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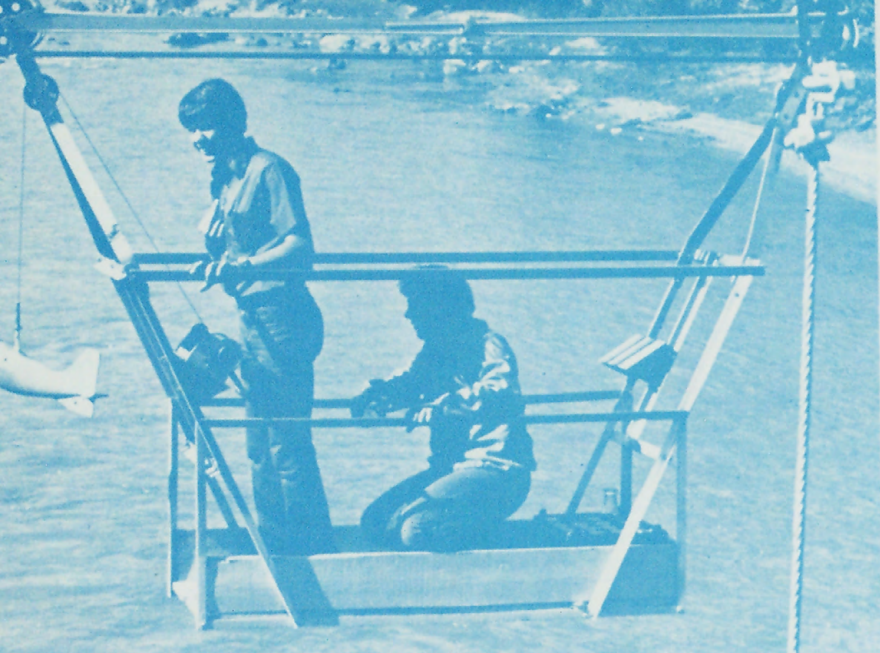
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October 1981 through September 1982

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY





UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

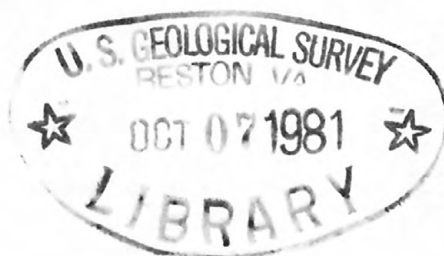
TRAINING BULLETIN

OCTOBER 1981 THROUGH SEPTEMBER 1982

Compiled By J. P. Monis and L. A. Foxhoven

Open-File Report 81-1017

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(United States
Geological Survey)

Lakewood, Colorado

1981

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UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

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WATER RESOURCES DIVISION
TRAINING BULLETIN
OCTOBER 1981 THROUGH SEPTEMBER 1982

Compiled by J. P. Monis and L. A. Foxhoven

INTRODUCTION

Purpose and Scope

This bulletin is designed to inform interested personnel about training available through the Water Resources Division of the U.S. Geological Survey during the period October 1981 through September 1982. The information in this bulletin also can assist supervisors and training officers in developing a coordinated, efficient training program for the personnel for whom they are responsible.

The objective of the Water Resources Division training program is to provide specialized training in many phases of hydrology and other subjects related to water-resources investigations. The courses featured in this bulletin are on specialized subjects that are not generally available elsewhere, including the latest developments in applications of ground-water, surface-water, and water-quality hydrologic methods in the field and in the laboratory. The training described herein provides: (1) rapid application of new research results to increase the skills of personnel, and (2) provides newly recruited personnel with special training skills and methods required in water-resources investigations. These courses will assist personnel in learning, reviewing, and expanding their knowledge of technical operations involved in various phases of hydrology and related subjects, and also will develop an overall insight into the broad field of water-resources work.

Training Facilities

Most of the training is presented at the U.S. Geological Survey National Training Center at Lakewood, Colo. (fig. 1). The Training Center is located in Building 53 (fig. 2) at the Denver Federal Center, which is near the intersection of U.S. Highway 6 (Sixth Avenue) and Kipling Street, approximately 8 miles west of downtown Denver. Laboratory and lecture facilities at the National Training Center are air-conditioned, comfortably and pleasingly furnished, and well-equipped. Readily available is a wide variety of audio-visual aids, including closed-circuit and videotape television, as well as specialized instruments, equipment, and supplies needed for laboratory lecture room, and field studies. The National Training Center is adjacent to the computer terminal facilities of the Computer Center Division.

