION OF SCIENTIFIC HYDROLOGY,
PUBLICATION NO 72, P 193-199, 1967. 7 P, 4 FIG, 3 REF.

DESCRIPTORS:

*ARTIFICIAL RECHARGE, *RECHARGE WELLS, *WATER REUSE, *NEW YORK, *SALINE
WATER INTRUSION, ON-SITE TESTS, TERTIARY TREATMENT, FILTERS,
GROUNDWATER MOVEMENT, INJECTION WELLS, OBSERVATION WELLS, COSTS.

IDENTIFIERS:

LONG ISLAND(NY), BARRIER INJECTION WELLS.

ABSTRACT:

THE U.S. GEOLOGICAL SURVEY, IN COOPERATION WITH THE NASSAU COUNTY
DEPARTMENT OF PUBLIC WORKS, IS CONDUCTING A SERIES OF
ARTIFICIAL-RECHARGE EXPERIMENTS ON LONG ISLAND, NEW YORK TO OBTAIN
SCIENTIFIC AND ECONOMIC DATA NEEDED TO EVALUATE THE FEASIBILITY OF
INJECTING HIGHLY TREATED SEWAGE-PLANT EFFLUENT INTO A PROPOSED NETWORK
OF 'BARRIER' INJECTION WELLS THAT ARE INTENDED TO PREVENT OR RETARD THE
LANDWARD MOVEMENT OF SALTY WATER FROM THE ATLANTIC OCEAN INTO MAJOR
AQUIFERS. TERTIARY SEWAGE TREATMENT WAS DEVELOPED TO PRODUCE AN
EFFLUENT THAT MEETS REQUIREMENTS COMMONLY ACCEPTED FOR POTABILITY. AN
EXPERIMENTAL INJECTION WELL AND INJECTION PLANT HAVE BEEN COMPLETED.
REMOTE SENSING DOWNHOLE GEOCHEMICAL PROBES PERMIT THE MEASUREMENT OF
WATER-QUALITY AND HYDRAULIC-HEAD CHANGES AT SEVERAL POINTS WITHIN THE
INJECTION WELL AND THE FILTERPACK. (KNAPP-USGS)

FIELD 05D, 04B

ACCESSION NO. W70-04355

UNDER THE RUG,

COLORADO SCHOOL OF MINES, GOLDEN. MINERAL RESOURCES INST.

DAVID M. EVANS, AND ALBERT BRADFORD.

ENVIRONMENT, VOL 11, NO 8, P 3-13, 31, OCTOBER 1969. 12 P, 6 FIG, 1 TAB, 29 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, *AQUIFERS, INDUSTRIAL WASTES, RECHARGE, CORROSION, PUBLIC HEALTH, SAFETY, WATER POLLUTION SOURCES, WATER POLLUTION EFFECTS, EARTHQUAKES, WATER PRESSURE.

IDENTIFIERS:

*WASTE DISPOSAL WELLS.

ABSTRACT:

LEGISLATIVE CONTROL OF UNDERGROUND WASTE DISPOSAL, THE TECHNIQUES OF DISPOSAL, AND POSSIBLE EFFECTS OF THE USE OF DISPOSAL WELLS ARE REVIEWED. FEW STATES REGULATE IN ANY SPECIFIC WAY WHAT SUBSTANCES GO UNDERGROUND. MANY INDUSTRIES AND GOVERNMENT AGENCIES ARE TAKING ADVANTAGE OF THIS GAP IN CONTROL LAWS AND ARE NOW DUMPING THEIR TOXIC WASTES BELOW THE GROUND THROUGH DEEP INJECTION WELLS. SUCH WELLS ARE USUALLY CHEAP TO BUILD AND OPERATE COMPARED WITH THE COST OF CLEANING UP WASTES OR STORING THEM, BUT THEY OFFER ONLY TEMPORARY SAFETY FROM THE MANY PERMANENTLY TOXIC WASTES BEING INJECTED. THE INDUSTRIAL WASTES GOING DOWN DEEP WELLS RANGE FROM STEROIDS AND PHOTOGRAPHIC CHEMICALS TO URANIUM TAILINGS. AT THE ROCKY MOUNTAIN ARSENAL IN DENVER, WASTES FROM THE MANUFACTURE OF POISON GAS HAD BEEN DUMPED INTO ABOVE-GROUND HOLDING PONDS SINCE 1943. A MONTH AFTER INJECTION BEGAN, DENVER HAD ITS FIRST EARTHQUAKE IN 80 YEARS, AND IN NOVEMBER 1965, THE 710 DENVER EARTHQUAKES RECORDED BY THAT TIME CORRELATED WITH THE VOLUMES OF FLUID PUMPED INTO THE ARSENAL WELL. DISCONTINUATION OF MANY WELLS IN SERVICE AND VERY CAREFUL STUDY OF THE NEED AND DESIRABILITY OF ANY NEW WELLS ARE RECOMMENDED. IN GENERAL, TREATMENT FOR NONPOLLUTING SURFACE DISPOSAL OF INDUSTRIAL WASTES IS SAFER AND MORE DESIRABLE THAN UNDERGROUND DISPOSAL OF RAW OR DANGEROUS WASTES. (KNAPP-USGS)

FIELD 05G, 05F

ACCESSION NO. W70-04589

CLARIFICATION OF TURBID WATER WITH POLYELECTROLYTES FOR RECHARGE THROUGH WELLS,
TECHNION-ISRAEL INST. OF TECH., HAIFA. SANITARY ENGINEERING LAB.; AND
AGRICULTURAL RESEARCH SERVICE, BUSHLAND, TEX. SOUTHERN PLAINS BRANCH.

M. REBHUN, AND V. L. HAUSER.

ARTIFICIAL RECHARGE AND MANAGEMENT OF AQUIFERS, SYMPOSIUM OF HAIFA (MARCH
19-26, 1967), INTERNATIONAL ASSOCIATION OF SCIENTIFIC HYDROLOGY,
PUBLICATION NO 72, P 218-228, 1967. 11 P, 9 FIG, 8 REF.

DESCRIPTORS:

*ARTIFICIAL RECHARGE, *WATER TREATMENT, *COAGULATION, ELECTROLYTES,
CLAYS, TURBIDITY, INJECTION WELLS, PERMEABILITY, FILTRATION, TEXAS,
PLAYAS, WATER SPREADING.

IDENTIFIERS:

POLYELECTROLYTE COAGULATION.

ABSTRACT:

STORM RUNOFF WATER IS A GOOD SOURCE OF ADDITIONAL WATER SUPPLY FOR ARID
AND SEMIARID REGIONS; HOWEVER, IT MUST BE STORED FOR LATER USE. STORAGE
OF THESE WATERS IN AQUIFERS BY ARTIFICIAL RECHARGE IS HINDERED BY
SUSPENDED SOLIDS IN THE WATER. FOR RECHARGE BY INJECTION THROUGH WELLS,
REMOVAL OF SUSPENDED SOLIDS MUST BE NEARLY COMPLETE. POLYELECTROLYTE
FLOCCULANTS EFFECTIVELY CLARIFY SUSPENSIONS TYPICAL OF FLOOD RUNOFF
WATER. A SIMPLE FIELD SYSTEM WAS BUILT AND TESTED, AND ALL ELEMENTS OF
A COMPLETE SYSTEM INCLUDING TREATMENT WITH POLYELECTROLYTES, A SIMPLE
CLARIFICATION SYSTEM, AND GROUNDWATER RECHARGE THROUGH WELLS WERE
COMBINED INTO A SUCCESSFUL OPERATING UNIT. (KNAPP-USGS)

FIELD 04B, 05G

ACCESSION NO. W70-04609

SUBSURFACE DISPOSAL OF INDUSTRIAL WASTES,

MICHIGAN STATE GEOLOGICAL SURVEY, LANSING.

ROBERT E. IVES, AND GERALD E. EDDY.

INTERSTATE OIL COMPACT COMMISSION STUDY, OKLAHOMA CITY, JUNE 1968. 109 P, 6
FIG, 3 TAB, 62 REF, 3 APPEND.

DESCRIPTORS:

*WASTE WATER DISPOSAL, *INDUSTRIAL WASTES, *INJECTION WELLS, SURVEYS,
AQUIFERS, HYDROGEOLOGY, LEGAL ASPECTS, WATER LAW, WATER CHEMISTRY,
WATER POLLUTION, GEOLOGY, REGULATION, MONITORING, WELL REGULATIONS.

IDENTIFIERS:

WASTE DISPOSAL WELLS.

ABSTRACT:

UNDERGROUND WASTE DISPOSAL POLICIES AND PRACTICES IN THE U.S. ARE
COMPILED AND REVIEWED. A QUESTIONNAIRE WAS COMPILED AND SENT OUT TO
ESTABLISH INFORMATION ON THE NATURE, SERIOUSNESS, LEGAL ASPECTS, AND
METHOD OF HANDLING THESE PROBLEMS AS THEY EXIST IN EACH OF THE STATES.
ANOTHER QUESTIONNAIRE WAS SENT OUT THAT DEALT SPECIFICALLY WITH
INDIVIDUAL SUBSURFACE WASTE DISPOSAL WELLS. A SHORT DISCUSSION OF
POLLUTION PROBLEMS INCLUDES INFORMATION ON THE NATURE AND SERIOUSNESS
OF THE POLLUTANTS AND THE TREATMENT METHODS CURRENTLY BEING USED.
PHYSICAL CONSIDERATIONS OF USE OF UNDERGROUND RESERVOIRS MAY AFFECT
OTHER VALUES AND OTHER USES OF THESE RESERVOIRS FOR REASONABLE
PURPOSES. LEGAL CONSIDERATIONS AND RESULTING COMPLICATIONS ARE
DISCUSSED. A SUMMARY COVERAGE OF DISPOSAL SYSTEMS AND DISPOSAL WELLS
NOW IN USE IN THE VARIOUS STATES INCLUDES COMMENTS ON STATE POLICIES,
REGULATIONS AND ENFORCEMENT. RECOMMENDED PRACTICES AND PROCEDURES IN
THE ESTABLISHMENT OF GUIDELINES CONCERNING INITIAL PROCESSING OF
APPLICATIONS, DRILLING, MONITORING, AND FINAL ABANDONMENT OF DISPOSAL
WELLS ARE GIVEN. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W70-05181

PERSPECTIVE ON THE REGULATION OF UNDERGROUND INJECTION OF WASTEWATERS,

OHIO RIVER VALLEY WATER SANITATION COMMISSION, CINCINNATI; AND FEDERAL WATER POLLUTION CONTROL ADMINISTRATION.

EDWARD J. CLEARY, AND DON L. WARNER.

CINCINNATI, OHIO RIVER VALLEY WATER SANITATION COMMISSION, DECEMBER 1969. 88 P, 14 FIG, 6 TAB, 36 REF, 2 APPEND.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, *HYDROGEOLOGY, *WATER LAW, *REVIEWS, REGULATION, LEGISLATION, LEGAL ASPECTS, WATER POLLUTION CONTROL, GROUNDWATER, AQUIFERS, OHIO RIVER, SANITARY ENGINEERING, ENVIRONMENTAL ENGINEERING, SURVEYS, INVESTIGATIONS, POLITICAL ASPECTS, ADMINISTRATION.

IDENTIFIERS:

OHIO RIVER VALLEY, WASTE DISPOSAL WELLS, DISPOSAL WELLS.

ABSTRACT:

THE EIGHT STATES OF THE OHIO RIVER VALLEY WATER SANITATION COMMISSION (ORSANCO) COMMISSIONED A STUDY OF POLICIES, PROCEDURES AND OTHER MATTERS ALLIED TO THE PRACTICE OF SUBSURFACE DISPOSAL. PERSPECTIVE AND GUIDELINES ARE OFFERED IN A MONOGRAPH ON THE REGULATION OF UNDERGROUND INJECTION OF WASTEWATERS. THE FIRST SECTION PROVIDES BACKGROUND ON PUBLIC POLICY ISSUES ASSOCIATED WITH ENVIRONMENTAL FACTORS AND SUBSURFACE-RESOURCES, INCLUDING LEGISLATIVE AND LEGAL ASPECTS. PART II DISCUSSES ADMINISTRATIVE PROCEDURES, GEOLOGICAL EVALUATION AND TECHNICAL CRITERIA RELATING TO INJECTION-WELL PRACTICE, SPECIFICALLY IN THE OHIO VALLEY. THERE IS GROWING CONCERN THAT WASTEWATER INJECTION MAY BE PROCEEDING FASTER THAN WARRANTED BY KNOWLEDGE AND REGULATORY PROCEDURES. A DEEP-WELL DISPOSAL SYSTEM NEAR DENVER MAY HAVE TRIGGERED EARTH TREMORS IN THE AREA. LEGAL CONCERN EXISTS WITH RESPECT TO UNDERGROUND TRESPASS. NO STATE PROHIBITS UNDERGROUND DISPOSAL, BUT NINE STATES SUBSCRIBE TO A POLICY OF EITHER REJECTING APPLICATIONS OR DISCOURAGING THEM. ONLY OHIO, WEST VIRGINIA AND TEXAS HAVE SPECIFIC LEGISLATION PERTAINING TO THE REGULATION OF INDUSTRIAL WASTEWATER INJECTION. THERE IS NO SPECIFIC FEDERAL LEGISLATION ON DEEP-WELL DISPOSAL. ONLY SMALL AREAS OF THE OHIO VALLEY WOULD APPEAR TO BE ELIMINATED OR SIGNIFICANTLY LIMITED FOR WASTE INJECTION ON THE BASIS OF THE MOST GENERAL CONSIDERATION OF THE ROCK UNITS THAT ARE PRESENT, THEIR GEOLOGIC STRUCTURE, AND THE GROUNDWATER CIRCUMSTANCES. FOR ABANDONMENT OF AN INJECTION SYSTEM, IT IS SUGGESTED THAT WELLS BE COMPLETELY PLUGGED WITH CEMENT AND THAT A PERMANENT MONUMENT BE CONSTRUCTED AT THE WELL SITE. (KNAPP-USGS)

FIELD 05G, 05E

ACCESSION NO. W70-05521

INJECTION OF RECLAIMED WASTEWATER INTO CONFINED AQUIFERS,

TOUPS ENGINEERING, INC., SANTA ANA, CALIF.; AND ORANGE COUNTY WATER DISTRICT,
SANTA ANA, CALIF.

G. M. WESNER, AND D. C. BAIER.

JOURNAL AMERICAN WATER WORKS ASSOCIATION, VOL 62, NO 3, P 203-210, MARCH
1970. 8 P, 6 FIG, 7 TAB, 19 REF.

DESCRIPTORS:

*RECLAIMED WATER, *INJECTION WELLS, *ARTIFICIAL RECHARGE, *SALINE WATER
INTRUSION, *CALIFORNIA, WATER REUSE, ODOR, TASTE, WATER QUALITY, WATER
POLLUTION CONTROL, MONITORING, ON-SITE TESTS, AQUIFERS, GROUNDWATER
MOVEMENT.

IDENTIFIERS:

SALINE WATER BARRIER WELLS, ORANGE COUNTY(CALIF).

ABSTRACT:

THE ORANGE COUNTY WATER DISTRICT, CALIFORNIA HAS CONDUCTED RESEARCH IN
WASTEWATER RECLAMATION AND SUBSURFACE INJECTION SINCE JULY, 1965. THE
FIRST PHASE OF THE WORK WAS INTENDED TO DETERMINE THE FEASIBILITY OF
TREATING AND INJECTING SECONDARY EFFLUENT. THE SECOND PHASE HAS THE
FOLLOWING OBJECTIVES: (1) DETERMINE THE HYDRAULIC CHARACTERISTICS OF
THE PROPOSED INJECTION BARRIER SYSTEM OF MULTI-POINT INJECTION WELLS;
(2) DETERMINE THE LONG-TERM FATE OF RECLAIMED WASTEWATER IN THE
INJECTION SYSTEM; (3) DETERMINE THE FEASIBILITY OF UTILIZING WASTEWATER
FOR A BARRIER; AND (4) DETERMINE THE CHEMICAL COMPOSITION OF BLENDED
RECLAIMED WATER AND DEEP GROUNDWATER. THE MULTIPLE CASING INJECTION
WELLS HAVE PERFORMED VERY SATISFACTORILY. THE TREATED TRICKLING FILTER
EFFLUENT IS INJECTABLE AND WOULD NOT CAUSE EXCESSIVE WELL CLOGGING.
COLIFORM BACTERIA HAVE APPEARED SPORADICALLY 100 FT FROM THE INJECTION
WELL, AND HAVE NOT BEEN FOUND AT 245 FT. MANY CHEMICAL CONSTITUENTS DO
NOT MOVE CONSERVATIVELY IN THE INJECTED WATER. HARDNESS AND ALKALINITY
INCREASE; AMMONIA AND OTHER OXYGEN-DEMANDING MATERIALS ARE
SIGNIFICANTLY REDUCED BY TRAVEL IN THE CONFINED AQUIFER. THE ODOR AND
TASTE WHICH PERSIST IN THE INJECTED RECLAIMED WATER IS PROBABLY THE
MOST SERIOUS DETERRENT TO UTILIZING THIS SOURCE FOR INJECTION IN A
BARRIER SYSTEM. (KNAPP-USGS)

FIELD 05D, 04B

ACCESSION NO. W70-05880

HYDROGEOLOGIC INFORMATION ON THE GLORIETA SANDSTONE AND THE OGALLALA FORMATION
IN THE OKLAHOMA PANHANDLE AND ADJOINING AREAS AS RELATED TO UNDERGROUND WASTE
DISPOSAL,

GEOLOGICAL SURVEY, WASHINGTON, D.C.

JAMES H. IRWIN, AND ROBERT B. MORTON.

REPORT AVAILABLE FREE ON APPLICATION TO U S GEOLOGICAL SURVEY, WASHINGTON, D
C 20242. GEOLOGICAL SURVEY CIRCULAR 630, 1969. 26 P, 4 FIG, 4 PLATE, 2 TAB,
43 REF.

DESCRIPTORS:

*HYDROGEOLOGY, *WATER POLLUTION SOURCES, *WASTE WATER DISPOSAL,
*INJECTION WELLS, *LEAKAGE, TEXAS, OKLAHOMA, UNDERGROUND, GROUNDWATER
MOVEMENT, SEEPAGE, AQUIFERS, BRINES, SALINE WATER, SALINE WATER
INTRUSION.

IDENTIFIERS:

GLORIETA SANDSTONE, OGALLALA FORMATION.

ABSTRACT:

THE OKLAHOMA PANHANDLE AND ADJACENT AREAS IN TEXAS, KANSAS, COLORADO,
AND NEW MEXICO HAVE SUPPLIES OF FRESH WATER AND OF OIL AND GAS. THE
OGALLALA AND, IN PLACES, CRETACEOUS ROCKS PRODUCE FRESH WATER THROUGH
APPROXIMATELY 9,000 IRRIGATION AND PUBLIC-SUPPLY WELLS AND A LARGE
NUMBER OF OTHER WELLS. DISPOSAL OF OIL-FIELD BRINE AND OTHER WASTES
INTO THE GLORIETA SANDSTONE IS OF CONCERN BECAUSE OF THE POSSIBILITY OF
POLLUTION OF THE OVERLYING FRESH-WATER AQUIFERS, PARTICULARLY THE
OGALLALA FORMATION. PERMITS FOR 147 DISPOSAL WELLS INTO THE GLORIETA
HAVE BEEN ISSUED IN THIS AREA. IN THE REPORT AREA, THE GLORIETA
SANDSTONE LIES AT DEPTHS RANGING FROM ABOUT 500 TO 1,600 FEET BELOW THE
BASE OF THE OGALLALA FORMATION. THE ROCKS BETWEEN THOSE TWO FORMATIONS
ARE RELATIVELY IMPERMEABLE BUT SOLUTION HAS RESULTED IN COLLAPSE IN
SOME PLACES, RESULTING IN INCREASED VERTICAL PERMEABILITY. THIS MIGHT
RESULT IN MOVEMENT OF BRINE UNDER HYDROSTATIC HEAD FROM THE GLORIETA
SANDSTONE INTO OVERLYING FRESH-WATER AQUIFERS. (KNAPP-USGS)

FIELD 04B, 05E

ACCESSION NO. W70-05922

UNDERGROUND DISPOSAL OF ACTIVATED SLUDGE,

DOW CHEMICAL CO., MIDLAND, MICH.