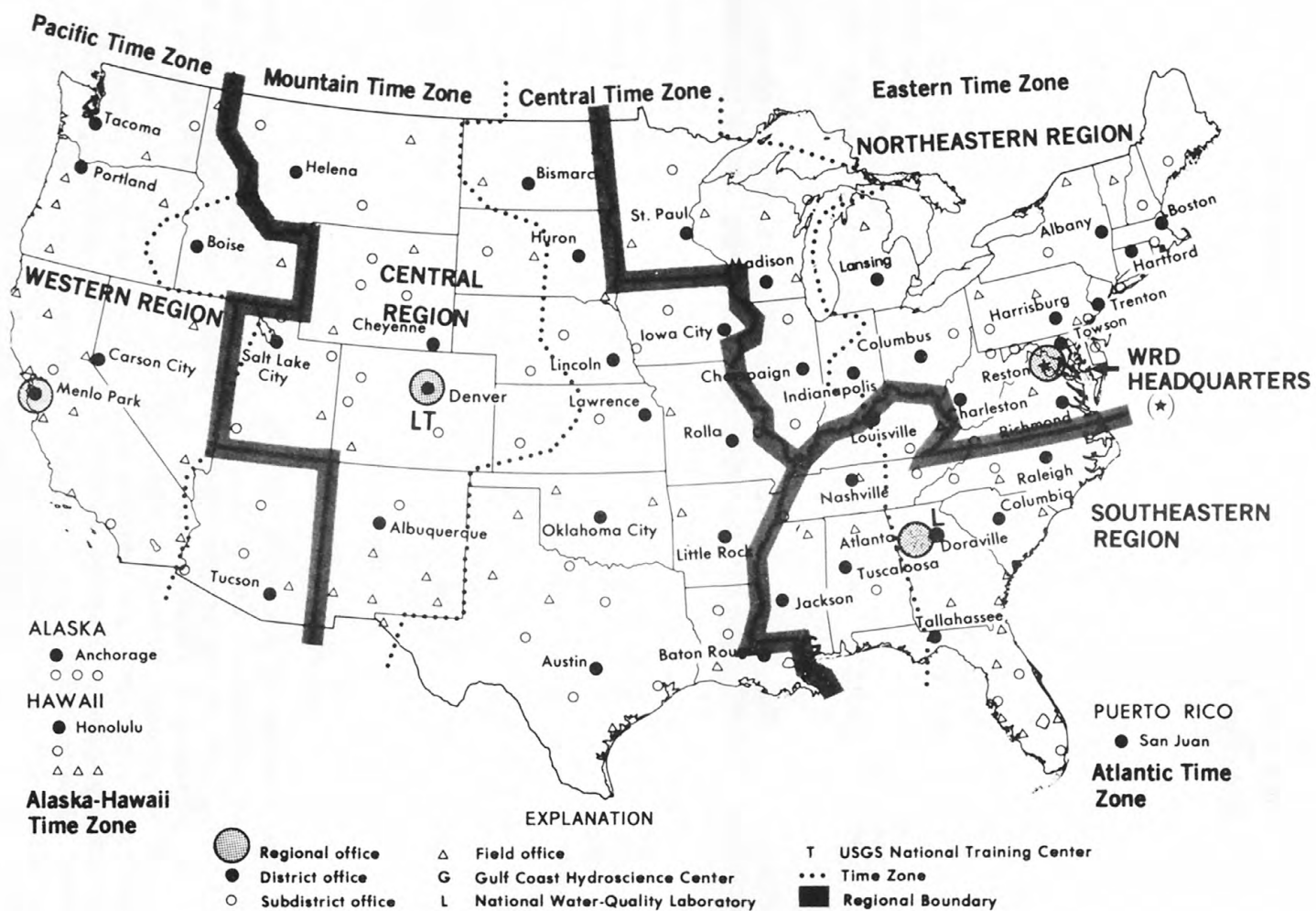


Figure 1.--Location of training facilities and Water Resources Division office locations.



Figure 2.--Location of the U.S. Geological Survey National Training Center, Building 53, Denver Federal Center.

The area around Denver provides the National Training Center with field conditions representative of both plains and mountain environment. Thus, a wide variety of geologic and hydrologic characteristics is available for field trips and field problems.

Some of the training in fluvial-sediment analysis is given at the Water Resources Division's sediment laboratories at Sacramento, Calif., and Harrisburg, Pa. Other specialized training is occasionally conducted at other locations.

Training Staff

Water Resources Division scientists and engineers, who are nationally and often internationally recognized authorities, serve as the main training staff for the training sessions. Experts from other divisions of the Geological Survey, other government agencies, universities, and industries, also serve as lecturers and special consultants.

EXPLANATION OF TRAINING COURSES

The training courses are structured to include lectures, workshop problems, and field trips. The schedule of the courses is presented in table 1 and the alphabetical listing of courses is presented in table 2. Some courses are presented more than one time during the fiscal year and the multiple presentation dates are shown in table 2. A detail description of the courses is given in tables 3 and 4.

Some of the training is designed only for professional personnel, and some for technicians, and administrative personnel. In addition, some training sessions are designed primarily for international participants and some for both international and national personnel. Special capabilities and experience may be required of personnel attending some of the more advanced or highly specialized training sessions. All requirements for admission are given with the descriptions of the courses in table 3.