E. S. SHANNON.

JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 12, P 2059-2061, DEC 1968. 2 FIG.

DESCRIPTORS:

*ACTIVATED SLUDGE, *SLUDGE DISPOSAL, *DEEPWELL, INDUSTRIAL WASTES, INJECTION, INJECTION WELLS, WELLS, WASTE WATER.

IDENTIFIERS:

*DOW CHEMICAL, *MIDLAND(MICH).

ABSTRACT:

THE DEEPWELL DISPOSAL HAS BEEN USED SUCCESSFULLY FOR MANY YEARS BY A CHEMICAL MANUFACTURING PLANT AT MIDLAND, MICHIGAN TO DISPOSE OF UNMARKETABLE BY-PRODUCT CHEMICALS, BRINES, AND HIGH BOD WASTES. SINCE 1963 EXCESS ACTIVATED SLUDGE FROM THE PLANT'S WASTE WATER TREATMENT FACILITY ALSO HAS BEEN INJECTED INTO UNDERGROUND FORMATIONS. THE ACTIVATED SLUDGE DISPOSAL WELL SYSTEM CONSISTS OF A 100 FT DIAMETER THICKENER, TWO SLUDGE HOLDING TANKS, 1 SLUDGE FORWARDING STATION, 4 HIGH PRESSURE PUMPS, AND 2 DISPOSAL WELLS. IN OPERATION EXCESS ACTIVATED SLUDGE AT ABOUT 1.5% SOLIDS IS PUMPED TO THE THICKENER WHERE THE CONCENTRATION IS INCREASED TO ABOUT 2.5% SOLIDS. INJECTION PRESSURES ARE KEPT BELOW LEVELS THAT WOULD CAUSE FRACTURE OF RECEIVING FORMATIONS. (HANCUFF-TEXAS)

FIELD 05E, 05D

ACCESSION NO. W70-06077

WASTE WATER TREATMENT FOR THE BURNS HARBOR PLANT OF BETHLEHAM STEEL CORPORATION,
BETHLEHAM STEEL CORP., CHESTERTON, IND. BURNS HARBOR PLANT.

R. N. LEIDNER.

JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 41, NO 5, PART I, P
796-807, MAY 1969. 18 FIG.

DESCRIPTORS:

*ACTIVATED SLUDGE, *OIL, SKIMMING, *WASTE WATER TREATMENT, INDUSTRIAL
WASTES.

IDENTIFIERS:

*STEEL WASTE DISCHARGE, *ACID WASTE, SECONDARY WASTE TREATMENT, PRIMARY
TREATMENT, COAGULANT AID, DEEP-WELL INJECTION, MILL WASTES,
FLOCCULATOR-CLARIFIER, PH.

ABSTRACT:

THE BURNS HARBOR PLANT OF THE BETHLEHAM STEEL CORPORATION HAS A COMPLEX
WASTE WATER TREATMENT FACILITY FOR ALL CONTAMINATED WASTE WATER. THE
INITIAL DESIGN OF WATER AND WASTE WATER SYSTEMS INCLUDED DESIGN
PARAMETERS SUCH AS (1) THE REUSE OF PROCESS WATER WHENEVER POSSIBLE,
(2) THE SEGREGATION OF WASTES TO FACILITATE TREATMENT, (3) THE PRIMARY
TREATMENT OF WASTES WHEN REQUIRED TO PROTECT SEWER SYSTEMS, AND (4)
TERMINAL TREATMENT OF ALL CONTAMINATED WASTE PRIOR TO DISCHARGE. A
STUDY OF MODIFICATIONS MADE TO THE WASTEWATER SYSTEMS, IN OPERATION
SINCE 1964, IS ALSO INCLUDED. PH MONITORING, DEEP-WELL INJECTION PIPING
MATERIALS, AND COAGULANT AIDS WERE ALL CHANGED. THE ACTIVATED SLUDGE
UNIT 0.47 MGD HAS OPERATED SATISFACTORILY UNDER VARIED CONDITIONS OF
OPERATION. THE BURNS HARBOR PLANT IS IN THE PROCESS OF EXPANDING TO AN
INTEGRATED STEEL MILL. (SHANKAR-TEXAS)

FIELD 05D

ACCESSION NO. W70-06614

RELATIONSHIPS BETWEEN SELECTED PHYSICAL PARAMETERS AND COST RESPONSES FOR THE
DEEP-WELL DISPOSAL OF AQUEOUS INDUSTRIAL WASTES,

TEXAS UNIV., AUSTIN. CENTER FOR RESEARCH IN WATER RESOURCES.

JOE CLIFTON MOSELEY, II, AND JOSEPH F. MALINA, JR.

ENVIRONMENTAL HEALTH ENGINEERING RESEARCH LABORATORY REPORT EHE 07-6801,
CRWR-28, AUGUST 1968. 276 P, 51 FIG, 13 TAB, 175 REF. PUBLIC HEALTH SERVICE
GRANT EH-68-610-B.

DESCRIPTORS:

*COMPUTER MODELS, *COST ANALYSIS, *ECONOMIC PREDICTION, *INJECTION
WELLS, EQUATIONS, PERFORMANCE, ULTIMATE DISPOSAL, *WASTE WATER
DISPOSAL, *INDUSTRIAL WASTES.

IDENTIFIERS:

AQUEOUS WASTES, COMPUTERIZED DESIGN, ECONOMIC DATA.

ABSTRACT:

THE OBJECTIVES OF THIS INVESTIGATION WERE: (A) TO DEVELOP THE EQUATIONS
AND THE SYSTEMS OF EQUATIONS GOVERNING THE PERFORMANCE OF AN INJECTION
WELL, (B) TO COLLECT ECONOMIC DATA ON THE COMPONENTS OF SUCH A SYSTEM,
(C) TO DEVELOP A COMPUTERIZED DESIGN AND COST MODEL GIVING THE COST
RESPONSES TO THE INPUT VARIABLES, (D) TO TEST THIS MODEL ON MANY
FEASIBLE INPUT DATA COMBINATIONS, AND (E) TO DEVELOP GENERALIZED
RELATIONSHIPS BETWEEN PHYSICAL CONDITIONS AND THE COSTS OF INJECTION.
PHYSICAL RELATIONSHIPS IN COMMON USAGE IN THE PETROLEUM INDUSTRY WERE
MODIFIED WHERE NECESSARY AND USED TO DESCRIBE THE BEHAVIOR OF THE
INJECTION SYSTEM. COST DATA WERE COLLECTED FROM A VARIETY OF SOURCES,
ESPECIALLY THE PETROLEUM AND CHEMICAL ENGINEERING FIELDS. THE RESULTS
OF THIS STUDY INDICATE THAT DEEP WELL INJECTION OF AQUEOUS WASTES IS
BOTH TECHNICALLY AND ECONOMICALLY FEASIBLE UNDER CERTAIN CONDITIONS.
THE COST OF THIS OPERATION MAY RUN UPWARD FROM A MINIMUM OF 0.25 - 0.40
DOLLARS PER THOUSAND GALLONS, INCLUDING MINIMAL PRE-INJECTION TREATMENT
AND AMORTIZATION OF THE INITIAL CAPITAL INVESTMENT. THE CAPITAL COST OF
SUCH SYSTEMS APPEARS TO VARY FROM \$0.30 TO OVER \$2.00 PER THOUSAND
GALLONS PER DAY FOR A 10 TO 0.10 MGD SYSTEM, RESPECTIVELY.
(AGUIRRE-TEXAS)

FIELD 05D

ACCESSION NO. W70-07033

WATER -- 1969.

CHEMICAL ENGINEERING PROGRESS SYMPOSIUM SERIES 97, VOL 65, PUBLISHED BY
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, NEW YORK, 1969. 315 P.

DESCRIPTORS:

*ULTIMATE DISPOSAL, *WATER POLLUTION CONTROL, *WATER POLLUTION
TREATMENT, *CONFERENCES, WASTE WATER TREATMENT, DESALINATION, WATER
REUSE, INJECTION WELLS, SOIL DISPOSAL FIELDS, RADIOACTIVE WASTES,
EUTROPHICATION, WATER MANAGEMENT(APPLIED), ECONOMICS, OILY WATER.

IDENTIFIERS:

WASTE MANAGEMENT SYMPOSIUM.

ABSTRACT:

A SYMPOSIUM COLLECTION PRESENTS 43 PAPERS ON THE GENERAL SUBJECT OF
ULTIMATE DISPOSAL OF WASTES OR POLLUTION CONTROL. THE TOPICS INCLUDE
INJECTION WELL PRACTICES, SOIL DISPOSAL-FIELDS, RADIOACTIVE WASTE
MANAGEMENT, DISPOSAL TO BODIES OF WATER, THERMAL WASTE DISPOSAL,
QUALITY STANDARDS, WATER REUSE, WASTE MANAGEMENT, POLLUTION SURVEYS,
WATER POLLUTION TREATMENT, ECONOMICS OF WASTE MANAGEMENT, WASTE
TREATMENT TECHNOLOGY, DESALINATION, EUTROPHICATION, AND OIL SPILL
CONTROL. (SEE ALSO W70-07381 THRU W70-07393). (KNAPP-USGS)

FIELD 05G, 05D, 05E

ACCESSION NO. W70-07380

DEEP-WELL DISPOSAL OF STEEL MILL WASTES,

NATIONAL STEEL CORP., PORTAGE, IND. MIDWEST STEEL DIV.

C. D. HARTMAN.

JOURNAL WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 1, P 95-100, JAN 1968.
6 FIG, 2 TAB.

DESCRIPTORS:

*SLUDGE DISPOSAL, *INJECTION WELL, *ACIDS, *STEEL, INDUSTRIAL WASTES,
SLUDGE TREATMENT, LAGOONS, GROUNDWATER, GEOLOGY, COSTS, FILTRATION,
DISPOSAL, WASTE DISPOSAL.

ABSTRACT:

THE LARGE ACCUMULATION OF SLUDGE AS WELL AS THE INCREASING PRODUCTION OF SLUDGE AT THE MIDWEST STEEL MILL FORCED INVESTIGATION OF AN ALTERNATE DISPOSAL METHOD TO ITS OVERTAXED SLUDGE LAGOONS. DEEP-WELL INJECTION WAS CONSIDERED AND GEOLOGICAL INVESTIGATION SHOWED THAT A WATER-FILLED SAND STONE FORMATION APPROXIMATELY 2,500 FEET THICK WAS LOCATED ABOUT 2,000 FEET BENEATH THE MIDWEST PLANT SITE. THE INJECTION TUBE IS A 3-INCH FIBERGLASS PIPE WHICH IS RESISTANT TO THE WASTE PICKLE ACID. BEFORE INJECTION THE ACID IS FILTERED TO ELIMINATE PARTICLES LARGER THAN 0.5 MICRONS. THE NEW PROCESS HAS REDUCED SLUDGE ACCUMULATION BY 70%. A FLOW OF 75 GAL/MIN HAS BEEN OPERATING FOR 18 MONTHS WITH NO PRESSURE REQUIRED. THE MONTHLY WASTE DISPOSAL COSTS HAVE BEEN REDUCED FROM \$33,000 FOR LIME NEUTRALIZATION TO \$5,200 FOR THE DEEP-WELL INJECTION. (HANCUFF-TEXAS)

FIELD 05E

ACCESSION NO. W70-07447

WASTE WATER REUSE,

NEW YORK STATE DEPARTMENT OF HEALTH, ALBANY.

DONALD B. STEVENS.

JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 40, NO 4, P 677-683,
APRIL 1968. 2 FIG, 1 TAB, 15 REF.

DESCRIPTORS:

*WATER REUSE, *TERTIARY TREATMENT, WASTE WATER TREATMENT, GROUNDWATER,
RECHARGE WELLS, INJECTION WELLS.

ABSTRACT:

WHILE NEW YORK STATE IS A COMPARATIVELY WATER RICH STATE IT MUST PROVIDE A HIGH DEGREE OF TREATMENT TO ITS WASTE WATER SIMPLY BECAUSE EVERY STREAM IS A SOURCE OF WATER SUPPLY. THE PRESENT STATE OF THE ART IS SUCH THAT A WATER MEETING DRINKING WATER STANDARDS CAN BE PRODUCED FROM THE USUAL RUN OF DOMESTIC WASTE WATERS. EMPHASIS MUST SHIFT FROM THE MERE REMOVAL OF POLLUTANTS FROM THE MAINSTREAM OF WASTE WATER TO SATISFACTORY DISPOSAL OF THIS REMOVAL MATERIAL. TWO CURRENT STUDIES ARE DESCRIBED IN REGARD TO THE REPLENISHMENT OF GROUNDWATER WELL SUPPLIES. IT IS ESTIMATED THAT BY THE YEAR 1977, THE GROUNDWATER SUPPLY WILL BE EXCEEDED BY THE DEMAND AND RAIN ALONE WILL NOT BE ABLE TO REPLENISH THE SOURCE. PLAN I (NASSAU COUNTY) IS TO AUGMENT THE GROUNDWATER SUPPLY AND SIMULTANEOUSLY PROVIDE A HYDRAULIC BARRIER TO PREVENT SALT WATER INTRUSION. PLAN II (LONG ISLAND) PROVIDES FOR TERTIARY TREATMENT WHICH WILL PRODUCE AN EFFLUENT THAT MEETS THE DRINKING WATER STANDARDS. THE SECOND PLAN IS ALSO TO BE USED FOR GROUNDWATER INJECTION.
(HANCUFF-TEXAS)

FIELD 05D

ACCESSION NO. W70-07721

WASTE DISPOSAL AND EARTHQUAKES AT THE ROCKY MOUNTAIN ARSENAL, DERBY, COLORADO,
GEOLOGICAL SURVEY, WASHINGTON, D.C.

H. K. VAN POOLLEEN, AND D. B. HOOVER.

JOURNAL OF PETROLEUM TECHNOLOGY, P 983-993, AUGUST 1970. 11 P, 11 FIG, 3 TAB,
32 REF.

DESCRIPTORS:

*INJECTION WELLS, *EARTHQUAKES, *COLORADO, WASTE DISPOSAL,
FAULTS(GEOLOGY), CRYSTALLINE ROCKS, METAMORPHIC ROCKS, TRANSMISSIVITY,
POROSITY, INJECTION, SAFETY, FRACTURES(GEOLOGY).

IDENTIFIERS:

ROCKY MOUNTAIN ARSENAL(COLO), DENVER(COLO), HUBBERT-RUBEY THEORY, WASTE
DISPOSAL WELLS.

ABSTRACT:

IN EARLY 1962 WASTE WATER WAS INJECTED INTO A 12,000-FT WELL DRILLED IN
THE PRE-CAMBRIAN NEAR DENVER, COLO. SINCE THAT TIME OVER 100
EARTHQUAKES LARGE ENOUGH TO BE FELT HAVE OCCURRED IN THIS AREA WHERE NO
QUAKES HAD BEEN RECORDED BEFORE (ONE AS HIGH AS RICHTER MAGNITUDE 5.3).
IN 1966 WATER INJECTION WAS STOPPED, BUT EARTHQUAKE ACTIVITY HAS
CONTINUED. SEVERAL MECHANISMS EXPLAIN THIS PHENOMENON--THE
HUBBERT-RUBEY THEORY, REDUCTION OF COEFFICIENT OF FRICTION, HYDRAULIC
FRACTURING, AND THERMAL AND CHEMICAL EFFECTS. (KNAPP-USGS)

FIELD 05E, 04B

ACCESSION NO. W70-09539

UNDERGROUND WASTE DISPOSAL,

GURNHAM AND ASSOCIATES, INC., CHICAGO, ILL.

CHARLES A. CASWELL.

ENVIRONMENTAL SCIENCE AND TECHNOLOGY, VOL 4, NO 8, P 642-647, AUGUST 1970. 6
P, 5 FIG.

DESCRIPTORS:

*INJECTION WELLS, HYDROGEOLOGY, WASTE DISPOSAL, LEGAL ASPECTS, SAFETY,
ENVIRONMENTAL ENGINEERING.

ABSTRACT:

THE TECHNOLOGY, HYDROLOGY, AND LEGAL STATUS OF DEEP DISPOSAL WELLS ARE BRIEFLY REVIEWED. INJECTION IS ULTIMATE DISPOSAL IN THE SENSE THAT WASTES ARE HELD OUT OF CONTACT WITH THE SURFACE ENVIRONMENT FOR A VERY LONG TIME, LONG ENOUGH TO RENDER MANY WASTES HARMLESS BY GEOCHEMICAL PROCESSES BEFORE THEY REACH THE SURFACE AGAIN. IN MANY CASES WASTES ARE MADE SAFE ENOUGH THAT UNDERGROUND DISPOSAL IS A VALUABLE SOURCE OF AQUIFER RECHARGE. IN MANY CASES, HOWEVER, INJECTION IS NOT FEASIBLE BECAUSE WASTES ARE TOO LONG-LIVED OR THE HYDROGEOLOGY OF THE DISPOSAL HORIZON IS NOT FAVORABLE FOR SAFETY, LONG RETENTION, OR DEGRADATION OF THE WASTES. LEGAL PROBLEMS INCLUDE UNDERGROUND TRESPASS, LIABILITY FOR DAMAGE, AND OWNERSHIP OF AQUIFERS AND GROUNDWATER. (KNAPP-USGS)

FIELD 05E, 04B

ACCESSION NO. W70-09543

SOME CONSIDERATIONS IN UNDERGROUND WASTE WATER DISPOSAL,

OHIO RIVER VALLEY WATER SANITATION COMMISSION, CINCINNATI; AND MISSOURI
UNIV., COLUMBIA. DEPT. OF GEOLOGICAL ENGINEERING.

EDWARD J. CLEARY, AND DON L. WARNER.

JOURNAL AMERICAN WATER WORKS ASSOCIATION, VOL 62, NO 8, P 489-498, AUGUST
1970. 10 P, 16 REF.

DESCRIPTORS:

*INJECTION WELLS, *WASTE WATER DISPOSAL, *OHIO RIVER, *INDUSTRIAL
WASTES, *REGULATION, WATER LAW, MONITORING, HYDROGEOLOGY, LEGISLATION,
INJECTION, WATER WELLS, WATER RIGHTS, REVIEWS, PUBLICATIONS.

IDENTIFIERS:

OHIO RIVER BASIN, ORSANCO, WASTE DISPOSAL WELLS.

ABSTRACT:

TWO SECTIONS OF A MONOGRAPH ON UNDERGROUND WASTE WATER DISPOSAL ARE
PRESENTED AND THE ENTIRE MONOGRAPH IS BRIEFLY DISCUSSED. THE MONOGRAPH
PROVIDES PERSPECTIVE ON THE STATUS OF UNDERGROUND INJECTION PRACTICE
AND THE SOCIAL CONCERNS AND POLICY ISSUES THAT RELATE TO IT, AND OFFERS
REGULATORY GUIDELINES AND CRITERIA FOR EVALUATING THE LOCATION, DESIGN
CONSTRUCTION, AND OPERATION OF INJECTION WELLS, SPECIFICALLY WITH
RESPECT TO GEOLOGICAL AND OTHER CIRCUMSTANCES IN THE OHIO VALLEY. LEGAL
LIABILITIES AND CONSTRAINTS ARE MORE IMPORTANT THAN TECHNICAL ONES. ALL
ASPECTS OF THE PLANNING, CONSTRUCTION, OPERATION, AND ABANDONMENT OF
WASTE-INJECTION SYSTEMS SHOULD BE EMBRACED IN THE REGULATORY PROCESS.
ALTHOUGH ONLY SMALL AREAS OF THE OHIO VALLEY ARE LIMITED FOR WASTE
INJECTION ON THE BASIS OF HYDROLOGIC CONSIDERATION OF THE ROCK UNITS,
GEOLOGIC STRUCTURE, AND GROUNDWATER CIRCUMSTANCES, ONLY LIMITED
QUANTITIES OF WASTES SHOULD BE REGARDED AS ELIGIBLE FOR SUBSURFACE
DISPOSAL. CONTINUOUS RECORDS OF WASTE WATER VOLUMES AND INJECTION
PRESSURES SHOULD BE KEPT. MONITORING OF CONDITIONS AT THE INJECTION
INTERVAL OR OTHER INTERVALS ABOVE OR BELOW THE INJECTION HORIZON IS
OFTEN DESIRABLE. (KNAPP-USGS)

FIELD 05E, 04B

ACCESSION NO. W70-09549

CONSERVATION OF FRESH-WATER RESOURCES BY DEEP-WELL DISPOSAL OF LIQUID WASTES,
ALABAMA UNIV., UNIVERSITY, NATURAL RESOURCES CENTER.

DAVID M. GRUBBS, CHARLES D. HAYNES, AND WILLIAM E. TUCKER.

AVAILABLE FROM NTIS AS PB-194 112, \$3.00 IN PAPER COPY, \$0.65 IN MICROFICHE.
ALABAMA UNIVERSITY NATURAL RESOURCES CENTER, AND ALABAMA GEOLOGICAL SURVEY
REPORT, MAY 1970. 85 P, 23 FIG, 2 TAB, 42 REF. OWRR PROJECT NO B-019-ALA(2).

DESCRIPTORS:

*WASTE WATER DISPOSAL, *INJECTION WELLS, *ALABAMA, AQUIFERS,
AQUICLUDES, HYDROGEOLOGY, WATER LAW, LEGAL ASPECTS, GROUNDWATER
MOVEMENT, PERMEABILITY, COST ANALYSIS, WATER COSTS, COMPUTER PROGRAMS,
WATER CONSERVATION.

IDENTIFIERS:

WASTE INJECTION WELLS.

ABSTRACT:

GEOLOGICAL AND ENGINEERING PARAMETERS WHICH GOVERN THE DISPOSAL OF
LIQUID-WASTE MATERIAL BY DEEP-WELL INJECTION WERE EVALUATED IN ALABAMA.
A STUDY WAS MADE OF GEOLOGY TO IDENTIFY POTENTIALLY FAVORABLE
SUBSURFACE RESERVOIRS. PHYSICAL PROPERTIES CONTROLLING FLUID MOVEMENT
AND STORAGE, AND LIQUID WASTES FROM INDUSTRIES WERE INJECTED INTO CORE
SAMPLES OF ACTUAL RESERVOIR ROCKS. PARAMETERS REQUIRED FOR CONFINEMENT
OF WASTES TO ASSURE THE ISOLATION OF FRESH WATER AND OTHER NATURAL
RESOURCES FROM ADVERSE EFFECTS OF WASTE INJECTION WERE STUDIED. A
DESIGN AND COST PROCEDURE WAS SUPPLEMENTED BY A COMPUTER PROGRAM TO
PROVIDE RAPID FEASIBILITY STUDIES. DATA PROVIDED BY WELLS DRILLED FOR
OIL AND GAS SHOW SEVERAL POTENTIAL RECEPTIVE HORIZONS IN THE SOUTHWEST
PORTION OF THE STATE NEAR MOBILE. UNTIL DEFINITION OF LEGAL
RESPONSIBILITIES IS CLARIFIED, DISPOSAL OF LIQUID WASTES IN DEEP-WELLS
SHOULD BE UNDERTAKEN ONLY AFTER STUDY OF CAPACITY, PERMEABILITY,
CONFINING BEDS, AND CONTROL OF THE FLOW STREAM. A SPECIAL BIBLIOGRAPHY
IS INCLUDED CONTAINING 460 ENTRIES. (KNAPP-USGS)

FIELD 05E, 04B

ACCESSION NO. W70-09771

CONSERVATION OF FRESH-WATER RESOURCES BY DEEP-WELL DISPOSAL OF LIQUID WASTES,
APPENDIX B: PART I CHEMICAL REACTIONS BETWEEN ACID INDUSTRIAL WASTES,
FORMATION WATERS, AND MINERALS IN SALAQUIFERS OF ALABAMA; PART II, LABORATORY
STUDY OF SELECTED RESERVOIR ROCKS,

ALABAMA UNIV., UNIVERSITY. NATURAL RESOURCES CENTER.

DAVID M. GRUBBS, AND TRAVIS H. HUGHES.

AVAILABLE FROM NTIS AS PB-194 114, \$3.00 IN PAPER COPY, \$0.65 IN MICROFICHE.
ALABAMA UNIVERSITY, NATURAL RESOURCES CENTER, AND ALABAMA GEOLOGICAL SURVEY
REPORT, MAY 1970. 23 P, 3 FIG, 5 TAB, 11 REF. OWRR PROJECT B-019-ALA(4).

DESCRIPTORS:

*WATER CHEMISTRY, *WASTE WATER DISPOSAL, *INJECTION WELLS, *ALABAMA,
LABORATORY TESTS, HYDROGEOLOGY, POROSITY, PERMEABILITY, CHEMICAL
REACTIONS, CHEMICAL PRECIPITATION.

IDENTIFIERS:

WASTE DISPOSAL WELLS.

ABSTRACT:

ALTHOUGH THE IMPORTANT CHEMICAL REACTIONS IN WASTE INJECTION MAY BE
PREDICTED, THE PHYSICAL EFFECTS OF THESE REACTIONS OFTEN ARE NOT
PREDICTABLE. LABORATORY STUDIES OF A VARIETY OF RESERVOIR ROCKS SAMPLES
WERE CONDUCTED IN AN EFFORT TO ESTABLISH STORAGE CAPACITY AND FLOW
PARAMETERS AND TO ASSESS COMPATIBILITY OF POTENTIAL RECEPTIVE HORIZONS
WITH INJECTED LIQUID WASTES. GROUNDWATER RESERVOIRS WITH PHYSICAL AND
CHEMICAL PARAMETERS FAVORABLE TO INJECTION OF LIQUID WASTES ARE AT
MODERATE DEPTHS IN THE GEOLOGIC SECTIONS IN A PORTION OF ALABAMA. THERE
SHOULD BE NO SIGNIFICANT PERMANENT REDUCTION IN POROSITY AS A RESULT OF
INJECTION OF SIZABLE VOLUMES OF MOST OF THE STATE'S INDUSTRIAL WASTES.
PERMEABILITY TO CONTINUED FLOW OF WASTE MATERIAL SHOWED A SUBSTANTIAL
DECREASE AFTER A PERIOD OF RELATIVELY FEW DAYS, BUT COULD BE RESTORED
TO A LEVEL SATISFACTORY FOR INJECTION BY FLUSHING THE AQUIFER WITH
WATER. PERMEABILITY LOSS RESULTING IN REDUCTION OF INJECTION RATES IS
GREATEST AT THE WELL FACE. REMEDIAL ACTION MAY BE TAKEN IN SOME
INSTANCES TO RESTORE FLOW TO A SUITABLE LEVEL. (KNAPP-USGS)

FIELD 05E, 02K, 04B

ACCESSION NO. W70-09773

DEEP-WELL INJECTION (LITERATURE REVIEW),

WATER POLLUTION CONTROL FEDERATION, WASHINGTON, D.C.

T. J. TOFFLEMIRE.

JOURNAL OF THE WATER POLLUTION CONTROL FEDERATION, VOL 42, NO 6, P 1231-1235,
JUNE 1970. 35 REF.

DESCRIPTORS:

*INDUSTRIAL WASTES, *DEEP-WELLS, *INJECTION WELLS, WELLS, WASTE WATER
TREATMENT, WASTE DISPOSAL, GEOLOGY.

ABSTRACT:

THE USE OF DEEP WELLS FOR DISPOSAL OF INDUSTRIAL WASTE HAS GROWN RAPIDLY OVER THE LAST 20 YEARS. IN 1950 THERE WERE MANY SALT-BRINE DISPOSAL WELLS BUT ONLY A FEW DISPOSAL WELLS FOR INDUSTRIAL WASTES. IN 1967 THERE WERE 40,000 SALT-BRINE DISPOSAL WELLS AND 110 WELLS FOR OTHER WASTES. IT IS SUGGESTED THAT IN SOME CASES DEEP-WELL INJECTION HAS ACHIEVED A COMPLETE SOLUTION TO THE POLLUTION PROBLEM AND 100% BOD REMOVAL. A DISCUSSION OF THE LEGAL IMPLICATIONS, LEGISLATION AND REGULATIONS OF DEEP-WELL INJECTION IS DISCUSSED. GEOLOGICAL CONSIDERATIONS ARE DISCUSSED FROM THE STANDPOINT OF ISOLATING THE WASTE FROM FRESH GROUNDWATER AND FROM OTHER NATURAL RESOURCES SUCH AS GAS, OIL AND COAL. ABANDONED WELLS, FAULTS, AND GEOLOGICAL CONDITIONS MUST BE CONSIDERED WHEN PLANNING A DISPOSAL WELL SITE. IT IS ALSO NECESSARY TO CONSIDER EARTHQUAKE ACTIVITY WHEN PLANNING A DEEP-WELL. IT IS CONCEIVABLE THAT UNDER CERTAIN CONDITIONS AN IMPROPERLY LOCATED DEEP-WELL MIGHT TRIGGER AN EARTHQUAKE. TECHNICAL CONSIDERATIONS SUCH AS OPERATIONAL PROBLEMS FROM CLOGGING AND CORRSION ARE MENTIONED. NUMEROUS CASE HISTORIES ARE DISCUSSED FROM SEVERAL INDUSTRIES WHICH UTILIZE DEEP-WELL INJECTION DISPOSAL METHODS. (HANCUFF-TEXAS)

FIELD 05E, 05D

ACCESSION NO. W71-00136

PRELIMINARY REPORT ON GEOHYDROLOGIC EXPLORATION FOR DEEP WELL DISPOSAL OF
EFFLUENT, WAIMANALO SEWAGE TREATMENT PLANT, OAHU,

HAWAII STATE DEPT. OF LAND AND NATURAL RESOURCES, HONOLULU. DIV. OF WATER AND
LAND DEVELOPMENT.

DANIEL LUM.

DEPARTMENT OF THE LAND AND NATURAL RESOURCES, CIRCULAR C 54. 14 P, 6 FIG, 1
TAB.

DESCRIPTORS:

*EFFLUENTS, *SEWAGE DISPOSAL, *DEEP WELLS, HYDROLOGY, COSTS, INJECTION,
DISCHARGE MEASUREMENT, HAWAII, HYDROGEOLOGY, *EXPLORATION.

ABSTRACT:

BECAUSE OF A HIGH ESTIMATED COST OF CONSTRUCTING AN OCEAN OUTFALL
SEWAGE EFFLUENT DISPOSAL SYSTEM, THE HAWAIIAN DEPARTMENT OF LAND AND
NATURAL RESOURCES DECIDED TO INVESTIGATE EFFLUENT DISPOSAL UTILIZING
DEEP WELLS. THE VARIOUS GEOHYDROLOGIC INVESTIGATIONS WERE COMPLETED
OVER A THREE-YEAR PERIOD IN THREE PHASES. FIRST, A PRELIMINARY
INJECTION TEST UTILIZING AN EXISTING NON-USED WELL. SECOND, SUBSURFACE
GEOHYDROLOGIC EXPLORATION CONSISTING OF DRILLING, CORING, AND TESTING
EIGHT NX-SIZE TEST HOLES. DEPTHS VARIED FROM 50 TO 450 FEET AND A TOTAL
OF 2,200 FEET OF CORE DRILLING AND HYDROLOGIC TESTING WERE
ACCOMPLISHED. THIRD, DRILLING AND TESTING OF THREE-15 INCH DIAMETER
DISPOSAL WELLS WITHIN THE SEWAGE TREATMENT PLANT SITE. TEST RESULTS
SHOW THAT THE THREE 15-INCH DISPOSAL WELLS HAVE A MINIMUM CAPACITY OF
14.0 MGD (MILLION GALLONS PER DAY), COMPARED TO THE PRESENT 1.1 MGD AND
THE ULTIMATE 2.2 MGD EFFLUENT FLOW DESIGNED FOR THE WAIMANALO SEWAGE
TREATMENT PLANT. ALSO, THE 14.0 MGD CAPACITY OF THE WELLS IS TWICE THE
7.0 MGD DESIGN PEAK FLOW OF THE TREATMENT PLANT. (SELBY-TEXAS)

FIELD 05E

ACCESSION NO.. W71-00430

DEEP WELL DISPOSAL OF WASTE WATERS IN SALINE AQUIFERS OF SOUTH FLORIDA,

BLACK, CROW AND EIDNESS, INC., GAINESVILLE, FLA.; AND GEOLOGICAL SURVEY,
TALLAHASSEE, FLA.

JOSE I. GARCIA-BENGOCHEA, AND ROBERT O. VERNON.

WATER RESOURCES RESEARCH, VOL 6, NO 5, P 1464-1470, OCTOBER 1970. 7 P, 4 FIG,
1 TAB, 5 REF.

DESCRIPTORS:

*AQUIFERS, *INJECTION WELLS, *FLORIDA, WASTE DISPOSAL, INDUSTRIAL
WASTES, SALINE WATER SYSTEMS, LIMESTONES, KARST, CONFINED WATER,
GROUNDWATER MOVEMENT, REGULATION, WATER LAW, HYDROGEOLOGY, MONITORING,
SAMPLING, BRINES, ACIDS.

IDENTIFIERS:

WASTE DISPOSAL WELLS.

ABSTRACT:

FLORIDA IS UNDERLAIN BY VERY RICH WATER-BEARING STRATA CALLED THE
FLORIDAN AQUIFER. SOLUTION CHANNELS AND CAVERNS IN CARBONACEOUS ROCKS
ARE FOUND AT DIFFERENT DEPTH INTERVALS IN EXTENSIVE, THICK (SEVERAL
THOUSAND FEET) SECTIONS OF LIMESTONES AND DOLOMITES. IN SOUTH FLORIDA
THE BOTTOM PART OF THE FLORIDAN AQUIFER INCLUDES EXTREMELY CAVERNOUS
STRATA, COMMONLY REFERRED TO AS THE 'BOULDER ZONE.' CHLORIDE
CONCENTRATION IN THE WATER OF THE BOULDER ZONE IS OVER 2000/MG LITER.
BECAUSE OF THIS, LARGE VOLUMES OF BRINE FROM OIL FIELDS ARE REINJECTED
INTO THIS ZONE. SINCE 1966 INDUSTRIAL WASTE (ESSENTIALLY 1% ACETIC
ACID) HAS BEEN INJECTED INTO A DISPOSAL WELL DRILLED TO THE TOP OF THE
BOULDER ZONE SOUTHEAST OF LAKE OKEECHOBEE. PLANNING AND MONITORING OF
THIS WELL HAVE INCLUDED THE COOPERATION OF GOVERNMENT AND PRIVATE
INTERESTS. EXPERIENCES, RESULTS, AND POTENTIAL OF THIS ZONE FOR FURTHER
SIMILAR USES ARE DISCUSSED. (KNAPP-USGS)

FIELD 05E, 04B

ACCESSION NO. W71-00573

A NOTE ON BACTERIAL GROWTH AROUND A RECHARGE WELL AT BAY PARK, LONG ISLAND, NEW YORK,

GEOLOGICAL SURVEY, MINEOLA, N.Y.

JOHN VECCHIOLI.

WATER RESOURCES RESEARCH, VOL 6, NO 5, P 1415-1419, OCTOBER 1970. 5 P, 3 TAB, 6 REF.

DESCRIPTORS:

*INJECTION WELLS, *RECLAIMED WATER, *BACTERIA, WATER REUSE, ARTIFICIAL RECHARGE, NEW YORK, WATER QUALITY, TERTIARY TREATMENT, AQUATIC MICROORGANISMS, AQUATIC MICROBIOLOGY, AQUIFERS, WATER POLLUTION EFFECTS.

IDENTIFIERS:

BAY PARK(NY), LONG ISLAND(NY).

ABSTRACT:

HIGHLY TREATED SEWAGE PLANT EFFLUENT IS INJECTED INTO A DEEP SAND AQUIFER AT BAY PARK, LONG ISLAND, NEW YORK. HIGH BACTERIAL COUNTS ARE OBSERVED IN WATER PUMPED INITIALLY FROM THE INJECTION WELL AFTER RECHARGE TERMINATION, EVEN THOUGH THE INJECTED WATER GENERALLY MEETS POTABLE STANDARDS. MOREOVER, THE NUMBER OF BACTERIA RECOVERED DURING PUMPING IS MUCH LARGER THAN THE NUMBER INJECTED. THIS SUGGESTS A GROWTH OF BACTERIA IN THE AQUIFER AROUND THE INJECTION WELL, POSSIBLY IN PART ON A FILTER MAT OF ORGANIC MATERIAL FORMED AT OR NEAR THE AQUIFER-GRAVEL PACK INTERFACE DURING INJECTION. CONTINUED PUMPING RESULTS IN LOWER COUNTS UNTIL VIRTUALLY BACTERIA-FREE WATER IS PRODUCED. HOWEVER, WHENEVER PUMPING IS STOPPED AND RESTARTED, THE INITIAL SLUG OF WATER PUMPED SHOWS HIGHER COUNTS THAN BEFORE SHUTDOWN. APPARENTLY THE SURGING ACTION OF THE WATER DISLODGES BACTERIA THAT OTHERWISE WOULD NOT ENTER THE WELL. (KNAPP-USGS)

FIELD 05C, 05D

ACCESSION NO. W71-00579

RADIOACTIVE WASTE DISPOSAL BY HYDRAULIC FRACTURING,

OAK RIDGE NATIONAL LAB., TENN.

WALLACE DE LAGUNA.

INDUSTRIAL WATER ENGINEERING, VOL 7, NO 10, P 32-37, OCTOBER 1970. 6 P, 4 FIG, 9 REF.

DESCRIPTORS:

*INJECTION WELLS, *RADIOACTIVE WASTE DISPOSAL, *FRACTURES(GEOLOGY),
*SHALES, *GROUTING, HYDROGEOLOGY, PERMEABILITY, CEMENT GROUTING, CLAYS,
CONCRETES, LEAKAGE.

IDENTIFIERS:

HYDRAULIC FRACTURING(UNDERGROUND), WASTE DISPOSAL WELLS, WASTE
INJECTION WELLS.

ABSTRACT:

NUCLEAR FUEL REPROCESSING PLANTS PRODUCE ABOUT 1300 TO 5200 GAL PER DAY OF INTERMEDIATE WASTE. THIS MATERIAL, AND THE SLUDGES FROM THE LOW-LEVEL WASTE TREATMENT, ARE SUITABLE CANDIDATES FOR DISPOSAL BY HYDRAULIC FRACTURING IN AREAS WHERE THE GEOLOGY IS FAVORABLE FOR SUCH OPERATIONS. WASTE DISPOSAL BY HYDRAULIC FRACTURING REQUIRES MUCH THE SAME PROCEDURE AND EQUIPMENT AS OIL-WELL STIMULATION. ONCE ROCK FRACTURING AND FLOW DOWN THE INJECTION WELL ARE ESTABLISHED, PORTLAND CEMENT AND CLAY, AND POSSIBLY OTHER ADDITIVES ARE MIXED INTO THE STREAM OF WATER. THE LIQUID FEED IS THEN SWITCHED TO THE RADIOACTIVE WASTE, AND THE WASTE, ALSO MIXED WITH THE PROPER PROPORTION OF SOLIDS, IS PUMPED DOWN THE WELL UNTIL THE WASTE TANKS ARE EMPTY. THE LIQUID FEED IS THEN SWITCHED BACK TO WATER UNTIL THE REMAINING SOLIDS ARE ALL USED UP, AND FINALLY IS PUMPED DOWN THE WELL TO FLUSH IT AND THE SLOT CLEAR OF CEMENT. THE WELL IS THEN SHUT IN UNTIL THE CEMENT HAS SET AND THE WASTE-CEMENT-CLAY MIXTURE CONVERTED INTO A THIN LAYER OF ARTIFICIAL ROCK EMBEDDED IN DEPTH IN THE SHALE. (KNAPP-USGS)

FIELD 05E

ACCESSION NO. W71-00882

ADVANCED WASTE TREATMENT IN NASSAU COUNTY, NEW YORK, WATER PROVIDED FOR
INJECTION INTO GROUNDWATER AQUIFERS,

BURNS AND ROE, INC., ORADELL, N.J.

JOHN L. ROSE.

WATER AND WASTE ENGINEERING, VOL 7, NO 2, P 38-39, FEBRUARY 1970. 2 FIG, 3
TAB.

DESCRIPTORS:

*WASTE WATER TREATMENT, *TERTIARY TREATMENT, *WATER REUSE, AQUIFERS,
ACTIVATED SLUDGE, COAGULANTS, INJECTION WELLS, OBSERVATION WELLS,
COSTS, NEW YORK.

IDENTIFIERS:

*NEW YORK, *HYDRAULIC BARRIER, BACKWASH, NASSAU COUNTY(N.Y.).