Most of the courses described in this bulletin are short-term of 3-to 5-days duration but some courses are 2 weeks or more in duration. The schedule for training courses offered during the period October 1, 1981, through September 30, 1982, are presented in the training calendar (table 1) and described in table 3.

ADMISSION TO TRAINING SESSIONS

Water Resources Division Personnel

Nominations for attendance at training courses will be made by the District or Project Chief to the appropriate Regional Hydrologist. Each Regional

Hydrologist then notifies the Chief, U.S. Geological Survey National Training Center of approved nominations for each training course. Admission of personnel from Reston Headquarters is accomplished by having the employee's supervisor nominate the employee as a candidate to the course to the Chief, Manpower Section. For some specialized training, nominations will be made by the Regional Hydrologist to the Chief, Manpower Section.

Applicants will be notified when admission has been approved. Information on housing, local transportation, exact location and time of the training courses, and other pertinent information will be sent to accepted applicants in advance of their arrival at the Training Center.

Other Federal and State Agency Personnel

Admission of personnel from other Federal and State agencies is by application to the nearest Water Resources Division office. That office in turn will obtain approval from the Chief, Manpower Section, Water Resources Division, Reston, Va., through the appropriate Regional Hydrologist.

Early application for admission is advised since course attendance is always limited. All costs must be paid by the attendee's sponsoring office, for example, housing, transportation, and subsistence; none of these costs will be borne by the training facility. There will be no tuition cost; however, in a few cases, a fee will be charged to cover extraordinary costs, such as computer time.

Applicants will be notified when admission has been approved. Information on housing, local transportation, exact location and time of the training courses, and other pertinent information will be sent to accepted applicants in advance of their arrival at the Training Center.

International Participants

Admission of international participants to training courses is by application to the Director, U.S. Geological Survey (Attention: Chief, Office of International Hydrology, Water Resources Division, Mail Stop 470) Reston, VA 22092. Applications usually are transmitted through AID, UN, UNESCO, FAO, and others. International participants will be charged instructional costs.

REGISTRATION AND FEE INFORMATION FOR WATER RESOURCES DIVISION PERSONNEL

Travel Equalization Charge

There is a Travel Equalization Charge for Water Resources Division employees attending the Training Center. The charge has been established for each training course presented at the Training Center, based upon a per-diem rate of \$50 per day times the length of the course including two travel days

plus \$400 travel costs. As an example, the charge for a 5-day training course would be \$750 per student. The charge includes travel and per-diem costs only and does not include any other charges which may be incurred. If an attendee rents an automobile, it should be charged to the individual's District or project account. The Travel Equalization Charge applies only to Water Resources Division employees attending training as students; accounting procedures for instructors are annually set forth in Water Resources Division training memorandums.

Billing Procedures

Each student will provide the National Training Center with copy 3 of the completed OF-170 or SF-182 Request, Authorization, Agreement and Certification of Training prior to or on the first day of class. The student's office account number must be typed on the OF-170 or SF-182 in the space marked "Agency Use Only." The Training Center staff will prepare a composite journal voucher to charge the account of each student an amount equal to the published Travel Equalization Charge. A copy of this journal voucher will be forwarded to the offices billed. Upon completion of the training session, a travel voucher will be prepared by the student's office covering actual transportation costs and per-diem for the session. These costs should be charged to account number 2-4060-98400. When the original copy of the travel voucher is submitted to the Branch of Financial Management, Mail Stop 270, Reston, VA 22092, a copy must be sent to the Chief, Manpower Section (Code 4151-3112), Mail Stop 406, Reston, VA 22092.

Preparation of Optional Form OF-170 or Standard Form SF-182 (5 Part)

When a district or project office is notified by the Training Center that an employee(s) has been selected for training, the office will prepare, in advance of the course, an OF-170 or SF-182 Request, Authorization, Agreement and Certification of Training (5-part form) for each attendee from that office. In completing item 16, considerable thought should be given to the preparation of a statement describing Benefits to be derived by the Government. "Career development" and "to improve present job performance" are not acceptable objectives for Government-sponsored training. All training must be related to the employee's present position or a recognized career ladder position, and must describe clearly the benefit to Government operations not the benefit to the employee. Career development objectives must meet these basic criteria before training can be authorized. Course Hours, item 19, should reflect actual classroom hours of instruction. To properly complete item 22, Indirect Costs, only an estimated travel and per-diem charge should be included. The Travel Equalization Charge should not be shown. The Appropriation Fund to be charged is 2-4000-98400. Completed forms should be sent to the appropriate Water Resources Division Regional or Headquarters Office for final approval. The approving office will make the following distribution: copy 1 and 2 to the servicing personnel office; copy 3 for the National Training Center; and copy 5 to the originator for employee or office files. The servicing personnel offices and the Training Center no longer require copy 4 of the OF-170 or SF-182 on Water Resources Division training courses. See Course Evaluation.