ABSTRACT:

TO MEET A THREAT OF SALT WATER INTRUDING INTO ITS AQUIFERS, NASSAU COUNTY, NEW YORK, CONSIDERED A PROPOSAL WHICH WOULD ALLOW AN INCREASE OF THE PERMISSIBLE WITHDRAWALS, TO CREATE A HYDRAULIC BARRIER IN THE AQUIFER, WHICH WOULD PREVENT BOTH THE NATURAL OUTFLOW, NOW LOST TO THE SEA, AND THE INTRUSION OF SALT WATER. THE BARRIER WOULD BE FORMED BY INJECTING TREATED WASTE WATER THROUGH A SERIES OF RECHARGE WELLS. FOR EVALUATION PURPOSES, A 400 GPM DEMONSTRATION PLANT WAS CONSTRUCTED. THE PLANT PROVIDES TERTIARY TREATMENT FOR THE EFFLUENT OF THE CONVENTIONAL ACTIVATED SLUDGE PLANT. THE PRODUCT WATER IS PUMPED ABOUT ONE-HALF MILE TO A TEST INJECTION SITE. THE TERTIARY TREATMENT PLANT IS A CONVENTIONAL WATER TREATMENT PLANT MODIFIED TO UTILIZE SECONDARY EFFLUENT AS A WATER SOURCE. EFFLUENT IS PUMPED INTO A CLARIFIER TO WHICH ALUM AND COAGULANT AIDS ARE ADDED. THE SUPERNATANT FLOWS BY GRAVITY TO TWO MIXED MEDIA FILTERS OPERATED IN PARALLEL. FINAL BACKWASH IS SEMI-AUTOMATIC AND INCLUDES AIR SCOUR, SURFACE WASH, AND HIGH-AND LOW-RATE BACKWASHING. FILTER EFFLUENT IS PUMPED THROUGH FOUR GRANULAR ACTIVATED CARBON ADSORBERS. THE RENOVATED WATER IS DISINFECTED WITH CHLORINE BEFORE BEING PUMPED TO THE INJECTION SITE. THE INJECTION FACILITIES CONSIST OF A STORAGE TANK, A DEGASIFIER FOR REMOVAL OF DISSOLVED GASES, INJECTION AND REDEVELOPMENT PUMPS, AN INJECTION WELL, AND 12 OBSERVATION WELLS. THE INJECTION WELL IS 36 INCHES IN DIAMETER BY 500 FEET DEEP AND CONTAINS AN OBSERVATION WELL AND GEOPHYSICAL PROBES. COSTS ARE TABULATED. OPERATION OF THE TERTIARY TREATMENT PLANT AND INJECTION SYSTEM SINCE JANUARY 1968, CONFIRMS THE CONCEPT OF RECHARGING WASTE WATERS INTO THE AQUIFER. THE WELL HAS BEEN REDEVELOPED AFTER EACH SERIES OF INJECTION TESTS WITH NEGLIGIBLE LOSS OF CAPACITY. THE TREATMENT PLANT HAS CONSISTENTLY PRODUCED WATER MEETING THE INJECTION QUALITY CRITERIA. (SELBY-TEXAS).

FIELD 05D

ACCESSION NO. W71-01970

DEEP WELL DISPOSAL STUDY FOR BALDWIN, ESCAMBIA AND MOBILE COUNTIES, ALABAMA,
ALABAMA GEOLOGICAL SURVEY, UNIVERSITY.

ROY M. ALVERSON.

ALABAMA GEOLOGICAL SURVEY CIRCULAR 58, 1970. 49 P, 8 FIG, 10 PLATE, 1 TAB, 15
REF, APPEND.

DESCRIPTORS:

*INJECTION WELLS, *WASTE WATER DISPOSAL, *INDUSTRIAL WASTES, *ALABAMA,
AQUIFERS, WATER POLLUTION CONTROL, PERMEABILITY, POROSITY, WATER
QUALITY, HYDROLOGIC DATA, HYDROGEOLOGY, GROUNDWATER MOVEMENT,
STRATIGRAPHY.

IDENTIFIERS:

*MOBILE(ALA), *WASTE DISPOSAL WELLS.

ABSTRACT:

BALDWIN, ESCAMBIA, AND MOBILE COUNTIES, ALABAMA, HAVE A COMBINED AREA
OF 3,817 SQUARE MILES AND A POPULATION OF 396,900 IN THE HIGHLY
INDUSTRIALIZED MOBILE METROPOLITAN AREA. THE AREA IS UNDERLAIN BY
SEDIMENTARY ROCKS OF THE TYPE USED AS RESERVOIRS FOR WASTE DISPOSAL IN
OTHER PARTS OF THE UNITED STATES. UNDER CERTAIN GEOLOGIC, HYDROLOGIC,
AND GEOCHEMICAL CONDITIONS DEEP-WELL INJECTION OF LIQUID INDUSTRIAL
WASTE CAN BE CARRIED OUT EFFECTIVELY IN SOUTHWEST ALABAMA. EACH
PROPOSAL, HOWEVER, MUST BE CAREFULLY EVALUATED, USING THE CRITERIA
OUTLINED IN THIS REPORT TO INSURE AGAINST POLLUTION OF FRESH-WATER
SUPPLIES, SURFACE AND GROUND, AND PROTECT AGAINST DAMAGE TO THE
ENVIRONMENT IN THE SUBSURFACE OR AT THE SURFACE. (KNAPP-USGS)

FIELD 05E, 02F, 04B

ACCESSION NO. W71-02428

SUBSURFACE DISPOSAL OF LIQUID WASTES IN ONTARIO,

D. D. MCLEAN.

ONTARIO (CANADA) DEPARTMENT OF ENERGY AND RESOURCES PAPER 68-2, DECEMBER 1968. 91 P, 23 FIG, 2 TAB, 95 REF, 2 APPEND.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, INDUSTRIAL WASTES, WASTE WATER DISPOSAL, HYDROGEOLOGY, AQUIFERS, CONFINED WATER, AQUICLUDES, GEOLOGY, PERMEABILITY, WATER CHEMISTRY, WATER QUALITY.

IDENTIFIERS:

*CANADA, *WASTE DISPOSAL WELLS, *ONTARIO(CANADA).

ABSTRACT:

ONTARIO, AS A SITE FOR SUBSURFACE DISPOSAL OF WASTES, IS DISCUSSED IN RELATION TO ITS PECIFIC GEOLOGICAL AND HYDROLOGICAL FEATURES, WITH REGARD TO THEIR SUITABILITY FOR DISPOSAL, AND THE POLICIES AND REQUIREMENTS OF ITS REGULATORY AGENCIES. THE PROPOSED DISPOSAL FORMATION MUST BE A UNIFORM SANDSTONE, LIMESTONE OR DOLOMITE AQUIFER, LARGE IN AREA AND CROSS-SECTION, WITH HIGH POROSITIES AND PERMEABILITIES. THE FORMATION MUST BE WELL BELOW FRESH WATER HORIZONS AND BE CONTAINED BY OVERLYING AND UNDERLYING IMPERMEABLE STRATA. A SALT WATER FILLED FORMATION, ARTESIAN IN NATURE, AND CONTAINING NO WATERS OF ECONOMIC VALUE SHOULD BE EMPLOYED. THE FLUIDS PRESENT MUST BE COMPATIBLE WITH THE ONES TO BE INJECTED. THE REGION SURROUNDING A PROPOSED DISPOSAL WELL MUST BE STUDIED TO ASCERTAIN WHETHER THERE ARE ANY UNPLUGGED WELLS WHICH PENETRATE THE FORMATION, OR WHETHER THERE IS EVIDENCE OF FRACTURES OR FAULTS. EQUATIONS WERE DEVELOPED FOR IDEAL CONDITIONS WHICH PERMIT ACCURATE PREDICTIONS OF WELL PERFORMANCE, DISPERSION OF WASTE AND PRESSURE BUILDUP. THE WELL MUST BE CONSTRUCTED IN SUCH A MANNER AS TO PROTECT ALL OTHER HORIZONS AND TO CONFINED THE WASTE TO THE DISPOSAL FORMATION. IT IS ESSENTIAL THAT ANY DISPOSAL OPERATION BE MONITORED. (KNAPP-USGS)

FIELD 05E, 02F

ACCESSION NO. W71-03438

DEEP WELL DISPOSAL STUDY FOR BALDWIN, ESCAMBIA AND MOBILE COUNTIES, ALABAMA.

GEOLOGICAL SURVEY OF ALABAMA, UNIVERSITY.

AVAILABLE FROM NTIS AS PB-194 336, \$3.00 IN PAPER COPY, \$0.95 IN MICROFICHE.
CIRC-58, JUNE 1970. 79 P, 8 FIG, 10 PLATES, 15 REF. HUD PROJECT ALA
P-63(G).

IDENTIFIERS:

*WASTE DISPOSAL, *INJECTION WELLS, *WATER POLLUTION, *INDUSTRIAL
WASTES, *ALABAMA, WATER POLLUTION, DEEP WELLS, SEDIMENTARY ROCKS,
GROUNDWATER, POROSITY, STRATIGRAPHY, PERMEABILITY, CONSTRUCTION,
LIQUIDS, CHEMICAL REACTIONS, *BALDWIN COUNTY(ALABAMA), *ESCAMBIA
COUNTY(ALABAMA), *MOBILE COUNTY(ALABAMA), *WATER POLLUTION CONTROL.

ABSTRACT:

BALDWIN, ESCAMBIA, AND MOBILE COUNTIES HAVE A COMBINED AREA OF 3,817
SQUARE MILES AND A POPULATION OF 396,900 (1960 CENSUS). THE AREA
ENCOMPASSES THE HIGHLY INDUSTRIALIZED MOBILE METROPOLITAN AREA AND THE
PORT OF MOBILE. THE AREA OF STUDY IS UNDERLAIN BY SEDIMENTARY ROCKS OF
THE TYPE USED AS RESERVOIRS FOR WASTE DISPOSAL IN OTHER PARTS OF THE
UNITED STATES. UNDER CERTAIN GEOLOGIC, HYDROLOGIC, AND GEOCHEMICAL
CONDITIONS IT IS BELIEVED THAT DEEP-WELL INJECTION OF LIQUID INDUSTRIAL
WASTE CAN BE CARRIED OUT EFFECTIVELY IN SOUTHWEST ALABAMA. EACH
PROPOSAL, HOWEVER, MUST BE CAREFULLY EVALUATED, USING THE CRITERIA
OUTLINED IN THIS REPORT TO INSURE AGAINST POLLUTION OF FRESH-WATER
SUPPLIES, SURFACE AND GROUND, AND PROTECT AGAINST DAMAGE TO THE
ENVIRONMENT IN THE SUBSURFACE OR AT THE SURFACE.

FIELD 05E

ACCESSION NO. W71-03766

SURVEY OF COSTS ON METHODS FOR CONTROL OF ACID MINE DRAINAGE POLLUTION,

BUREAU OF MINES, PITTSBURGH, PA. AREA 1 MINERAL RESOURCE OFFICE.

ROBERT W. STEPHAN, AND WALTER C. LORENZ.

ATTACHMENT E TO APPENDIX C - THE INCIDENCE AND FORMATION OF MINE DRAINAGE POLLUTION, BUREAU OF MINES REPORT, VOL 18 OF 25 VOL ON DEVELOPMENT OF WATER RESOURCES IN APPALACHIA, 1967. 35 P, 8 FIG, 21 TAB, 21 REF.

DESCRIPTORS:

*COST ANALYSIS, *WATER POLLUTION CONTROL, *APPALACHIAN MOUNTAIN REGION, *ACID MINE WATER, NEUTRALIZATION, WASTE WATER DISPOSAL, INJECTION WELLS, WATER TREATMENT, ION EXCHANGE, CHEMICAL PRECIPITATION.

IDENTIFIERS:

*APPALACHIAN REDEVELOPMENT.

ABSTRACT:

THIS REPORT PRESENTS CAPITAL INVESTMENT AND OPERATING COSTS ON THE VARIOUS PROCESSES AND METHODS AVAILABLE FOR THE ABATEMENT OF POLLUTION DUE TO ACID COAL MINE WATER DRAINAGE. THE ABATEMENT MEASURES INCLUDE NEUTRALIZATION, IRON REMOVAL, DEMINERALIZATION, AND PHYSICAL DISPOSAL BY DEEP WELL INJECTION. COST DATA ARE PRESENTED ON THE RECLAMATION OF LAND DISTURBED BY SURFACE AND STRIP MINING OPERATIONS. A SUMMARY OF AVAILABLE DATA RELATING THE VARIOUS SIZE PLANTS FOR TREATING ACID MINE WATER IS REPORTED FOR THE VARIOUS PROCESSES FOR ABATEMENT OF POLLUTION. THE COSTS OF POLLUTION ABATEMENT MEASURES AS DETERMINED IN THIS SURVEY RANGE FROM LESS THAN \$0.07/1,000 GAL. TO \$1.13/1,000 GAL. OF ACID MINE WATER TREATED. (SEE ALSO W71-03872) (KNAPP-USGS)

FIELD 05B, 06C, 05G

ACCESSION NO. W71-03877

SALTY GROUNDWATER IN THE POCATALICO RIVER BASIN,

GEOLOGICAL SURVEY, MORGANTOWN, W.VA.

GEORGE L. BAIN.

WEST VIRGINIA GEOLOGICAL AND ECONOMIC SURVEY CIRCULAR SERIES, NO 11, OCTOBER 1, 1970. 31 P, 8 FIG, 8 REF.

DESCRIPTORS:

*SALINE WATER INTRUSION, *OIL FIELDS, *WEST VIRGINIA, OIL WELLS, INJECTION WELLS, BRINES, SALINE WATER, WASTE WATER DISPOSAL, WATER POLLUTION SOURCES, PATH OF POLLUTANTS, WATER QUALITY, GROUNDWATER, SURFACE WATERS.

IDENTIFIERS:

*OIL-FIELD BRINES.

ABSTRACT:

IN THE POCATALICO RIVER BASIN OF WEST VIRGINIA, EXCESSIVE SALT CONCENTRATION IN STREAMS AND IN SHALLOW GROUNDWATER HAS BEEN A PROBLEM FOR SOME TIME. THE RECENT USE OF HYDRAULIC-FRACTURING TECHNIQUES TO IMPROVE THE PERMEABILITY OF THE AREA'S OIL-PRODUCING ROCKS HAS CAUSED INCREASED DRILLING. MUCH SALT BRINE, AS MUCH AS 80 BBLS OF BRINE FOR ONE BBL OF OIL, IS GENERALLY PRODUCED WITH THIS OIL, CREATING A BRINE STORAGE AND DISPOSAL PROBLEM. A NUMBER OF BRINE-DISPOSAL WELLS HAVE BEEN DRILLED FOR RE-INJECTION OF THE OIL-FIELD BRINES INTO THE 'INJUN SAND' AND THE SHALLOWER 'SALT SANDS' (POTTSVILLE GROUP). SALT BRINE, OIL, OR GAS ARE PRESENT EVERYWHERE IN THE SALT SANDS. THERE IS SUFFICIENT NATURAL HYDRAULIC HEAD (PRESSURE) ON BRINE IN THE SALT SANDS TO CONTAMINATE OVERLYING FRESH-WATER HORIZONS UNLESS ALL WELLS TAPPING THE SALT SANDS ARE PERMANENTLY AND PROPERLY CASED INTO THE SALT SANDS IN THIS AREA. (KNAPP-USGS)

FIELD 05B, 02K

ACCESSION NO. W71-04368

HYDROGEOCHEMICAL EFFECTS OF INJECTING WASTES INTO A LIMESTONE AQUIFER NEAR
PENSACOLA, FLORIDA,

GEOLOGICAL SURVEY, OCALA, FLA.

DONALD A. GOOLSBY.

GROUNDWATER, VOL 9, NO 1, P 13-19, JANUARY-FEBRUARY 1971. 7 P, 9 FIG, 1 TAB,
10 REF.

DESCRIPTORS:

*PATH OF POLLUTANTS, *WATER POLLUTION EFFECTS, *INJECTION WELLS, *WASTE
DISPOSAL, *FLORIDA, HYDROGEOLOGY, GEOCHEMISTRY, INJECTION, AQUIFERS,
GROUNDWATER MOVEMENT, AQUICLUDES, CONFINED WATER, MONITORING,
OBSERVATION WELLS.

IDENTIFIERS:

*WASTE DISPOSAL WELLS, *FLORIDAN AQUIFER, PENSACOLA(FLA).

ABSTRACT:

ACIDIC INDUSTRIAL WASTES HAVE BEEN INJECTED INTO DEEP WELLS IN A
LIMESTONE AQUIFER NEAR PENSACOLA, FLORIDA, SINCE 1963. PRIOR
GEOHYDROLOGIC STUDIES INDICATED THAT THE LIMESTONE AQUIFER CONTAINED
NONPOTABLE WATER AND WAS overlain BY AN EXTENSIVE CLAY CONFINING LAYER.
TWO INJECTION WELLS ARE BEING USED TO INJECT THE WASTE AT A RATE OF
APPROXIMATELY 2,000 GALLONS PER MINUTE. THE INJECTION PRESSURES ARE
ABOUT 200 POUNDS PER SQUARE INCH. OVER 3 BILLION GALLONS HAVE BEEN
INJECTED. CURRENT STUDY INDICATES THAT THE WASTE EXTENDS OUTWARD ABOUT
1 MILE FROM THE INJECTION WELLS, AND PRESSURE EFFECTS EXTEND OUTWARD
MORE THAN 25 MILES. MONITOR WELLS SHOW THAT PRESSURE CHANGES ARE
FOLLOWING A PREDICTABLE PATTERN. NO WASTES HAVE BEEN DETECTED IN A
MONITOR WELL OPEN TO THE FLORIDAN AQUIFER IMMEDIATELY ABOVE THE
BUCATUNNA CLAY MEMBER OF THE BYRAM FORMATION AND 100 FEET FROM ONE OF
THE INJECTION WELLS. IN A MONITOR WELL OPEN TO THE RECEIVING FORMATION
ABOUT 1,300 FEET SOUTH OF THE INJECTION WELLS, EFFECTS OF THE WASTES
WERE DETECTED ABOUT 10 MONTHS AFTER INJECTION BEGAN. IN EARLY 1968, THE
PH OF THE WASTE WAS LOWERED TO ABOUT 3. EFFECTS OF THIS CHANGE WERE
DETECTED AT THE MONITOR WELL ABOUT 5 MONTHS LATER. (KNAPP-USGS)

FIELD 05B, 05C, 04B

ACCESSION NO. W71-04578

DISPOSAL OF BRINES PRODUCED IN RENOVATION OF MUNICIPAL WASTE WATER.

BURNS AND ROE, INC., ORADELL, N.J.

COPY AVAILABLE FROM GPO SUP DOC AS 167.13/4:17070DLY, \$1.25; MICROFICHE FROM NTIS AS PB-197 597, \$0.95. WATER POLLUTION CONTROL RESEARCH SERIES ORD-17070 DLY 05/70, MAY 1970. 113 P, 16 TAB, 25 FIG, 33 REF, APPEND. FWQA PROGRAM NO 17070 DLY.

DESCRIPTORS:

*ULTIMATE DISPOSAL, *BRINE DISPOSAL, MUNICIPAL WASTES, DEEP WELLS, INJECTION WELLS, EVAPORATION, BRINES, *DISPOSAL, COSTS, EFFLUENTS, *WASTE WATER DISPOSAL, WASTE WATER TREATMENT, TEXAS, ARIZONA, COLORADO.

IDENTIFIERS:

BRINE WASTES, *MUNICIPAL WASTE WATER, WASTE WATER RENOVATION, EL PASO(TEX), TUCSON(ARIZ), DENVER(COLO), DEEP WELL INJECTION, *SOLAR EVAPORATION, BRINE REDUCTION, MULTISTAGE FLASH EVAPORATION.

ABSTRACT:

COSTS OF ULTIMATE DISPOSAL OF BRINE WASTES FROM MUNICIPAL WATER RENOVATION SCHEMES HAVE BEEN INVESTIGATED FOR THE SITES OF EL PASO, TEXAS TUCSON, ARIZONA AND DENVER, COLORADO. BASED ON 10 MILLION GALLONS PER DAY, 7% FIXED CHARGE RATE, AND 12 MILLS/KWHR POWER COST, ESTIMATED COSTS ARE AS FOLLOWS: NEAR EL PASO, TEXAS, BRINE CAN BE DUMPED ON WORTHLESS ARID LAND AT A COST OF \$.052/KGAL. IT CAN BE INJECTED INTO THE SALINE HUECO-BOLSON BASIN AT \$.13/KGAL. SOLAR EVAPORATION IN LOCAL PONDS, USING 30 MIL LINERS AND A PIPELINE TO CONVEY RESIDUAL BRINE 50 MILES FOR ULTIMATE DISPOSAL, COSTS \$.18 KGAL. SOLAR EVAPORATION EAST OF DENVER, USING PONDS WITH A 30 MIL LINER, WOULD COST \$.76/KGAL. ALTERNATELY, SOLAR EVAPORATION EAST OF PUEBLO, COLORADO IN LINED PONDS WOULD COST \$.96/KGAL., INCLUDING THE PIPELINE FROM DENVER. MULTISTAGE FLASH EVAPORATION TO 10% SOLIDS WOULD REDUCE THE AMOUNT OF BRINE AND THE SIZE OF THE SOLAR PONDS TO A POINT WHERE THEY MIGHT BE ACCEPTABLE. THEIR COMBINED COST, BASED ON \$.46/MBTU STEAM AND STEAM-DRIVEN PUMPS IS \$.54/KGAL. OF BRINE EFFLUENT. WELL INJECTION IS UNFEASIBLE HERE, DUE TO EARTHQUAKES. AT TUCSON, THE TEMPORARY MEASURE OF USING INJECTION WELLS TO 3500 FEET WHILE AWAITING THE SOUTHWEST WATER PLAN WOULD COST \$.13/KGAL. A PERMANENT SCHEME, USING LOCAL SOLAR PONDS WITH 30 MIL LINERS WOULD COST \$.18/KGAL., INCLUDING COSTS FOR A RESIDUAL BRINE PIPELINE TO THE WILCOX PLAZA 50 MILES EASTWARD.

FIELD 05E

ACCESSION NO. W71-04614

VERTICAL MOLECULAR DIFFUSION OF XENON-133 GAS AFTER INJECTION UNDERGROUND,
GEOLOGICAL SURVEY, IDAHO FALLS, IDAHO.

JOHN B. ROBERTSON.

FOR SALE BY SUPERINTENDENT OF DOCUMENTS, US GOVERNMENT PRINTING OFFICE,
WASHINGTON, DC 20402 - PRICE \$3.75. GEOLOGICAL SURVEY RESEARCH 1970,
CHAPTER D, PROFESSIONAL PAPER 700-D, P D287-D300, 1970. 14 P, 8 FIG, 2 TAB,
10 REF.

DESCRIPTORS:

*DIFFUSION, *PATH OF POLLUTANTS, *NUCLEAR WASTES, *TRACERS,
*RADIOACTIVITY TECHNIQUES, AQUIFERS, IDAHO, DISTRIBUTION PATTERNS,
INJECTION WELLS, WASTE DISPOSAL, RADIOACTIVE WASTES, PLAYAS.

IDENTIFIERS:

GAS DIFFUSION, XENON RADIOISOTOPES, *WASTE DISPOSAL WELLS.

ABSTRACT:

NINE HUNDRED AND EIGHTY-SEVEN Curies of radioactive Xe-133 gas mixed with 28,300 cu m of air was injected rapidly into permeable basalt strata at the National Reactor Testing Station, Idaho. A capping layer of fine-grained playa sediments confined the gas underground. The subsurface Xe-133 was monitored by Geiger-Mueller detectors and by air samples from observation wells surrounding the injection well. Most of the Xe-133 apparently remained underground and decayed radioactively. Molecular diffusion rates of Xe-133 from the ground were estimated using a simplified mathematical model. A maximum flux rate of 2,560 microcuries/hr from a ground-atmosphere interface area of 26,700 sq m was calculated for the first day after injection. The estimated rates indicated a total diffusion loss of 0.37 C for the total area during the 26-day observation period. The calculated rates had fairly good agreement with the measured flux rates at the ground surface. Erratic variations in the measured flux rates were attributed to other influences such as barometric-pressure changes. (Knapp-USGS)

FIELD 05B, 02F, 07B

ACCESSION NO. W71-04977

GEOLOGIC AND HYDROLOGIC FACTORS BEARING ON SUBSURFACE STORAGE OF LIQUID WASTES
IN MARYLAND,

GEOLOGICAL SURVEY, PARKVILLE, MD.

EDMOND G. OTTON.

REPORT AVAILABLE FROM MARYLAND GEOLOGICAL SURVEY, LATROBE HALL, JOHNS HOPKINS
UNIVERSITY, BALTIMORE, MD. 21218, \$2.75. MARYLAND GEOLOGICAL SURVEY REPORT
OF INVESTIGATIONS NO 14, 1970. 39 P, 10 FIG, 6 TAB, 57 REF.

DESCRIPTORS:

*WASTE DISPOSAL, *LIQUID WASTES, *WASTE STORAGE, *INJECTION WELLS,
*MARYLAND, SUBSURFACE INVESTIGATIONS, GEOLOGY, HYDROGEOLOGY, AQUIFER
CHARACTERISTICS, WATER QUALITY, HYDROLOGIC PROPERTIES, EVALUATION,
PLANNING.

IDENTIFIERS:

*SUBSURFACE LIQUID-WASTE STORAGE, *WASTE INJECTION WELLS.

ABSTRACT:

MARYLAND IS DIVIDED INTO 3 MAJOR REGIONS AND THESE, IN TURN ARE DIVIDED
INTO 8 MAJOR SUBREGIONS ON THE BASIS OF PHYSIOGRAPHY, GEOLOGY, AND
HYDROLOGY AND EACH IS DISCUSSED IN RELATION TO DEEP-WELL INJECTION OF
WASTES. IN THE APPALACHIAN REGION, THERE ARE SEVERAL POROUS ZONES THAT
MIGHT ACCEPT INJECTED WASTES, AND THICK SEQUENCES OF LOW-PERMEABILITY
ROCKS MIGHT FUNCTION AS CONFINING LAYERS. IN SOME PLACES THERE ARE
FRESH-WATER ZONES THAT MUST BE CONSIDERED AND IN THE EASTERN PART OF
THE WESTERN MARYLAND SUBREGION, THERE IS EXTENSIVE FAULTING THAT MIGHT
PERMIT VERTICAL LEAKAGE OF INJECTED WASTES. IN THE PIEDMONT REGION THE
HIGHLY METAMORPHOSED AND FRACTURED ROCKS OF THE CATOCTIN MOUNTAIN BELT
OFFER FEW OPPORTUNITIES FOR PRACTICABLE INJECTION OF WASTES BECAUSE OF
THE LOW PERMEABILITY AND GENERALLY INEFFECTIVE CONFINING LAYERS. IN THE
COASTAL PLAIN REGION FACTORS RELATED TO WASTE INJECTION DECISIONS RANGE
WIDELY. MOST OF THE AQUIFERS CONTAIN FRESH WATER IN THE INNER COASTAL
PLAIN AND THE NUMBER DECREASES SEAWARD. IN THE MIDDLE COASTAL PLAIN,
THERE APPEAR TO BE SEVERAL SALINE AQUIFERS BELOW A DEPTH OF ABOUT 2,000
FEET AND IN THE OUTER COASTAL PLAIN THERE ARE MANY. THROUGHOUT THE
COASTAL PLAIN REGION THERE ARE EXTENSIVE THICK CONFINING LAYERS.
(WOODARD-USGS)

FIELD 05E, 02F

ACCESSION NO. W71-06695

HYDRAULIC FRACTURING,

G. C. HOWARD, AND C. R. FAST.

NEW YORK, SOCIETY OF PETROLEUM ENGINEERS OF AIME, 1970. 210 P.

DESCRIPTORS:

*HYDRAULICS, *OIL INDUSTRY, *AQUIFER CHARACTERISTICS, *INJECTION WELLS, CAVITATION, FLOW CHARACTERISTICS, HYDRAULIC ENGINEERING, HYDRAULIC PROPERTIES, FLUID MECHANICS, ACIDIZING, CEMENTING.

IDENTIFIERS:

*HYDRAULIC FRACTURING, *DEEP DISPOSAL WELLS, FRACTURE AREA, FRACTURING FLUIDS AND ADDITIVES, PROPPING AGENTS.

ABSTRACT:

HYDRAULIC FRACTURING IS A METHOD FOR INCREASING WELL PRODUCTIVITY BY FRACTURING THE PRODUCING FORMATION AND THUS INCREASING THE WELL DRAINAGE AREA. THIS MONOGRAPH IS DESIGNED TO BE A THESIS ON HYDRAULIC FRACTURING COVERING THE STATE-OF-THE-ART FROM THE THEORY AND TECHNIQUE OF HYDRAULIC FRACTURING TO THE APPLICATION OF NUCLEAR ENERGY AS A MEANS OF CRACKING THE RESERVOIR ROCK AND FORMING RUBBLE. HYDRAULIC FRACTURING IS BASED ON THE FACT THAT INJECTION PRESSURE DECREASES WHEN WATER, ACID, CEMENT OR OIL IS PUMPED INTO A FORMATION AT HIGH RATE AND AT A HIGH INITIAL PRESSURE. THIS WORK HAS CONSIDERABLE VALUE IN DEEP WELL LIQUID WASTE DISPOSAL APPLICATIONS AND PROVIDES THE PRACTICING ENGINEER WITH A SOURCE OF INFORMATION THAT WILL AID IN JUDGING THE RELATIVE MERITS OF VARIOUS HYDRAULIC FRACTURING TREATING PROCEDURES AND THE RESULTS TO BE EXPECTED FROM SUCH METHODS. (CAMPBELL-NWWA)

FIELD 08B, 04B, 05E

ACCESSION NO. W71-06950

DISPOSAL WELL PROBLEMS IN CHICAGO AND BAKERSFIELD AREAS,

CONSOER, TOWNSEND AND ASSOCIATES, CHICAGO, ILL.

RALPH G. BERK.

ASCE NATIONAL WATER RESOURCES ENGINEERING MEETING, PHOENIX, ARIZONA, JAN 11-15, 1971. MEETING PREPRINT 1302. AMERICAN SOCIETY OF CIVIL ENGINEERS, JAN 1971. 28 P, 3 FIG, 5 REF. PRICE \$0.50.

DESCRIPTORS:

*INDUSTRIAL WASTES, *WATER POLLUTION CONTROL, *WASTE DISPOSAL, *INJECTION WELLS, *WELLS, *LIQUID WASTES, *HYDROGEOLOGY, CHEMICAL WASTES, WELL CASINGS, DRILLING, DRILLING EQUIPMENT, PHENOLS, BRINE DISPOSAL, GEOLOGICAL ENGINEERING, GEOLOGIC CONTROL, GEOLOGIC INVESTIGATIONS, GROUNDWATER, AQUIFERS.

IDENTIFIERS:

*WASTE DISPOSAL WELLS, WELL DRILLING PROBLEMS.

ABSTRACT:

METHODS USED AND PROBLEMS ENCOUNTERED ARE DESCRIBED IN DRILLING TWO DEEP INJECTION WELLS INTENDED FOR THE DISPOSAL OF INDUSTRIAL LIQUID WASTES. ONE WELL WAS DRILLED TO A DEPTH OF 2,629 FEET IN THE CHICAGO, ILLINOIS AREA FOR DISPOSAL OF 1,200 BARRELS PER DAY OF HIGHLY ALKALINE BRINES AND PHENOLS HAVING A SPECIFIC GRAVITY OF 1.15. THE OTHER WELL WAS DRILLED IN THE VICINITY OF BAKERSFIELD, CALIFORNIA FOR THE DISPOSAL OF CANNERY WASTE LIQUID FROM THE SAN JOAQUIN VALLEY CANNERIES. THIS WELL WAS TO BE CAPABLE OF ACCEPTING 18,000 BARRELS PER DAY OF CAUSTICS, CHLORIDES, AND RELATIVELY SMALL AMOUNTS OF HYDROCHLORIC ACID AND VEGETABLE OILS--ALONG WITH 100 PPM OF SUSPENDED SOLIDS, 4,000 TO 10,000 PPM TOTAL DISSOLVED SOLIDS, 300 TO 13,000 PPM BOD AND 100 TO 48,000 PPM COD, WITH A PH OF 10.0 PLUS. USE OF A COMBINATION WELL CASING AND INJECTION TUBING IN THE FORM OF SARAN-LINED STEEL PIPE, ALTHOUGH OF GREATER INITIAL COST THAN THE STANDARD DESIGN OF STEEL OIL-WELL CASING AND PLASTIC INJECTION TUBE, HAS OFF-SETTING PHYSICAL AND ECONOMIC ADVANTAGES. WITH THE VUGATE FRACTURED DEVONIAN DISPOSAL ZONES IN THE CHICAGO DISPOSAL WELL, THE VACUUM PRODUCED IN INJECTING THE LIQUID WASTE WOULD HAVE COLLAPSED THE SMALLER DIAMETER INJECTION TUBE. (POERTNER)

FIELD 05E

ACCESSION NO. W71-07195

WATER TREATMENT PLANT WASTES DISPOSAL,

ORANGE COUNTY SEWER DISTRICTS, ORLANDO, FLA.

ROBERT MCCOLGAN.

REPORT TO AWWA RESEARCH FOUNDATION, NOV 11, 1970. 7 P, 2 REF.

DESCRIPTORS:

*INJECTION WELLS, SLUDGE DISPOSAL, SLUDGE TREATMENT, LAGOONS,
NEUTRALIZATION, DEWATERING, FILTRATION, *WATER TREATMENT, WASTES,
FLORIDA.

IDENTIFIERS:

ALUM COAGULATION, ALUMINUM HYDROXIDE SLUDGE, ACTIVATED CARBON SLUDGE,
PIPELINE DISPOSAL, GAMMA RAY SLUDGE DESTRUCTION, NALCO671, LAKE
WASHINGTON, FLORIDA AQUIFER, MELBOURNE(FLORIDA).

ABSTRACT:

THE PROJECT GOAL WAS TO DETERMINE EFFECTIVE TREATMENT OR DISPOSAL OF
ACTIVATED CARBON AND ALUMINUM HYDROXIDE SLUDGES AND THE NEUTRALIZATION
OF THE SUPERNATANT BEFORE DISCHARGE TO A LAKE. SLUDGE DISPOSAL
TECHNIQUES INCLUDED INJECTION WELLS AND PIPELINE DISPOSAL TO ROADBASE
PITS. SLUDGE TREATMENT METHODS INCLUDED GAMMA RAY SLUDGE DESTRUCTION,
DEWATERING, AND FILTRATION. SLUDGE INJECTION CAUSED CLOGGING OF THE
AQUIFER AND ELIMINATION OF THE GROUNDWATER AS A POTENTIAL SUPPLY.
PIPELINE DISPOSAL CREATED A DEWATERING PROBLEM IN THE ROADBASE PITS. A
0.1MG/L NALCO 671 POLYMER ADDITION GENERATED LESS SLUDGE THAN RADIATION
TREATMENT AND WAS AS EFFECTIVE. VACUUM FILTRATION, SAND BED DRYING,
CENTRIFUGATION, AND FILTER PRESSING CONCENTRATED SLUDGE SOLIDS UP TO
20%. BASIC RESEARCH IS RECOMMENDED FOR SLUDGE LAGOONS. LAGOON DESIGN
CONSIDERATIONS ARE A 2 1/2 FOOT MAXIMUM DEPTH, A 10 FOOT CLEARANCE FOR
DUMP TRUCKS, AND A BUFFER ZONE BETWEEN LAGOONS AND RESIDENTIAL
COMMUNITIES. (NARDOZZI-AWWA)

FIELD 05D, 05F

ACCESSION NO. W71-07476

RECLAMATION OF WASTE WATER FOR WELL INJECTION,

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, CALIF.; AND CALIFORNIA INST. OF TECH., PASADENA. W. M. KECK LAB. OF ENVIRONMENTAL HEALTH ENGINEERING.

JOHN K. MITCHELL, AND WILLIAM R. SAMPLES.

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT, CALIFORNIA, FEB 1967. 250 P, 32 FIG, 57 TAB, 14 REF. PARTIALLY SUPPORTED BY A RESEARCH GRANT BY THE US PUBLIC HEALTH SERVICE.

DESCRIPTORS:

*WATER REUSE, *INJECTION, *TERTIARY TREATMENT, *FILTERS, *WASTE WATER TREATMENT, *RECHARGE WELLS, INJECTION WELLS, CALIFORNIA, GROUNDWATER, SALINE WATER INTRUSION, WATER PURIFICATION, SEWAGE TREATMENT, WATER SUPPLY, RECLAIMED WATER, ON-SITE INVESTIGATIONS.

IDENTIFIERS:

*LOS ANGELES, HYPERION PLANT.

ABSTRACT:

THE LOS ANGELES FLOOD CONTROL DISTRICT REPORTS ITS INVESTIGATION OF HIGH-RATE TREATMENT FACILITIES TO POLISH STANDARD-RATE ACTIVATED SLUDGE EFFLUENT TO MAKE IT SUITABLE FOR USE AS A WATER SUPPLY FOR RECHARGE THROUGH INJECTION WELLS. PREVIOUS TESTING BY THE DISTRICT USING SLOW SAND FILTRATION FOR HYPERION EFFLUENT INDICATED THAT A SATISFACTORY WATER COULD BE PROVIDED. DUE TO THE UNAVAILABLE LARGE LAND AREA REQUIRED BY THIS SYSTEM, THE PRESENT TEST WAS UNDERTAKEN TO DEMONSTRATE THE POTENTIAL OF HIGH RATE FILTRATION. THE INVESTIGATION CONDUCTED AT THE CITY OF LOS ANGELES HYPERION TREATMENT PLANT HAD THREE BASIC PHASES. FIRST WAS TERTIARY TREATMENT TO POLISH THE STANDARD RATE ACTIVATED SLUDGE EFFLUENT. THE FACILITIES USED FOR THIS CONSISTED OF PARALLEL OPERATION OF A RAPID SAND FILTER, PRESSURE SAND FILTER, AND A DIATOMACEOUS EARTH FILTER. SECOND, THE POLISHED WATER FROM ONE OF THE FILTERS WAS STORED IN A RESERVOIR AND THEN RECHARGED INTO A TEST SITE INJECTION WELL. THIRD, OBSERVATION WELLS WERE USED TO MONITOR THE WATER QUALITY AS IT MOVED THROUGH THE UNDERGROUND AQUIFER. EITHER RAPID SAND FILTRATION WITH PRETREATMENT OR DIATOMACEOUS EARTH FILTRATION CAN BE USED TO PRODUCE WATER FROM HYPERION SECONDARY EFFLUENT WHICH IS ACCEPTABLE FOR INJECTION. THE ESTIMATED COST IS \$24 PER ACRE-FOOT. FURTHER TESTING OF WATER RECLAMATION AND INJECTION, ON A LARGER SCALE, IS RECOMMENDED. IT IS SUGGESTED THAT THE DISTRICT COOPERATE WITH OTHER AGENCIES TO MAKE RECLAIMED WATER AVAILABLE FOR OPERATION OF THE FRESH WATER BARRIERS WHICH ARE MAINTAINED TO PREVENT SEA WATER INTRUSION. (POERTNER)

FIELD 05D, 04B

ACCESSION NO. W71-08124

THE PROTECTION OF GROUNDWATER RESOURCES.

WATER WELL JOURNAL, VOL 24, NO 7, P 31-33, JULY 1970. 3 P.

DESCRIPTORS:

*GROUNDWATER, *WATER RESOURCES DEVELOPMENT, *WATER WELLS, *WATER QUALITY CONTROL, *HYDROGEOLOGY, REVIEWS, WATER MANAGEMENT(APPLIED), GOVERNMENTS, WATER CONSERVATION, WATER SUPPLY, REGULATION, AQUIFERS, INJECTION WELLS, WATER POLLUTION SOURCES.

IDENTIFIERS:

*GROUNDWATER PROTECTION.