Course Evaluation

Students are required to prepare a narrative critique of each course attended. Instructions for preparation of the critique will be given during the course. The critique will be prepared within 10 days after completion of the course. The critique will be directed to the Chief, National Training Center, U.S. Geological Survey, Water Resources Division, Mail Stop 414, Lakewood, CO 80225. The Training Center will distribute copies as required approximately 60 days following completion of the course.

Courses Listed by Discipline

The discipline courses are listed by categories to help training officers of students plan a program of courses that will achieve a level of skill in special areas of hydrology. A student may elect to bypass any courses or area of training in which he has already had similar training or has demonstrated proficiency.

The code numbers used in the bulletin are the same as used in the Division's Career Development Forms. This was done in order to avoid using two numbering systems and to enable a person to cross-reference the Training Bulletin with their Career Development Forms.

Ground Water

Courses that relate to ground water are listed below. The courses offered range from introduction to basic concepts and field techniques in ground-water hydrology to advanced courses in digital-model simulation of flow and solute transport in aquifer systems. Courses that relate to ground water are listed below.

I. Ground-Water ADP

System 2000 Natural Language (Version 2.9) Retrieval Commands (G0941)
Processing and Input Procedures for WATSTORE Daily Values and Associated Files (G0274)
Retrieval Procedures for WATSTORE Daily Values and Associated Files (G0294)
Seminar for NAWDEX Assistance Centers (G0054)
Water-Quality ADP (G0862)
WATSTORE (G0944)
Seminar on NAWDEX Data Systems (G0044)
Ground-Water Site-Inventory Workshop (G0921)
System 2000 Advanced Retrieval Techniques (G0114)

II. Ground-Water Geophysics

Surface Geophysics in Water-Resources Investigations (G0821)
Geophysical Log Analysis and Formation Evaluation (G0751)
Introduction to Borehole Geophysics (G0791)
Operation and Maintenance of Geophysical Logging Equipment
(G0061)

III. Ground-Water Geochemistry

Geochemistry for Ground-Water Systems (G0212)
Chemistry for Ground-Water Solute-Transport Models (G0702)

IV. Ground-Water Hydrology

Ground-Water Concepts (G0761)
Seminar on Mechanics of Compressible Aquifer Systems and
Land Subsidence (G0901)
Analytical Methods to Determine Aquifer Properties and to
Predict Aquifer Response (G0461)
Unsaturated Flow in Porous Media (G0841)
Ground-Water Flow Systems in Secondary Permeability Terranes
(G0011)

V. Ground-Water Modeling

Modeling of Ground-Water Flow (G0911)
Advanced Modeling of Ground-Water Flow (G0681)
Parameter Estimation Techniques for Ground-Water Models
(G0931)
Modeling Transport of Ground-Water Solutes (G0801)
Advanced Modeling of Ground-Water Transport (G0071)

VI. Multidiscipline

Hydrologic Instrumentation (G0023)
Water-Resources Data for Technicians (G0884)
Network Design for Streamflow Information (G0914)
Project Planning and Management (G0064)
Natural Resource Economic Short Course (G0714)
Finite Difference Numerical Methods in Hydrology (G0041)
Ground Water--Surface Water Relationships (G0154)
The Mechanics of Fluids (G0554)
Report Planning, Policy, and Review for New Authors (G0144)
Report Planning and Management Seminar (G0264)
Satellite Data Collection Platform Installation and Operation
(G0174)
Real-Time Data Management (HYDRECS) (G0124)
Water-Quality Field Techniques (G0042)
Water-Quality Instrumentation (G0872)
Water-Quality Concepts for New Professionals (G0122)
Fundamentals of Lake Limnology (G0052)
Orientation to Water-Quality Activities in WRD (G0942)
Statistical Analysis of Water-Quality Data (G0062)

Surface Water

Courses that relate to surface water are listed below. These courses cover the principal subjects needed to define the occurrence, distribution, and movement of surface water both under natural conditions and as modified by man. Data collection and the analyses of these data, according to hydrologic principles, are emphasized.

I. Data Collection

Surface-Water Techniques for Technicians (G0833)
Processing and Input Procedures for WATSTORE Daily Values
and Associated Files (G0274)
Retrieval Procedures for WATSTORE Daily Values and Associated
Files (G0294)
Water-Resources Data for Technicians (G0884)
Hydrologic Instrumentation (G0023)

II. Open-Channel Hydraulics

Basic Hydraulic Principles (G0043)
Surface-Water Hydraulic Analyses (G0093)
Step-Backwater and Floodway Analysis (G0303)

III. Surface-Water Hydrology

Statistical Approach to Surface-Water Hydrologic Analysis
(G0113)
Introduction to Geomorphic Processes (G0112)
Ground Water--Surface Water Relationships (G0154)
Network Design for Streamflow Information (G0914)