ABSTRACT:

INFORMATION CONCERNING PROTECTION OF GROUNDWATER RESOURCES WAS ASSEMBLED FROM MANY AUTHORITATIVE SOURCES AND REVIEWED UNDER THE FOLLOWING MAIN TOPICS: (1) THE PROTECTION OF GROUNDWATER RESOURCES; (2) THE AVAILABILITY AND USE OF GROUNDWATER; (3) THE CLASSIFICATION OF GROUNDWATER POLLUTANTS; (4) GROUNDWATER POLLUTION FROM SURFACE SOURCES; (5) GROUNDWATER POLLUTION FROM PRODUCTION WELLS; (6) GROUNDWATER POLLUTION FROM INJECTION WELLS; (7) THE PURIFICATION OF POLLUTED GROUNDWATER; (8) THE ROLE OF FEDERAL LEGISLATION; (9) GOVERNMENTAL RESPONSIBILITIES IN GROUNDWATER MANAGEMENT; AND (10) SHARING THE RESPONSIBILITY. (WOODARD-USGS)

FIELD 04B, 02F, 05B

ACCESSION NO. W71-08542

MOVEMENT AND RECOVERY OF HERBICIDES IN THE OGALLALA AQUIFER,

AGRICULTURAL RESEARCH SERVICE, BUSHLAND, TEX. SOIL AND WATER CONSERVATION
RESEARCH DIV.

ARLAND D. SCHNEIDER, ALLEN F. WIESE, AND ORDIE R. JONES.

IN: THE OGALLALA AQUIFER--A SYMPOSIUM, TEXAS TECH UNIVERSITY, LUBBOCK,
INTERNATIONAL CENTER FOR ARID AND SEMI-ARID LAND STUDIES SPECIAL REPORT NO
39, P 219-226, 1970. 8 P, 1 FIG, 3 TAB, 4 REF.

DESCRIPTORS:

*PATH OF POLLUTANTS, *GROUNDWATER MOVEMENT, *INJECTION WELLS,
*PESTICIDES, PESTICIDE KINETICS, DDT, COLIFORMS, PERMEABILITY,
PESTICIDE REMOVAL, ABSORPTION, HERBICIDES, INSECTICIDES, WATER
POLLUTION EFFECTS.

IDENTIFIERS:

*OGALLALA AQUIFER(TEX).

ABSTRACT:

DURING THE FALL OF 1969, WATER FROM AN IRRIGATION WELL WAS USED TO
INJECT THREE COMMON HERBICIDES INTO A DUAL-PURPOSE WELL IN THE OGALLALA
AQUIFER AT THE USDA SOUTHWESTERN GREAT PLAINS RESEARCH CENTER,
BUSHLAND, TEXAS. THEN, THE WELL WAS PUMPED LONG ENOUGH TO RECOVER
ESSENTIALLY ALL OF THE RECHARGED WATER. THE DUAL-PURPOSE WELL WAS
RECHARGED FOR 10 DAYS AT AN AVERAGE RATE OF 360 GPM. THE HERBICIDES,
PICLORAM, ATRAZINE, AND TRIFLURALIN, WERE CONTINUOUSLY MIXED WITH THE
RECHARGE WATER AT CONCENTRATIONS THAT AVERAGED 0.125, 1.28 AND 0.24
PPM, RESPECTIVELY. NITRATE, ADDED IN THE FORM OF SODIUM NITRATE, WAS
USED TO TRACE THE MOVEMENT OF THE RECHARGED WATER. WATER SAMPLES PUMPED
FROM THE OBSERVATION WELLS AT RADIAL DISTANCES OF 30 AND 66 FEET FROM
THE DUAL-PURPOSE WELL SHOWED THAT ALL THREE HERBICIDES MOVED THROUGH
THE AQUIFER WITH THE RECHARGED WATER. THE COLIFORM BACTERIA AND DDT
WERE EFFECTIVELY FILTERED OR ABSORBED BY THE FINE OGALLALA SAND. (SEE
ALSO W71-08349 THRU W71-08357 AND W71-08570 THRU W71-08575)
(KNAPP-USGS)

FIELD 05B, 02F

ACCESSION NO. W71-08898

AN ACT TO PROHIBIT THE SURFACE DISCHARGING SALTWATER ON THE SURFACE OF LANDS;
TO PROHIBIT TAX DEDUCTIONS TO THOSE WHO DISCHARGE SALTWATER: AND FOR OTHER
PURPOSES.

ACT 254, ACTS OF ARKANSAS, P 795-796 (1969). 2 P.

DESCRIPTORS:

*ARKANSAS, *OIL INDUSTRY, *ENCROACHMENT, *WATER POLLUTION SOURCES, WELL
REGULATIONS, SALINE WATER-FRESHWATER INTERFACES, SEEPAGE, WELLS,
MINING, OIL WELLS, SALINITY, LEGISLATION, TAXES, SECONDARY
RECOVERY(OIL), INJECTION, OIL FIELDS, OIL, SALINE WATER, GROUNDWATER,
FRESHWATER, STREAMS, WATER POLLUTION CONTROL, POLLUTION ABATEMENT,
STATE GOVERNMENTS, LEGAL ASPECTS.

ABSTRACT:

UNDER THIS ACT, TAX DEDUCTIONS ARE DENIED OIL-WELL OPERATORS WHO ALLOW
INJECTED SALTWATER TO ESCAPE AND ENTER STREAMS. THE ACT IS APPLICABLE
TO INDIVIDUALS, PARTNERSHIPS, AND CORPORATIONS OR EMPLOYEES WHO
WILLFULLY OR NEGLIGENTLY CAUSE OR PERMITE SALTWATER TO FLOW, SEEP, OR
OTHERWISE ESCAPE FROM LEASED PREMISES. ANY INDIVIDUAL CAN FILE A
COMPLAINT AND SECURE A HEARING BEFORE THE POLLUTION CONTROL COMMISSION
FOR VIOLATIONS OF THIS ACT. UPON A FINDING THAT THE ACCUSED HAS
VIOLATED THIS ACT TAX DEDUCTIONS, UNDER ACTS 57 AND 138 OF 1959, SHALL
BE DENIED FOR ONE YEAR. ANY VIOLATION DURING A PERIOD OF SUSPENSION
SHALL EXTEND THE SUSPENSION FOR ONE YEAR FROM THE LAST VIOLATION.
SHOULD ANY STREAM CONTAIN MORE THAN 250 PARTS PER MILLIONTH OF
CHLORIDES, THE POLLUTION CONTROL COMMISSION SHALL SEEK AND TAKE STEPS
TO ELIMINATE THE SOURCE OF SUCH POLLUTION. (EARL-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-09040

WASTE DISPOSAL IN DEEP WELLS.

NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL, WASHINGTON, D.C.

FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, US GOVERNMENT PRINTING OFFICE, WASHINGTON DC 20402--PRICE \$0.25. NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL, SUB-COUNCIL REPORT (FEB 1971). 20 P, 1 TAB.

DESCRIPTORS:

*WASTE DISPOSAL, *INJECTION WELLS, *INDUSTRIAL WASTES, *RESEARCH AND DEVELOPMENT, GEOLOGIC INVESTIGATIONS, LEGAL ASPECTS, RISKS, WELL REGULATIONS, MONITORING, GEOLOGICAL SURVEYS, STANDARDS, CLASSIFICATION, GEOGRAPHICAL REGIONS, ULTIMATE DISPOSAL, WASTE IDENTIFICATION, DAMAGES.

ABSTRACT:

THE GROWING CHEMICAL COMPLEXITY OF WASTE PRODUCTS COUPLED WITH THE SEVERITY OF POLLUTION STANDARDS HAS CAUSED INDUSTRY TO VIEW DEEP WELL DISPOSAL AS POSSIBLY THE ONLY LOGICAL METHOD FOR DISPOSING OF CERTAIN UNTREATABLE WASTES. THE NATIONAL INDUSTRIAL POLLUTION CONTROL COUNCIL RECOMMENDED IMMEDIATE RESEARCH BY THE FEDERAL GOVERNMENT AND INDUSTRY TO ESTABLISH: (1) THE GEOLOGICAL FACTORS INVOLVED IN DEEP WELL DISPOSAL, (2) IDENTIFICATION OF ALL AREAS IN THE COUNTRY AMENABLE TO THIS FORM OF DISPOSAL, (3) A CATEGORIZATION OF ALL WASTES AND THEIR SUITABILITY FOR DEEP WELL DISPOSAL, (4) THE LEGAL STATUS OF DEEP WELL DISPOSAL, AND (5) SUITABLE PROCEDURES FOR MONITORING DEEP WELLS AND DISPOSAL AREAS. USING DEEP WELL WASTE DISPOSAL RAISES SEVERAL LEGAL QUESTIONS. WHEN DOES UNDERGROUND TRESPASS START. TO WHAT DEGREE AND EXTENT ARE THE USERS LIABLE FOR SURFACE OR SUBSURFACE DAMAGE TO NEARBY PROPERTIES. WHO OWNS WATER-INJECTED AND GROUNDWATER RECHARGE. THE USE OF DEEP WELL DISPOSAL HASN'T BEEN SUFFICIENTLY EXTENSIVE TO ESTABLISH PRECEDENT AS TO LEGAL RESPONSIBILITIES ARISING THEREFROM. STATUTORY REGULATIONS THROUGHOUT THE COUNTRY ARE DIVERSE, AND AMBIGUITY AS TO LEGAL RESPONSIBILITIES DETERS WIDESPREAD USE OF THIS METHOD. (GALLAGHER-FLORIDA)

FIELD 05E, 06E, 05G

ACCESSION NO. W71-09440

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,

A. G. OSTROFF.

ENGLEWOOD CLIFFS, NJ, PRENTICE-HALL, INC, 1965, 412 P.

DESCRIPTORS:

*OIL INDUSTRY, *INJECTION WELLS, *CORROSION BRINE DISPOSAL, *ARTIFICIAL RECHARGE.

IDENTIFIERS:

*WATER POLLUTION LEGISLATION, WATER ANALYSIS, WATER TREATMENT MICROBIOTY, FILTRATION, CHEMICAL FEEDERS, BOILER AND COOLING WATER TREATMENT.

ABSTRACT:

THIS BOOK PROVIDES UP-TO-DATE INFORMATION ON OIL FIELD WATER TREATMENT TECHNIQUES. IT COVERS THE CHEMICAL, PHYSICAL, AND BIOLOGICAL PROBLEMS ENCOUNTERED WITH THESE WATERS AND THEIR CAUSES AND CORRECTION. VARIOUS TREATMENTS ARE PRESENTED FOR INJECTION, DISPOSAL, PRODUCED, BOILER, COOLING AND PLANT WATERS. IT DEALS SPECIFICALLY WITH WATER TREATMENT PROBLEMS ENCOUNTERED IN PRODUCTION AND INCLUDES CONSIDERABLE MATERIAL ON SUBSURFACE WATER INJECTION AND TREATMENT. COVERAGE OF SAMPLING AND ANALYSIS TECHNIQUES IS PROVIDED AS WELL AS CAUSES OF SCALE, CORROSION, AND POLLUTION AND METHODS FOR MINIMIZING THESE PROBLEMS. IT ALSO DETAILS MICROBIOLOGICAL PROBLEMS AND FACTORS WHICH INFLUENCE BACTERICIDE SELECTION. THE BOOK IS VERY WELL ILLUSTRATED AND REFERENCED. MANY OF THE PROCEDURES AND CONCEPTS ARE OF DIRECT INTEREST TO WORKERS IN THE FIELD OF GROUNDWATER SUPPLY. (CAMPBELL-NWWA)

FIELD 05E, 08B, 06A

ACCESSION NO. W71-09721

DISPOSAL OF OIL WASTES.

OKLAHOMA STATUTES ANN, TITLE 52, SECS 296, 309 THRU 319 (1969) AS AMENDED (SUPP 1970).

DESCRIPTORS:

*OKLAHOMA, *ADMINISTRATIVE AGENCIES, *WATER POLLUTION CONTROL, *WELL REGULATIONS, STATE GOVERNMENTS, ADMINISTRATION, ADMINISTRATIVE DECISIONS, LEGISLATION, LEGAL ASPECTS, WATER LAW, WATER POLLUTION, WATER POLICY, WASTE WATER DISPOSAL, WASTE WATER(POLLUTION), WASTE DISPOSAL, WASTES, POLLUTION ABATEMENT, INJECTION WELLS, SUBSURFACE WATERS, OIL WELLS, SURFACE WATERS, REMEDIES, SALINE WATER, OIL WASTES, NATURAL GAS.

ABSTRACT:

NO INFLAMMABLE PRODUCT FROM OIL OR GAS WELLS SHALL BE PERMITTED IN LIVESTOCK WATER SOURCES. ALL OIL WASTES SHALL BE TRANSPORTED AWAY OR BURNED; THEY SHALL NOT BE ALLOWED TO FLOW OVER THE LAND. OWNERS SHALL NOT PERMIT ANY WELL DRILLED FOR OIL, GAS, OR SALT WATER DISPOSAL THROUGH A WORKABLE COAL SEAM TO REMAIN UNPLUGGED AFTER IT IS NO LONGER USED. AFTER NOTICE AND HEARING THE CORPORATION COMMISSION MAY PLUG ANY GAS, OIL, INJECTION, OR DISPOSAL WELL CAUSING WATER POLLUTION OR LEAKING DELETERIOUS SUBSTANCES UPON THE LAND IF THE OWNERS CANNOT BE FOUND OR ARE FINANCIALLY UNABLE TO PLUG THE WELL. THE COMMISSION SHALL NOT BE LIABLE FOR SUCH ACTION, NOR SHALL THE COMMISSION HAVE ASSUMED RESPONSIBILITY FOR REMEDIAL REPAIR. THE ATTEMPTED REMEDY OF SUCH A CONDITION SHALL NOT BE AN ADMISSION OF LIABILITY. ONE WHO HAD NO OBLIGATION TO PLUG A WELL SHALL HAVE A LIEN UPON THE INTEREST OF ONE WHO WAS SO OBLIGATED. THIS STATUTE CONSTITUTES A SUPPLEMENTAL REMEDY. WHEN THE COMMISSION UNDERTAKES REMEDIAL WORK IT SHALL BE DONE BY CONTRACTS UPON COMPETITIVE BIDS. ANY PERSON WHO OPERATES SUCH A WELL SHALL FURNISH A CORPORATE SURETY BOND. (ROBINSON-FLORIDA)

FIELD 06E, 05E

ACCESSION NO. W71-10143

INJECTION WELL ACT.

TEXAS CIVIL STATUTES ANN TITLE 128, ART 7621B (SUPP 1970).

DESCRIPTORS:

*TEXAS, *INJECTION WELLS, *WASTE DISPOSAL, *PERMITS, MUNICIPAL WASTES, INDUSTRIAL WASTES, WATER POLLUTION, LEGAL ASPECTS, LEGISLATION, PUBLIC BENEFITS, OIL INDUSTRY, GEOLOGIC FORMATIONS, OIL WASTES, WATER POLLUTION SOURCES, SUBSURFACE WATERS.

ABSTRACT:

BEFORE INDUSTRIAL OR MUNICIPAL WASTES ARE DISPOSED OF THROUGH INJECTION WELLS, A PERMIT MUST BE OBTAINED FROM THE WATER QUALITY BOARD. TO APPLY FOR A PERMIT, THE APPLICANT MUST OBTAIN A LETTER FROM THE TEXAS RAILROAD COMMISSION STATING THAT THE INJECTION WELL WILL NOT ENDANGER ANY OIL OR GAS FORMATION. THE BOARD AND OTHER SPECIFIED AGENCIES EVALUATE THE PROBABLE EFFECT OF THE WELL AND MAKE RECOMMENDATIONS. THE BOARD MAY HOLD A PUBLIC HEARING IF DEEMED NECESSARY. FOR INJECTION WELL DISPOSAL OF WASTES ARISING OUT OF OR INCIDENTAL TO THE DRILLING FOR OR PRODUCING OF OIL OR GAS, THE APPLICANT MUST OBTAIN A PERMIT FROM THE RAILROAD COMMISSION. THE APPLICANT MUST SUBMIT TO THE COMMISSION A LETTER FROM THE BOARD STATING THAT THE WELL WILL NOT ENDANGER THE FRESH WATER STRATA IN THE AREA OF ITS LOCATION. IF THE PROPOSED INJECTION WELL IS IN THE PUBLIC INTEREST, WILL NOT IMPAIR EXISTING RIGHTS, AND SURFACE AND GROUNDWATERS CAN BE ADEQUATELY PROTECTED BY APPROPRIATE WELL REGULATIONS, THE APPLICATION MAY BE GRANTED. FAILURE TO COMPLY WITH THIS ACT MAY SUBJECT THE VIOLATOR TO A CIVIL FINE NOT TO EXCEED \$1000 PER DAY FOR EACH ACT OF NON-COMPLIANCE. (GALLAGHER-FLORIDA)

FIELD 06E, 05E.

ACCESSION NO. W71-10229

GENERAL RULES AND REGULATIONS RELATING TO WELLS.

UTAH DEPT. OF NATURAL RESOURCES, SALT LAKE CITY. DIV. OF OIL AND GAS
CONSERVATION.

RULES C-1 THRU E-6 P 28-48, 1969, 21 P.

DESCRIPTORS:

*UTAH, *OIL WELLS, *WATER POLLUTION CONTROL, *WELL REGULATIONS, WELL
CASINGS, LOGGING(RECORDING), WELL PERMITS, DRILLING, WELL SPACING,
INJECTION WELLS, GROUNDWATER, OIL WASTES, OIL FIELDS, OIL INDUSTRY,
NATURAL GAS, REGULATION, POLLUTION ABATEMENT, STREAMS, RESERVOIRS,
DRAINAGE, WATER POLLUTION SOURCES, WATER POLLUTION CONTROL,
LEGISLATION, LEGAL ASPECTS, CONSERVATION.

ABSTRACT:

ANY PERSONS PROPOSING WELL OPERATIONS SHALL OBTAIN SURETY BONDS
INSURING THE PROPER PLUGGING OF WELLS IN ACCORDANCE WITH RULES AND
REGULATIONS SET FORTH HEREIN. OWNERS OF WELLS SHALL TAKE ALL REASONABLE
PRECAUTIONS TO AVOID POLLUTING STREAMS, RESERVOIRS, NATURAL DRAINAGE
WAYS, AND UNDERGROUND WATER, INCLUDING THE PROPER DISPOSAL OF LIQUID
WASTES FROM WELL PRODUCTIONS. IN ORDER TO CONSERVE THE OIL AND GAS
SUPPLY, THE OIL AND GAS CONSERVATION COMMISSION MAY ESTABLISH DRILLING
UNITS FOR A POOL, REGULATING THE SPACING OF WELL THEREIN. BEFORE THE
INITIAL DRILLING OF ANY WELL, WRITTEN NOTICE OF THE CHARACTER OF THE
WORK PROPOSED MUST BE GIVEN TO THE COMMISSION. OTHER REQUIREMENTS
CONCERNING GAS AND OIL WELL OPERATIONS INCLUDE: (1) THE FILING OF WELL
LOGS AT SPECIFIED TIMES; (2) DRILLING PROCEDURES IN SPECIALIZED AREAS,
SUCH AS WILDCAT TERRITORY AND POTASH AREAS; (3) REPORTS OF CASING AND
WATER SHUT-OFF TESTS; (4) PROCEDURES FOR UNDERGROUND DISPOSAL OF WATER;
(5) NOTICE TO THE COMMISSION OF VARIOUS WELL PROCEDURES; AND (6)
PROCEDURES REGARDING THE ABANDONMENT AND PLUGGING OF WELLS. INJECTIONS
WELLS SHALL BE PROPERLY CASED AND CEMENTED TO AVOID DAMAGE TO FRESH
WATER RESOURCES. (SMILJANICH-FLORIDA)

FIELD 06E, 05G, 04B

ACCESSION NO. W71-10260

POLLUTION AND ATTENDANT PROBLEMS,

PAUL BROWN.

OKLAHOMA BAR ASSOCIATION JOURNAL, VOL 40, NO 7, P 417-422, 1969, 6 P, 13 REF.

DESCRIPTORS:

*OKLAHOMA, *INJECTION WELLS, *WATER POLLUTION CONTROL, *SALINE WATER, LEGISLATION, JUDICIAL DECISIONS, WATER LAW, STATE GOVERNMENTS, ADMINISTRATIVE AGENCIES, LEGAL ASPECTS, REGULATION, OIL INDUSTRY, INJECTION, OIL WELLS, COORDINATION, POLLUTION ABATEMENT, WASTE WATER DISPOSAL, SECONDARY RECOVERY(OIL), WATER UTILIZATION, WATER POLLUTION SOURCES.