IV. Streamflow Modeling

Theory and Application of Tracers in Hydrologic Studies (G0034)
Watershed Systems Modeling (G0083)
Numerical Analysis for One-Dimensional Streamflow Models
(G0194)
One-Dimensional Surface-Water Transport Models (G0903)
Urban Runoff Analysis (G0133)

V. Multidiscipline

WATSTORE (G0944)
Project Planning and Management (G0064)
Natural Resource Economic Short Course (G0714)
Report Planning, Policy, and Review for New Authors (G0144)
Report Planning and Management Seminar (G0264)

Water Quality

Courses that relate to water quality are listed below. The field of water quality encompasses a wide range of subjects and disciplines. Courses offered range from basic concepts and orientation to advanced modeling and interpretation. Several of the courses include field work as well as lectures, and some courses are conducted in locations other than the Training Center. The "Sediment Data-Collection Techniques (G0912)" course is given in Sacramento and Harrisburg. The "Fundamentals of Lake Limnology (G0052)" course is given at a suitable field location. The "Water-Quality Field Techniques (G0042)" and "Fundamentals of Stream Biology (G0892)" course include considerable time in the field. A course in "Sediment Laboratory Techniques (G0922)" is conducted in the New Mexico District's sediment laboratory, Albuquerque, N. Mex.

I. General Water Quality

Orientation to Water-Quality Activities in WRD (G0942)
Water-Quality Instrumentation (G0872)
Water-Quality Field Techniques (G0042)
Fundamentals of Lake Limnology (G0052)
Advanced Water-Quality Concepts for Technicians (G0022)
Water-Quality Concepts for New Professionals (G0122)
Advanced Seminar on Water Quality (G0012)
Water-Quality ADP (G0862)
Statistical Analysis of Water-Quality Data (G0062)
Water-Quality Application Programs (G0132)
SAS for Water-Resources Data (G0974)

II. Chemical Quality of Water

Organic Substances in Water (G0232)
Chemistry for Ground-Water Solute-Transport Models (G0702)
Geochemistry for Ground-Water Systems (G0212)

III. Aquatic Biology

Fundamentals of Stream Biology (G0892)
Aquatic Biology: Interpretation and Application (G0692)
Biological ADP (G0882)

IV. Sedimentation, Erosion, and Geomorphology

Introduction to Geomorphic Processes (G0112)
Sediment Data-Collection Techniques (G0912)
Sediment Laboratory Techniques (G0922)
Sediment Records Computation and Interpretation (G0962)
Fundamentals of PS-69 Pumping Sampler Operation (G0092)

V. Water-Quality Modeling

Introduction to Surface-Water-Quality Modeling (G0102)
Theory and Application of Tracers in Hydrologic Studies
(G0034)
One-Dimensional Surface-Water Transport Models (G0903)
Chemistry for Ground-Water Solute-Transport Models (G0702)
Modeling Transport of Ground-Water Solutes (G0801)

VI. Multidiscipline

WATSTORE (G0944)
Hydrologic Instrumentation (G0023)
Water-Resources Data for Technicians (G0884)
Network Design for Streamflow Information (G0914)
Project Planning and Management (G0064)
Natural Resource Economic Short Course (G0714)

Data Processing

Courses related to data processing are listed below. The courses offered in data processing include courses related to the input, update, and retrieval of water-quality, daily values, and ground-water data from the WATSTORE system. Processing digital-recorder data for input to the Daily Values Files also is included. The retrieval of data tables for publication for each major file is covered as well.

System 2000 Natural Language (Version 2.9) Retrieval Commands
(G0941)
System 2000 Advanced Retrieval Techniques (G0114)
Ground-Water Site-Inventory Workshop (G0921)
Processing and Input Procedures for WATSTORE Daily Values
and Associated Files (G0274)
Retrieval Procedures for WATSTORE Daily Values and Associated
Files (G0294)
Seminar for NAWDEX Assistance Centers (G0054)
Water-Quality ADP (G0862)
WATSTORE (G0944)
Seminar on NAWDEX Data Systems (G0044)
Statistical Analysis of Water-Quality Data (G0062)
Satellite Data Collection Platform Installation and Operation
(G0174)
Real-Time Data Management (G0124)
Water-Quality Application Programs (G0132)
Biological ADP (G0822)
SAS for Water-Resources Data (G0974)

General and Multidisciplinary

The Water Resources Division offers several courses of a more general or multidisciplinary nature. These courses focus on technical procedures, instrumentation, planning and analysis, information processing and retrieval, and administrative procedures.

- Seminar on Administrative Management (G0664)
- Seminar for WRD Managers (G0674)
- WATSTORE (G0944)
- Hydrologic Instrumentation (G0023)
- Water-Resources Data for Technicians (G0884)
- Processing and Input Procedures for WATSTORE Daily Values and Associated Files (G0274)
- Retrieval Procedures for WATSTORE Daily Values and Associated Files (G0294)
- Network Design for Streamflow Information (G0914)
- Project Planning and Management (G0064)
- Natural Resource Economic Short Course (G0714)
- Editorial Techniques (G0244)
- Reports Planning and Management Seminar (G0264)
- Report Planning, Policy, and Review for New Authors (G0144)
- Water-Use Workshop (G0234)
- National Water-Use Data System (NWUDS) Workshop (G0964)

Table 1.--Training Calendar

Date	Course title	Page
<u>1981</u>		
October 5-9-----	REPORT PLANNING AND MANAGEMENT SEMINAR-----	23
October 5-9-----	SATELLITE DATA COLLECTION PLATFORM INSTALLATION AND OPERATION-----	23
October 5-9-----	THEORY AND APPLICATION OF TRACERS IN HYDROLOGIC STUDIES-----	24
October 5-9-----	SEDIMENT LABORATORY TECHNIQUES (ALBUQUERQUE)-----	24
October 14-16-----	FUNDAMENTALS OF PS-69 PUMPING SAMPLER OPERATION-----	25
October 19-22-----	WATER-USE WORKSHOP-----	25
October 19-23-----	SEDIMENT DATA-COLLECTION TECHNIQUES (SACRAMENTO)-----	25
October 20-23-----	WATER-USE WORKSHOP-----	25
October 26-30-----	BASIC HYDRAULIC PRINCIPLES-----	26
October 26-30-----	SEMINAR FOR WRD MANAGERS-----	26
October 26-30-----	STATISTICAL ANALYSIS FOR WATER-QUALITY DATA-----	27
November 2-6-----	NETWORK DESIGN FOR STREAMFLOW INFORMATION-----	27
November 2-6-----	SEDIMENT DATA-COLLECTION TECHNIQUES-----	28
November 16-20-----	WATER-RESOURCES DATA FOR TECHNICIANS-----	28
November 16-20-----	GROUND WATER--SURFACE WATER RELATIONSHIPS-----	29
November 30-December 4	ORIENTATION TO WATER-QUALITY ACTIVITIES IN WRD-----	29
November 30-December 4	ADVANCED SEMINAR ON WATER QUALITY-----	29
November 30-December 4	EDITORIAL TECHNIQUES-----	30
December 7-11-----	SYSTEM 2000 NATURAL LANGUAGE (VERSION 2.9) RETRIEVAL COMMANDS-----	31
December 7-11-----	SEMINAR ON ADMINISTRATIVE MANAGEMENT-----	31
December 7-11-----	WATER-QUALITY ADP-----	32
December 14-18-----	WATER-QUALITY APPLICATIONS PROGRAMS-----	32

Table 1.--Training Calendar--Continued

Date	Course title	Page
<u>1982</u>		
January 11-15-----	SYSTEM 2000 ADVANCED RETRIEVAL TECHNIQUES-----	33
January 11-15-----	SURFACE-WATER TECHNIQUES FOR TECHNICIANS-----	33
January 12-15-----	WATER-QUALITY INSTRUMENTATION-----	34
January 18-22-----	WATER-QUALITY CONCEPTS FOR NEW PROFESSIONALS-----	35
January 18-22-----	INTRODUCTION TO BOREHOLE GEOPHYSICS-----	35
January 18-29-----	PARAMETER ESTIMATION TECHNIQUES FOR GROUND-WATER MODELS-----	36
January 25-27-----	OPERATION AND MAINTENANCE OF GEOPHYSICAL LOGGING EQUIPMENT-----	36
January 25-29-----	ORGANIC SUBSTANCES IN WATER-----	37
January 25-29-----	GEOPHYSICAL LOG ANALYSIS AND FORMATION EVALUATION-----	37
February 1-4-----	ADVANCED MODELING OF GROUND-WATER TRANSPORT-----	38
February 1-5-----	PROCESSING AND INPUT PROCEDURES FOR WATSTORE DAILY VALUES AND ASSOCIATED FILES-----	39
February 1-5-----	SURFACE GEOPHYSICS IN WATER-RESOURCES INVESTIGATIONS-----	39
February 8-12-----	RETRIEVAL PROCEDURES FOR WATSTORE DAILY VALUES AND ASSOCIATED FILES---	39
February 9-12-----	SEMINAR ON NAWDEX DATA SYSTEMS-----	40
February 22-26-----	SEDIMENT RECORDS COMPUTATION AND INTERPRETATION-----	41
February 22-26-----	INTRODUCTION TO GEOMORPHIC PROCESSES-----	41
February 22-March 5---	CHEMISTRY FOR GROUND-WATER SOLUTE TRANSPORT MODELS-----	42
March 1-5-----	ANALYTICAL METHODS TO DETERMINE AQUIFER PROPERTIES-----	42