ABSTRACT:

THE OIL INDUSTRY IS INCREASINGLY CONCERNED WITH PROBLEMS OF DISPOSING OF SALT WATER. IN 1968, AN OKLAHOMA STATUTE CREATED A DEPARTMENT OF POLLUTION CONTROL TO COORDINATE THE EFFORTS OF THE VARIOUS STATE AGENCIES HAVING AUTHORITY OVER WATER POLLUTION CONTROL. IN ADDITION, THE DEPARTMENT HAS THE POWER TO PREVENT OR ABATE ANY POLLUTION OF THE WATERS WHEN THE APPROPRIATE AGENCY FAILS TO DO SO. THE CONTROL OVER THE DISPOSITION OF SUB-SURFACE SALT WATER IS VESTED IN THE OKLAHOMA CORPORATION COMMISSION. THE CASE LAW INDICATED SEVERAL INTERESTING SITUATIONS AS TO THE USE AND INJECTION OF SALT WATER. SEVERAL CASES IMPLY THAT THE RIGHT GRANTED BY ONE COTENANT TO INJECT SALT WATER FURNISHES A RIGHT OF ENTRY AND OF USE, EVEN THOUGH OTHER COTENANTS DID NOT CONSENT TO THE AGREEMENT. HOWEVER, THE NON-CONSENTING COTENANTS MAY NOT BE PRECLUDED FROM MAKING THE SAME USE OF THE INJECTION WELL. ALSO, THE TREND OF THE CASE DECISIONS IS THAT FRESH WATER OR GROUNDWATER PROBABLY CANNOT BE USED FOR INJECTION PURPOSES, THOUGH IN ALL LIKELIHOOD AN OPERATOR WOULD BE ABLE TO USE SALT WATER FOR INJECTION PURPOSES. (JOHNSON-FLORIDA)

FIELD 05G, 06E

ACCESSION NO. W71-10261

WELL TECHNOLOGY SERVES THE MINING INDUSTRY.

UNIVERSAL OIL PRODUCTS CO., ST. PAUL, MINN. JOHNSON DIV.

JOHNSON DRILLERS JOURNAL, VOL 41, NO 2, P 1-4, MAR-APR 1969.

DESCRIPTORS:

*WATER WELLS, *DEWATERING, *WASTE WATER DISPOSAL, INJECTION WELLS, SCREENS, WELLS.

IDENTIFIERS:

*MINING INDUSTRY, KAOLIN MINING, IN-PLACE URANIUM ORE LEACHING.

ABSTRACT:

WHILE GROUNDWATER MAY NOT BE THE SOUGHT-FOR MINERAL, BETTER ENGINEERING IN WELL DESIGN, IMPROVED UNDERSTANDING OF GROUNDWATER HYDRAULICS, ADVANCED DRILLING METHODS AND EFFICIENT WELL COMPLETION METHODS CONTRIBUTE TO ECONOMIC MEANS OF MINING THE DESIRED MATERIAL. GROUNDWATER TECHNOLOGY, THEREFORE, CAN SERVE THE MINING ENGINEER CONSTRUCTIVELY AS HE PLAYS HIS IMMENSELY IMPORTANT ROLE IN ECONOMICAL EXPLOITATION OF OUR COUNTRY'S MINERAL RESOURCES. THIS ARTICLE DESCRIBES FOUR KINDS OF SITUATIONS WHERE GROUNDWATER TECHNOLOGY SERVES THE MINING INDUSTRY. THESE ARE: DEWATERING FOR OPEN PIT MINING, SOLUTION MINING, WELLS FOR EXTRACTING MINERALIZED WATER AS A RAW MATERIAL, DISPOSAL WELLS FOR DIFFICULT-TO-HANDLE WASTE FLUIDS. THESE ARE APPLICATIONS OTHER THAN DRAINAGE OF MINE SHAFTS AND DRIFTS IN UNDERGROUND WORKINGS. (CAMPBELL-NWWA)

FIELD 04B, 06B, 05G

ACCESSION NO. W71-10423

REGULATION OF OIL AND GAS WELLS.

KANSAS STATUTES ANN SECS 55-115 THRU 55-142 (1964).

DESCRIPTORS:

*KANSAS, *OIL WELLS, *WELL REGULATIONS, *POLLUTION ABATEMENT, WATER POLLUTION SOURCES, LEGISLATION, LEGAL ASPECTS, CASINGS, DRILLING, REGULATION, SALINE WATER INTRUSION, SUBSURFACE WATERS, WELL PERMITS, INJECTION WELLS, RECHARGE WELLS, ROTARY DRILLING, CONSERVATION, NATURAL RESOURCES, WATER POLLUTION CONTROL.

ABSTRACT:

ANY OIL OR GAS WELL OPERATOR MUST CASE OR PLUG HIS WELL SO AS TO PREVENT: (1) WATER INTRUSION INTO OIL OR GAS-BEARING ROCK, (2) SALT OR MINERAL WATER INTRUSION INTO WATER SUITABLE FOR DOMESTIC USE, AND (3) SALT WATER, OIL, OR OTHER REFUSE FROM ESCAPING BY OVERFLOW OR SEEPAGE. REGULATIONS FOR DRILLING AND ABANDONMENT OF CERTAIN HOLES AND WELLS TO PREVENT POLLUTION OF NATURAL RESOURCES ARE SPECIFIED. A LICENSE IS REQUIRED TO ENGAGE IN THE BUSINESS OF DRILLING SEISMIC OR CORE HOLES OR PLUGGING WELLS. THE PROCEDURES FOR OBTAINING A LICENSE AS WELL AS THE GROUNDS FOR SUSPENDING OR REVOKING A LICENSE ARE SET OUT. THE CORPORATION COMMISSION IS AUTHORIZED TO ASSESS THE COSTS OF ENFORCING CERTAIN PROVISIONS OF THE ACT. IN ABANDONING A WELL, ALL OPERATING STRUCTURES MUST BE REMOVED AS A MATTER OF PUBLIC POLICY. BEFORE USING SECONDARY RECOVERY METHODS OF WATER FLOODING OR REPRESSURING, AN OPERATOR MUST HAVE HIS APPLICATION APPROVED. REGULATIONS DESIGNED TO PREVENT POLLUTION OF FRESH WATER ARE ESTABLISHED FOR THE ABANDONMENT OF WELLS DRILLED WITH CABLE TOOLS OR ROTARY EQUIPMENT. INVESTIGATION AND PLUGGING OF ABANDONED WELLS LIKELY TO CAUSE POLLUTION IS AUTHORIZED. (GALLAGHER-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-10440

DISPOSAL OF BRINES AND MINERALIZED WATERS.

KANSAS STATUTES ANN SECS 55-1003 THRU 55-1007 (1964).

DESCRIPTORS:

*KANSAS, *WASTE DISPOSAL, *OIL WASTES, *PERMITS, LEGISLATION, LEGAL ASPECTS, WASTE WATER DISPOSAL, INJECTION WELLS, OIL INDUSTRY, ADMINISTRATIVE AGENCIES, WATER POLLUTION, POLLUTION ABATEMENT, PUBLIC HEALTH, STANDARDS, WATER POLLUTION SOURCES, PROJECT PLANNING.

ABSTRACT:

BEFORE DISPOSING OF OIL-FIELD OR GAS-FIELD BRINES AND MINERALIZED WATERS, PLANS AND SPECIFICATIONS FOR SUCH DISPOSAL MUST BE APPROVED BY THE BOARD OF HEALTH AND THE CORPORATION COMMISSION. THE BOARD OF HEALTH SHALL DETERMINE IF THE PLAN PROTECTS WATER RESOURCES FROM PREVENTABLE POLLUTION. THE CORPORATION COMMISSION SHALL DETERMINE THAT THE PROPOSED METHOD WILL NOT ENDANGER GAS OR OIL RESOURCES. IF A PERMIT IS NOT GRANTED THE APPLICANT MAY APPEAL. WHERE DISPOSAL IS BY INJECTION WELL, THE INJECTION PRESSURE MAY NOT EXCEED THE MAXIMUM ESTABLISHED BY THE BOARD OF HEALTH AND ENTERED IN THE PERMIT. DISPOSAL WELLS MUST COMPLY WITH THE MINIMUM DEPTH REQUIREMENT ESTABLISHED BY THE DESIGNATED STATE AGENCIES. VIOLATION OF THESE PROVISIONS CONSTITUTES A MISDEMEANOR, AND THE ATTORNEY GENERAL OR COUNTY ATTORNEY MAY SEEK INJUNCTIVE RELIEF. (GALLAGHER-FLORIDA)

FIELD 06E, 05E

ACCESSION NO. W71-10441

RULES AND REGULATIONS FOR SUBSURFACE DISPOSAL SYSTEMS.

COLORADO DEPT. OF HEALTH, DENVER. WATER POLLUTION CONTROL COMMISSION.

1970. 9 P.

DESCRIPTORS:

*COLORADO, *WASTE DISPOSAL, *INJECTION WELLS, *REGULATION, PERMITS, ADMINISTRATIVE AGENCIES, ADMINISTRATIVE DECISIONS, INJECTION, WELL PERMITS, STATE GOVERNMENTS, ADOPTION OF PRACTICES, CONSTRUCTION, STANDARDS.

ABSTRACT:

CONDITIONS FOR THE LOCATION, CONSTRUCTION, AND OPERATION OF SUBSURFACE DISPOSAL SYSTEMS ARE PROVIDED BY THESE COLORADO DEPARTMENT OF HEALTH REGULATIONS. FOLLOWING A COMPREHENSIVE LIST OF DEFINITIONS OF APPLICABLE TERMS, THE REGULATIONS PROVIDE THAT SUBSURFACE DISPOSAL SYSTEMS WILL NOT BE OPERATED WITHOUT A PERMIT. PERMITS WILL BE ISSUED UPON APPLICATION AND A FINDING, AFTER NOTICE AND HEARING, THAT NO SUBSTANTIAL ADVERSE AFFECT UPON COLORADO WATERS WILL OCCUR FROM THE PROPOSED DISPOSAL. THE COMMISSION MAY REQUIRE OTHER POLLUTION ABATEMENT AND CONTROL MEASURES AS A CONDITION SUBSEQUENT TO GRANTING A PERMIT. PERMIT APPLICATIONS MUST INCLUDE A VERY COMPREHENSIVE DESCRIPTION OF THE PROJECT AND THE SURROUNDING AREA, INCLUDING DESCRIPTIONS OF: (1) WELL ENGINEERING DATA; (2) GEOLOGICAL AND PHYSICAL CHARACTERISTICS OF THE INJECTION INTERVAL AND THE OVER- AND UNDER-LYING IMPERMEABLE BARRIERS; (3) WASTE CHARACTERISTICS; (4) MINERAL RESOURCES PRESENT IN THE AREA; AND (5) LOCAL TOPOGRAPHY, INDUSTRY, AGRICULTURE AND POPULATION. THE PRELIMINARY REVIEW OF APPLICATIONS IS POSSIBLE AND ADMINISTRATIVE DUE PROCESS IS AFFORDED THROUGH THE NOTICE AND HEARING PROVISIONS. NOTICE AND HEARING ARE ALSO REQUIRED FOR THE TERMINATION AND ABANDONMENT OF EXISTING SYSTEMS. LIABILITY UNDER STATUTORY OR COMMON LAW, HOWEVER, IS NOT ABSOLVED BY COMPLIANCE WITH THESE REGULATIONS. (HART-FLORIDA)

FIELD 05G, 06E, 05E

ACCESSION NO. W71-10960

DETERMINATION OF POLLUTIONAL POTENTIAL OF THE OGALLALA AQUIFER BY SALT WATER INJECTION,

ROBERT S. KERR WATER RESEARCH CENTER, ADA, OKLA.

LESLIE G. MCMILLION, SR. AND BRUCE W. MAXWELL.

AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE AS PB-202-227, \$3.00 IN PAPER COPY. JUN 1970, 80 P, 9 FIG, 2 TAB, 11 REF, 3 APPEND. EPA PROGRAM 16060--06/70

DESCRIPTORS:

*INJECTION WELLS, *TRANSMISSIVITY, *AQUIFER CHARACTERISTICS, GROUNDWATER, WATER POLLUTION CONTROL, OKLAHOMA, *BRINE DISPOSAL, STORAGE COEFFICIENT, AQUIFERS, WATER POLLUTION SOURCES, BRINES, OIL WELLS, WASTE WATER DISPOSAL, WELLS, UNDERGROUND STORAGE, INJECTION.

IDENTIFIERS:

*OGALLALA AQUIFER, TEXAS COUNTY(OKLA), GLORIETTA SANDSTONE, SALT WATER INJECTION, *GROUNDWATER CONTAMINATION, DISPOSAL WELLS.

ABSTRACT:

FIELD STUDIES WERE CONDUCTED TO DETERMINE WHETHER CONTAMINATION OF THE OGALLALA AQUIFER COULD RESULT FROM THE CURRENT PRACTICE OF INJECTION OF OIL-FIELD BRINES INTO THE GLORIETA SANDSTONE, WHICH LIES 500 TO 1,000 FEET BELOW THE OGALLALA IN TEXAS COUNTY, OKLAHOMA--THE STUDY AREA. THE PROJECT WAS DESIGNED ON THE BASIS THAT FOR BRINES TO MOVE FROM THE GLORIETA TO THE OGALLALA THE POTENTIOMETRIC PRESSURES IN THE GLORIETA WOULD HAVE TO BE HIGHER THAN WATER-LEVEL ELEVATIONS OF THE OGALLALA. SINCE THE HYDRAULIC CHARACTERISTICS OF THE GLORIETA SANDSTONE WERE NEEDED FOR DETERMINING THIS FLUID RELATIONSHIP, A TECHNIQUE WAS DEVELOPED FOR MAKING AQUIFER TESTS IN BRINE DISPOSAL WELLS. THE TECHNIQUE HAS APPLICATION IN CERTAIN WATER RESOURCES INVESTIGATIONS AND IN SIMILAR SITUATIONS. (KELLEY-EPA)

FIELD 05G, 05B, 04B

ACCESSION NO. W71-11361

THE EFFECTS OF DRAIN WELLS ON THE GROUND-WATER QUALITY OF THE SNAKE RIVER PLAIN,
IDAHO BUREAU OF MINES AND GEOLOGY, MOSCOW.

DONN E. ABEGGLEN, ALFRED T. WALLACE, AND ROY E. WILLIAMS.

IDAHO BUREAU OF MINES AND GEOLOGY PAMPHLET 148, OCTOBER 1970. 51 P, 9 FIG, 9
TAB, 45 REF, 3 APPEND.

DESCRIPTORS:

*WATER POLLUTION SOURCES, *INJECTION WELLS, *IDAHO, *WASTE WATER
DISPOSAL, *AQUIFERS, *BASALTS, HYDROGEOLOGY, AQUIFER CHARACTERISTICS,
WATER SOURCES, WATER SUPPLY, WATER QUALITY, WATER POLLUTION CONTROL,
PATH OF POLLUTANTS, WATER QUALITY CONTROL.

IDENTIFIERS:

*SNAKE RIVER PLAIN(IDAHO).

ABSTRACT:

THE EASTERN SNAKE RIVER PLAIN AQUIFER OF SOUTHERN IDAHO IS COMPOSED OF
A SERIES OF SUCCESSIVE BASALT (LAVA) FLOWS WITH INTERFLOW BEDS OF
PYROCLASTIC AND SEDIMENTARY MATERIALS. THE AQUIFER IS THE HIGHEST
YIELDING WATER BEARING SEQUENCE OF ROCKS IN IDAHO AND THE PRINCIPAL
DOMESTIC WATER SUPPLY RESOURCE IN SOUTHEASTERN IDAHO. WELLS WHICH
EXTEND DOWN INTO THE FRACTURED BASALT AQUIFERS OF THE SNAKE RIVER PLAIN
OF SOUTHERN IDAHO ARE BEING USED FOR THE DISPOSAL OF SEWAGE, STREET
DRAINAGE, IRRIGATION EXCESS WATER, AND INDUSTRIAL WASTES. BASED ON A
FIELD INVENTORY OF DRAIN WELLS IN 1969 AND 1970, IT IS ESTIMATED THAT
THERE ARE APPROXIMATELY 5000 DRAIN WELLS IN THE SNAKE RIVER PLAIN OF
SOUTHERN IDAHO. OF THESE 5000 WELLS, APPROXIMATELY 3000 DRAIN WELLS ARE
CONCENTRATED IN LINCOLN, JEROME, AND GOODING COUNTIES. A BACTERIAL
POLLUTION PROBLEM EXISTS ON A LOCAL SCALE AND CORRECTIVE MEASURES ARE
NEEDED IMMEDIATELY TO PROTECT THE PUBLIC HEALTH IN SEVERAL AREAS OF THE
PLAIN. EFFECTIVE ALTERNATIVES TO THE USE OF DRAIN WELLS EXIST. SEWAGE,
STREET DRAINAGE, AND INDUSTRIAL WASTE DRAIN WELLS CAN BE ELIMINATED IF
MUNICIPAL SEWERAGE, ABOVE-GROUND AND SUB-SURFACE SOIL ABSORPTION
SYSTEMS, AND SEDIMENTATION-RECIRCULATION SYSTEMS ARE IMPLEMENTED.
(KNAPP-USGS)

FIELD 02F, 05G

ACCESSION NO. W71-12274

RECHARGE OF CARBONACEOUS SALINE AQUIFER OF SOUTH FLORIDA WITH TREATED SANITARY WASTEWATER,

BLACK, CROW AND EIDNESS, INC., GAINESVILLE, FLA.

J. I. GARCIA-BENGOCHEA.

SUPPORTING PAPER C OF ARTIFICIAL GROUNDWATER RECHARGE CONFERENCE, UNIVERSITY OF READING, ENGLAND, SEPTEMBER 21-24, 1970: THE WATER RESEARCH ASSOCIATION, MARLOW, ENGLAND. 14 P, 5 FIG, 1 TAB, 9 REF.

DESCRIPTORS:

*TERTIARY TREATMENT, *WASTE WATER DISPOSAL, *ARTIFICIAL RECHARGE, *INJECTION WELLS, *RECHARGE WELLS, FLORIDA, AQUIFERS, AQUIFER CHARACTERISTICS, HYDROGEOLOGY, LIMESTONES, DOLOMITE, KARST, ARTESIAN WELLS, CONFINED WATER, AQUICIDES.

IDENTIFIERS:

*WASTE DISPOSAL WELLS.

ABSTRACT:

ARTIFICIAL RECHARGE OF A CARBONACEOUS SALINE AQUIFER OF SOUTH FLORIDA IS USED TO DISPOSE OF TREATED SANITARY WASTE. THE DEEP OPEN-HOLE INJECTION WELL IS LOCATED IMMEDIATELY SOUTH OF MIAMI, FLORIDA. THE TREATED WASTEWATER HAS A LOWER SPECIFIC GRAVITY (APPROXIMATELY 1.025). MIXING WILL OCCUR AT THE VERY BEGINNING OF THE INJECTION PERIOD AND THEREAFTER A FRESH-WATER BUBBLE WILL DEVELOP, FLOATING ON THE SALINE WATER AND LIMITED ABOVE BY CONFINING LAYERS. INJECTION OF THE FRESH-WATER EFFLUENT INTO THE DEEP ARTESIAN AQUIFER OF SOUTH FLORIDA WILL LEAD TO THE FORMATION OF AN ENORMOUS FRESH-WATER BUBBLE AT THE TOP OF THE AQUIFER WHICH WOULD BE UNDER NORMAL ARTESIAN PRESSURE. SUCH A VOLUME OF WATER COULD BE USED FOR IRRIGATION OR FOR FUTURE WATER SUPPLY WHEN SHORTAGE OF PRESENT FRESH WATER SOURCES WOULD JUSTIFY COST OF RECLAIMING THE STORED WATER. (KNAPP-USGS)

FIELD 05G, 03A, 04B

ACCESSION NO. W71-12415

PLUGGING OIL AND GAS WELLS.

INDIANA STAT ANN SECS 46-1733 THRU 46-1740 (1970 SUPP).

DESCRIPTORS:

*INDIANA, *WATER POLLUTION CONTROL, *OIL WELLS, *INJECTION WELLS, ADMINISTRATIVE AGENCIES, ADMINISTRATIVE DECISIONS, LEGISLATION, WATER LAW, LEGAL ASPECTS, WATER POLLUTION, WATER POLLUTION SOURCES, WATER QUALITY, WATER QUALITY CONTROL, WATER RESOURCES, OIL, NATURAL GAS, BRINE DISPOSAL, OIL WASTES, SALINE WATER, BRINE, SALINITY, OIL INDUSTRY, OIL FIELDS.