Table 1.--Training Calendar--Continued

Date	Course title	Page
<u>1982</u> --Continued		
March 1-12-----	MODELING OF GROUND-WATER FLOW-----	43
March 8-12-----	REPORT PLANNING, POLICY, AND REVIEW FOR NEW AUTHORS-----	44
March 8-12-----	BIOLOGICAL ADP-----	44
March 15-19-----	HYDROLOGIC INSTRUMENTATION-----	45
March 15-19-----	GROUND-WATER SITE-INVENTORY WORKSHOP-----	45
March 22-26-----	URBAN RUNOFF ANALYSIS-----	45
March 22-26-----	AQUATIC BIOLOGY: INTERPRETATION AND APPLICATION-----	46
March 22-26-----	HYDROLOGIC INSTRUMENTATION-----	46
March 29-April 2-----	WATER-RESOURCES DATA FOR TECHNICIANS-----	28
March 30-April 2-----	SEMINAR FOR NAWDEX ASSISTANCE CENTERS-----	40
March 30-April 8-----	ADVANCED MODELING OF GROUND-WATER FLOW-----	47
April 5-16-----	UNSATURATED FLOW IN POROUS MEDIA-----	47
April 6-8-----	NATIONAL WATER USE DATA SYSTEM (NWUDS) WORKSHOP-----	48
April 12-16-----	STATISTICAL ANALYSIS OF WATER-QUALITY DATA-----	27
April 19-23-----	GROUND WATER--SURFACE WATER RELATIONSHIPS-----	29
April 19-23-----	REAL-TIME DATA MANAGEMENT-----	49
April 20-22-----	WATSTORE-----	50
April 26-30-----	STEP-BACKWATER AND FLOODWAY ANALYSIS-----	50
April 26-May 7-----	NUMERICAL ANALYSIS FOR ONE-DIMENSIONAL STREAMFLOW MODEL-----	50
May 3-7-----	WATER-RESOURCES DATA FOR TECHNICIANS-----	28
May 3-14-----	GROUND-WATER CONCEPTS-----	51

Table 1.--Training Calendar--Continued

Date	Course title	Page
<u>1982</u> --Continued		
May 10-21-----	PARAMETER ESTIMATION TECHNIQUES FOR GROUND-WATER MODELS-----	36
May 10-14-----	SEDIMENT DATA-COLLECTION TECHNIQUES (HARRISBURG)-----	52
May 17-28-----	ONE-DIMENSIONAL SURFACE-WATER TRANSPORT MODELS-----	52
May 25-27-----	PROJECT PLANNING AND MANAGEMENT-----	53
June 7-11-----	WATER-QUALITY ADP-----	32
June 7-11-----	SURFACE-WATER TECHNIQUES FOR TECHNICIANS-----	33
June 7-11-----	EDITORIAL TECHNIQUES-----	30
June 14-18-----	WATER-QUALITY APPLICATION PROGRAMS-----	32
June 14-18-----	WATER-QUALITY FIELD TECHNIQUES-----	53
June 14-18-----	ANALYTICAL METHODS TO DETERMINE AQUIFER PROPERTIES-----	42
June 21-25-----	WATER-QUALITY FIELD TECHNIQUES-----	53
June 21-25-----	GEOCHEMISTRY FOR GROUND-WATER SYSTEMS-----	53
June 21-25-----	BASIC HYDRAULIC PRINCIPLES-----	26
June 28-July 2-----	SAS FOR WATER-RESOURCES DATA-----	54
July 12-16-----	ADVANCED WATER-QUALITY CONCEPTS FOR TECHNICIANS-----	54
July 12-16-----	FUNDAMENTALS OF STREAM BIOLOGY-----	55
July 12-23-----	GROUND-WATER CONCEPTS-----	51
July 19-23-----	ADVANCED WATER-QUALITY CONCEPTS FOR TECHNICIANS-----	54
July 19-23-----	GROUND-WATER FLOW SYSTEMS IN SECONDARY PERMEABILITY TERRANES-----	55
July 26-28-----	SEMINAR ON MECHANICS OF COMPRESSIBLE AQUIFER SYSTEMS AND LAND SUBSIDENCE-----	56

Table 1.--Training Calendar--Continued

Date	Course title	Page
<u>1982</u> --Continued		
July 26-August 6-----	MODELING OF GROUND-WATER FLOW-----	43
July 27-30-----	WATER-QUALITY INSTRUMENTATION-----	34
August 2-6-----	NATURAL RESOURCE ECONOMIC SHORT COURSE-----	56
August 3-5-----	PROJECT PLANNING AND MANAGEMENT-----	53
August 9-13-----	WATER-RESOURCES DATA FOR TECHNICIANS-----	28
August 9-20-----	WATERSHED SYSTEMS MODELING-----	57
August 9-20-----	INTRODUCTION TO SURFACE-WATER QUALITY MODELING-----	58
August 16-20-----	WATER-QUALITY FIELD TECHNIQUES-----	53
August 23-27-----	WATER-QUALITY FIELD TECHNIQUES-----	53
August 23-September 3-	STATISTICAL APPROACH TO SURFACE-WATER HYDROLOGIC ANALYSIS-----	58
August 23-September 3-	MODELING TRANSPORT OF GROUND-WATER SOLUTES-----	59
September 13-17-----	SEDIMENT RECORDS COMPUTATION AND INTERPRETATION-----	41
September 13-24-----	SURFACE-WATER HYDRAULIC ANALYSIS-----	60
September 13-24-----	FUNDAMENTALS OF LAKE LIMNOLOGY (SITE TO BE ANNOUNCED)-----	60
September 14-23-----	ADVANCED MODELING OF GROUND-WATER FLOW-----	47