ABSTRACT:

A SUPPLEMENTAL REMEDY IS HEREIN PROVIDED WHEN ANY PERSONS OBLIGATED TO PLUG AN OIL, GAS, OR SALT WATER DISPOSAL WELL FAILS TO DO SO, OR WHEN THE IDENTITY OF SAID PERSON OR PERSONS IS UNKNOWN. THE DEPARTMENT OF NATURAL RESOURCES MAY PLUG ANY WELL LEAKING DELETERIOUS SUBSTANCES, AFTER PROPER NOTICE. NO NOTICE IS REQUIRED IN EMERGENCY SITUATIONS INVOLVING IRREPARABLE INJURY. PERSONS PLUGGING OR REPAIRING WELLS PURSUANT TO AN ORDER OF THE DEPARTMENT SHALL NOT BE LIABLE FOR ANY DAMAGES RESULTING FROM OPERATIONS NECESSARY TO PLUG SUCH WELLS, NOR SHALL THEY BE RESPONSIBLE FOR ANY NECESSARY REMEDIAL WORK. THE INITIATION OR SUPPORT OF A PROCEEDING BEFORE THE DEPARTMENT OR AN ATTEMPT TO REMEDY THE CONDITION OF ANY WELL UNDER AUTHORITY OF THIS ACT SHALL NOT BE CONSIDERED AN ADMISSION OF LIABILITY. ANY PERSON WHO HAS NO OBLIGATION TO PLUG OR REPAIR A WELL, BUT WHO DOES SO, SHALL HAVE A CAUSE OF ACTION AGAINST THOSE SO OBLIGATED FOR REASONABLE COSTS AND EXPENSES. (ROBINSON-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-12925

THE DESIGN AND OPERATION OF A PRIVATE WASTE DISPOSAL PLANT NEAR SARNIA, ONTARIO,
TRECAN LTD., COOKSVILLE(ONTARIO).

W. K. LOMBARD.

PROCEEDINGS, INDUSTRIAL WASTE CONFERENCE, 24TH, MAY 6-8, 1969, P 6-12, 6 FIG.

DESCRIPTORS:

*INDUSTRIAL WASTES, *INCINERATION, LAND-FILL, SEDIMENTATION, INJECTION
WELLS, TEMPERATURE, OILY WASTES, PHENOLS, COST ANALYSIS, *WASTE
DISPOSAL, WASTE WATER TREATMENT.

IDENTIFIERS:

*CENTRALIZATION, CAUSTIC, CANADA.

ABSTRACT:

A FULL SCALE PLANT CONSTRUCTED SOLELY FOR THE PURPOSE OF COLLECTING,
STABILIZING, AND DISPOSING OF INDUSTRIAL WASTES FROM SEVERAL LOCATIONS
HAS BEEN OPERATIVE FOR SEVERAL MONTHS. AN ANTICIPATED 50,000 CU. YDS.
MIXED WASTES AND 10,000 CU. YDS. OF LIQUIDS TO BE INCINERATED ARE
NEEDED ANNUALLY TO ALLOW THE PLANT TO OPERATE AT MAXIMUM EFFICIENCY.
THE FIVE DISPOSAL SYSTEMS INCLUDE: (1) INCINERATING BURNERS FOR
COMBUSTIBLE LIQUIDS; (2) BULK WASTE INCINERATORS FOR HIGH BTU AND LOW
BTU BULK MATERIALS; (3) A DEEP WELL FOR CLEAN AQUEOUS LIQUIDS; (4)
LAGOONS FOR TEMPORARY HOLD-UP AND SETTLING OF LIQUIDS; (5) PROPERTY FOR
BURIAL AND LAND-FILLING OF BULK AND SEMI-LIQUID MATERIALS WHICH CANNOT
OTHERWISE BE DISPOSED OF. HOPEFULLY, THIS PLANT WILL SERVE AS A
PROTOTYPE OF THE TYPE OF PLANT WHICH CAN BE PRODUCED IF INDUSTRY,
GOVERNMENT, AND THE PUBLIC COOPERATE. (LOWRY-TEXAS)

FIELD 05D, 05E

ACCESSION NO. W71-13412

RUSCH V PHILLIPS PETROLEUM CO. (LIABILITY OF OIL COMPANIES FOR POLLUTING UNDERLYING STRATA),

180 P.2D 270-278 (KAN. 1947).

DESCRIPTORS:

*KANSAS, *CATTLE, *OIL WASTES, *WATER SUPPLY, WATER POLLUTION, WATER POLLUTION EFFECTS, WATER POLLUTION SOURCES, IMPAIRED WATER QUALITY, WATER QUALITY, LEGAL ASPECTS, LEASES, OIL INDUSTRY, BRINE, SALINE WATER, OIL, LIVESTOCK, JUDICIAL DECISIONS, ADJUDICATION PROCEDURE, LEGISLATION, DAMAGES, REMEDIES, POLLUTANTS, WATER WELLS, INJECTION WELLS, GROUNDWATER, PONDS.

ABSTRACT:

PLAINTIFF LEASEHOLDER/CATTLE RANCHER SOUGHT TO RECOVER DAMAGES FROM DEFENDANT OIL COMPANIES FOR INJURY TO HIS CATTLE AND LEASEHOLD CAUSED BY WATER POLLUTION. DEFENDANTS PERMITTED THEIR BRINE AND OIL WASTES TO ENTER THE FRESH WATER STRATA AND PLAINTIFF'S WATER SUPPLY ON AN ADJACENT TRACT WAS RENDERED UNFIT FOR LIVESTOCK. FOLLOWING A MISTRIAL, DEFENDANTS APPEALED FROM AN ORDER OVERRULING THEIR DEMURRER. THE KANSAS SUPREME COURT REVIEWED THE EVIDENCE PRESENTED AND CONCLUDED THAT IT PROPERLY PRESENTED A QUESTION FOR THE JURY. DEFENDANTS ALSO CONTENDED THAT PLAINTIFF DID NOT ESTABLISH A PROPER MEASURE OF DAMAGES. THE COURT, HOWEVER, DETERMINED THAT THE EVIDENCE SUFFICIENTLY ESTABLISHED THAT THE USE OF PLAINTIFF'S LEASEHOLD WAS IMPAIRED. FURTHERMORE, DEFENDANTS CONTENDED THAT NO BASIS FOR PUNITIVE DAMAGES WAS IN THE EVIDENCE. SINCE A STATUTE PROHIBITED, AND MADE CRIMINAL, THE ACT OF PERMITTING OIL WASTES AND BRINE TO ESCAPE THE IMMEDIATE DRILLING AREA, AND SINCE DEFENDANT APPARENTLY KNEW THE POLLUTANTS WERE ESCAPING, THE COURT HELD THAT THE JURY MIGHT PROPERLY FIND WANTON AND RECKLESS CONDUCT BY DEFENDANTS, WARRANTING PUNITIVE DAMAGES. (HART-FLORIDA)

FIELD 06E, 05B

ACCESSION NO. W71-13593

AUGUSTINE V HINNEN (LIABILITY OF OIL LESSEE FOR SALINE POLLUTION OF WATER SUPPLY ON ADJACENT LANDS).

443 P.2D 354-360 (KAN. 1968).

DESCRIPTORS:

*KANSAS, *SALINE WATER INTRUSION, *INJECTION WELLS, *DAMAGES, OIL WASTES, OIL FIELDS, OIL INDUSTRY, WATER POLLUTION, WATER POLLUTION SOURCES, WATER POLLUTION EFFECTS, WATER SUPPLY, SALINE WATER-FRESHWATER INTERFACES, BRINE DISPOSAL, DRILLING FLUIDS, OIL WELLS, BYPRODUCTS, WASTE DISPOSAL, WASTE WATER DISPOSAL, WELL PERMITS, WELL REGULATIONS, ADMINISTRATIVE AGENCIES, SUBSURFACE RUNOFF, WATER WELLS, CATTLE, FARMS, LEASES.

ABSTRACT:

PLAINTIFF CATTLE RANCHER SUED DEFENDANT OIL AND GAS LESSEE FOR ACTUAL AND PUNITIVE DAMAGES FOR SALINE POLLUTION OF PLAINTIFF'S WATER SUPPLY. DEFENDANT INSTALLED AN INJECTION WELL FOR DISPOSAL OF SALT WATER FROM ITS DRILLING OPERATION ON ITS LEASEHOLD ADJACENT TO PLAINTIFF'S TRACT. DEFENDANT OBTAINED A PERMIT FOR THE WELL FROM A STATE COMMISSION, ALTHOUGH THE DATA SUBMITTED FOR THE PERMIT WAS INACCURATE. A BRADEN HEAD WAS INSTALLED ON THE WELL TO PREVENT SALT WATER FROM PIPE LEAKS FROM RISING TO THE SURFACE. THE SALINE WATER INTRUDED INTO PLAINTIFF'S WATER SUPPLY AND INJURED HIS FARMING OPERATIONS AND HIS CATTLE. AT TRIAL, PLAINTIFF WAS AWARDED \$12,651 ACTUAL DAMAGES AND \$18,000 PUNITIVE DAMAGES. THE KANSAS SUPREME COURT UPHELD THE AWARD FOR ACTUAL DAMAGES, AND DETERMINED THAT PLAINTIFF'S ACTION WAS NOT BARRED BY THE STATUTE OF LIMITATIONS. THE COURT OBSERVED THAT PUNITIVE DAMAGES ARE ALLOWABLE WHEN A DEFENDANT'S CONDUCT SHOWED A RECKLESS INDIFFERENCE AND DISREGARD OF THE RIGHTS OF OTHERS. DEFENDANT'S VIOLATION OF LAW RELATING TO ESCAPE OF SALT WATER WAS NOT FOUND SUFFICIENT TO SUBJECT HIM TO PUNITIVE DAMAGES. NO OTHER ACTIONS WERE PROVEN TENDING TO SHOW A RECKLESS DISREGARD OF PLAINTIFF'S RIGHTS, AND THE COURT REVERSED THE AWARD OF PUNITIVE DAMAGES. (HART-FLORIDA)

FIELD 06E, 05G

ACCESSION NO. W71-13816

SUBSURFACE WASTE DISPOSAL BY MEANS OF WELLS--A SELECTIVE ANNOTATED BIBLIOGRAPHY,
GEOLOGICAL SURVEY, WASHINGTON, D.C.

D. R. RIMA, E. B. CHASE, AND B. M. MYERS.

AVAILABLE FROM THE SUP DOC GPO WASH, D.C. 20402-\$1.50. GEOLOGICAL SURVEY
WATER-SUPPLY PAPER 2020, 1971. 305 P, 692 REF.

DESCRIPTORS:

*INJECTION WELLS, *INJECTION, WASTE WATER DISPOSAL, *INDUSTRIAL WASTES,
*BRINE DISPOSAL, *RADIOACTIVE WASTE DISPOSAL, *BIBLIOGRAPHIES, WASTE
DISPOSAL, WASTES, UNITED STATES, FOREIGN COUNTRIES, GROUNDWATER
MOVEMENT, HYDRODYNAMICS, HYDROGEOLOGY, DOCUMENTATION, GEOCHEMISTRY,
ROCK PROPERTIES, FLUID MECHANICS.

IDENTIFIERS:

*WASTE MIGRATION, *SUBSURFACE WASTE STORAGE, *FLUID WASTE,
*ENVIRONMENTAL EFFECTS.

ABSTRACT:

THIS BIBLIOGRAPHY OF 692 SELECTIVE REFERENCES ON WASTE DISPOSAL THROUGH
WELLS IS INTENDED AS A SOURCE DOCUMENT FOR BOTH SCIENTIFIC AND
WASTE-MANAGEMENT NEEDS. IT WAS STIMULATED BY THE INCREASING NUMBER OF
INJECTION WELLS BEING USED BY INDUSTRY SINCE CONGRESS PASSED THE
CLEANSTREAMS ACT OF 1966, WHICH RESTRICTS DISCHARGE OF WASTE INTO
SURFACE WATERS; AND BY THE NEED FOR PERTINENT INFORMATION ON THE
ENVIRONMENTAL EFFECT OF WASTE INJECTION, PARTICULARLY THE EXOTIC AND
COMPLEX COMPONENTS OF SOME INDUSTRIAL WASTES. THE BIBLIOGRAPHY BRINGS
TOGETHER ABSTRACTS WITH CITATIONS THAT PERTAIN TO (1) THE INJECTION
TECHNOLOGY OF THE OIL INDUSTRY IN COLLECTING, HANDLING, TREATING, AND
INJECTING WASTE WATERS INTO THE SUBSURFACE; (2) RESEARCH STUDIES ON THE
DISPOSAL OF RADIOACTIVE WASTES THAT EMPHASIZE THE INTERACTION OF
RADIOACTIVE MATERIALS WITH THE NATURAL ENVIRONMENT, AND THUS HAVE
DIRECT APPLICATION TO THE PROBLEMS OF PREDICTING AND MONITORING THE
POST-INJECTION MOVEMENT OF WASTE WATERS; AND (3) CASE HISTORIES OF
VARIOUS INDUSTRIES THAT ARE USING INJECTION WELLS. THE BIBLIOGRAPHY IS
ARRANGED ALPHABETICALLY BY AUTHOR AND HAS SEPARATE GEOGRAPHIC (UNITED
STATES AND FOREIGN) AND SUBJECT INDEXES. (LANG-USGS)

FIELD 05E, 02F, 04B, 10

ACCESSION NO. W71-13909

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| ED SLUDGE, COAGULANTS, INJECTION | WELLS, OBSERVATION WELLS, COSTS, | W71-01970 |
| WASTE WATER DISPOSAL, INJECTION | WELLS, OIL INDUSTRY, ADMINISTRATI | W71-10441 |
| SALINE WATER BARRIER | WELLS, ORANGE COUNTY(CALIF).: | W70-05880 |
| TES, CLAYS, TURBIDITY, INJECTION | WELLS, PERMEABILITY, FILTRATION, | W70-04609 |
| GROUNDWATER MOVEMENT, *INJECTION | WELLS, POROUS MEDIA, WASTE DISPOS | W69-04928 |
| DISPOSAL | WELLS, PUBLIC RELATIONS.: | W69-04228 |
| TIVE WASTE DISPOSAL, OBSERVATION | WELLS, PUMPING, SAFETY, WATER QUA | W69-02692 |
| OSAL, UNITED STATES, OBSERVATION | WELLS, PUMPING, SAFETY, WATER QUA | W69-02688 |
| VE WASTE STORAGE TANKS, DISPOSAL | WELLS, RADIOACTIVE WASTE DECAY.: / | W69-04229 |
| WATERS, WELL PERMITS, INJECTION | WELLS, RECHARGE WELLS, ROTARY DRI | W71-10440 |
| CTIVE WASTE DISPOSAL, *INJECTION | WELLS, RESEARCH AND DEVELOPMENT, | W69-03061 |
| RMITS, INJECTION WELLS, RECHARGE | WELLS, ROTARY DRILLING, CONSERVAT | W71-10440 |
| , UNDERGROUND STORAGE, INJECTION | WELLS, SAFETY, WASTE DILUTION, NU | W69-09717 |
| CES, SEEPAGE, WELLS, MINING, OIL | WELLS, SALINITY, LEGISLATION, TAX | W71-09040 |
| *WASTE WATER DISPOSAL, INJECTION | WELLS, SCREENS, WELLS.: /TERING, | W71-10423 |
| *ALABAMA, WATER POLLUTION, DEEP | WELLS, SEDIMENTARY ROCKS, GROUNDW | W71-03766 |
| EATMENT, LAGOONS, NE/ *INJECTION | WELLS, SLUDGE DISPOSAL, SLUDGE TR | W71-07476 |
| LINATION, WATER REUSE, INJECTION | WELLS, SOIL DISPOSAL FIELDS, RADI | W70-07380 |
| , ADSORPTION, BURNING, INJECTION | WELLS, STORAGE, DISPERSION, WASTE | W69-04229 |
| , POLLUTION ABATEMENT, INJECTION | WELLS, SUBSURFACE WATER: / WASTES | W71-10143 |
| , *INDUSTRIAL WASTES, *INJECTION | WELLS, SURVEYS, AQUIFERS, HYDROGE | W70-05181 |
| KAN), INDUSTRIAL WASTE INJECTION | WELLS, SYNCLINES, SALT BEDS.: /N(| W69-04946 |
| ASIN, INDUSTRIAL WASTE INJECTION | WELLS, SYNCLINES, SALT BEDS.: / B | W69-04945 |
| ASIN, INDUSTRIAL WASTE INJECTION | WELLS, SYNCLINES.: *SAN JUAN B | W69-04948 |
| D-FILL, SEDIMENTATION, INJECTION | WELLS, TEMPERATURE, OILY WASTES, | W71-13412 |
| OIL WELLS, WASTE WATER DISPOSAL, | WELLS, UNDERGROUND STORAGE, INJEC | W71-11361 |
| R POLLUTION SOURCES, BRINES, OIL | WELLS, WASTE WATER DISPOSAL, WELL | W71-11361 |
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| , *PATH OF POLLUTANTS, INJECTION | WELLS, WASTE DISPOSAL, SUBSURFACE | W69-03212 |
| E WATER, *DEEP WELLS, *INJECTION | WELLS, WASTE DISPOSAL, SUBSURFACE | W69-06286 |
| OLORADO, *NEW MEXICO, *INJECTION | WELLS, WASTE DISPOSAL, GROUNDWATE | W69-04948 |
| E WATER, *DEEP WELLS, *INJECTION | WELLS, WASTE DISPOSAL, SUBSURFACE | W70-01480 |
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| TES, INJECTION, INJECTION WELLS, | WELLS, WASTE WATER.: /USTRIAL WAS | W70-06077 |
| ING(UNDERGROUND), WASTE DISPOSAL | WELLS, WASTE INJECTION WELLS.: /R | W71-00882 |
| , *DEEP-WELLS, *INJECTION WELLS, | WELLS, WASTE WATER TREATMENT, WAS | W71-00136 |
| WASTE WATER DISPOSAL, INJECTION | WELLS, WATER TREATMENT, ION EXCHA | W71-03877 |
| Y, LEGISLATION, INJECTION, WATER | WELLS, WATER RIGHTS, REVIEWS, PUB | W70-09549 |
| REGULATION, AQUIFERS, INJECTION | WELLS, WATER POLLUTION SOURCES.: / | W71-08542 |
| *WASTE DISPOSAL | WELLS, WELL DRILLING PROBLEMS.: | W71-07195 |
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| C FR/ INDUSTRIAL WASTE INJECTION | WELLS, WELL STIMULATION, HYDRAULI | W69-04928 |
| *WATER POLLUTION CONTROL, WATER | WELLS, WELL CASINGS, CORROSION, * | W68-00659 |
| E, *CALIFORNIA, LAND SUBSIDENCE, | WITHDRAWAL, COSTS, WATER POLLUTIO | W70-00447 |
| LLS, *WASTE DISPOSAL, *COLORADO, | WYOMING, GROUNDWATER BASINS, GEOL | W69-04947 |
| SAL WELLS.: GAS DIFFUSION, | XENON RADIOISOTOPES, *WASTE DISPO | W71-04977 |
| RRIER, BACKWASH, NASSAU COUNTY(N. | Y.).: *NEW YORK, *HYDRAULIC BA | W71-01970 |
| RECLAIMED WATER, AQUIFERS, WATER | YIELD, PERMEABILITY, RECHARGE, AR | W70-03249 |
| S, OBSERVATION WELLS, COSTS, NEW | YORK.: /OAGULANTS, INJECTION WELL | W71-01970 |
| LONG ISLAND(NEW | YORK).: | W69-03716 |
| H, NASSAU COUNTY(N.Y.).: *NEW | YORK, *HYDRAULIC BARRIER, BACKWAS | W71-01970 |
| CHARGE WELLS, *WATER REUSE, *NEW | YORK, *SALINE WATER INTRUSION, ON | W70-04355 |
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| ARTESIAN WELL/ *WATER REUSE, NEW | YORK, RECHARGE, INJECTION WELLS, | W69-03716 |
| REUSE, ARTIFICIAL RECHARGE, NEW | YORK, WATER QUALITY, TERTIARY TRE | W71-00579 |
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