Table 2.--Alphabetical listing of courses

Title	Date	Page
ADVANCED MODELING OF GROUND-WATER FLOW (G0681)-----	March 30-April 8, 1982---- September 14-23, 1982	47
ADVANCED MODELING OF GROUND-WATER TRANSPORT (G0071)-----	February 1-4, 1982-----	38
ADVANCED SEMINAR ON WATER QUALITY (G0012)-----	November 30- December 4, 1981-----	29
ADVANCED WATER-QUALITY CONCEPTS FOR TECHNICIANS (G0022)-----	July 12-16, 1982----- July 19-23, 1982	54
ANALYTICAL METHODS TO DETERMINE AQUIFER PROPERTIES (G0461)-----	March 1-5, 1982----- June 14-18, 1982	42
AQUATIC BIOLOGY: INTERPRETATION AND APPLICATION (G0692)-----	March 22-26, 1982-----	46
BASIC HYDRAULIC PRINCIPLES (G0043)-----	October 26-30, 1981----- June 21-25, 1982	26
BIOLOGICAL ADP (G0882)-----	March 8-12, 1982-----	44
CHEMISTRY FOR GROUND-WATER SOLUTE TRANSPORT MODELS (G0702)-----	February 22-March 5, 1982-	42
EDITORIAL TECHNIQUES (G0244)-----	November 30- December 4, 1981----- June 7-11, 1982	30
FUNDAMENTALS OF LAKE LIMNOLOGY (Site to be announced) (G0052)-----	September 13-24, 1982-----	60
FUNDAMENTALS OF PS-69 PUMPING SAMPLER OPERATION (G0092)-----	October 14-16, 1981-----	25
FUNDAMENTALS OF STREAM BIOLOGY (G0892)-----	July 12-16, 1982-----	55
GEOCHEMISTRY FOR GROUND-WATER SYSTEMS (G0212)-----	June 21-25, 1982-----	53
GEOPHYSICAL LOG ANALYSIS AND FORMATION EVALUATION (G0751)-----	January 25-29, 1982-----	37

Table 2.--Alphabetical listing of courses--Continued

Title	Date	Page
GROUND-WATER CONCEPTS (G0761)-----	May 3-14, 1982----- July 12-23, 1982	51
GROUND-WATER FLOW SYSTEMS IN SECONDARY PERMEABILITY TERRANES (G0011)--	July 19-23, 1982-----	55
GROUND-WATER SITE-INVENTORY WORKSHOP (G0921)-----	March 15-19, 1982-----	45
GROUND WATER--SURFACE WATER RELATIONSHIPS (G0154)-----	November 16-20, 1981----- April 19-23, 1982	29
HYDROLOGIC INSTRUMENTATION (G0023)-----	March 15-19, 1982----- March 22-26, 1982	45
INTRODUCTION TO BOREHOLE GEOPHYSICS (G0791)-----	January 18-22, 1982-----	35
INTRODUCTION TO GEOMORPHIC PROCESSES (G0112)-----	February 22-26, 1982-----	41
INTRODUCTION TO SURFACE-WATER-QUALITY MODELING (G0102)-----	August 9-20, 1982-----	58
MODELING OF GROUND-WATER FLOW (G0911)-----	March 1-12, 1982----- July 26-August 6, 1982	43
MODELING TRANSPORT OF GROUND-WATER SOLUTES (G0801)-----	August 23- September 3, 1982-----	59
NATIONAL WATER USE DATA SYSTEM (NWUDS) WORKSHOP (G0964)-----	April 6-8, 1982-----	48
NATURAL RESOURCE ECONOMIC SHORT COURSES (G0714)-----	August 2-6, 1982-----	56
NETWORK DESIGN FOR STREAMFLOW INFORMATION (G0914)-----	November 2-6, 1981-----	27
NUMERICAL ANALYSIS FOR ONE-DIMENSIONAL STREAMFLOW MODELS (G0194)-----	April 26-May 7, 1982-----	50
ONE-DIMENSIONAL SURFACE-WATER TRANSPORT MODELS (G0903)-----	May 17-28, 1982-----	52
OPERATION AND MAINTENANCE OF GEOPHYSICAL LOGGING EQUIPMENT (G0061)----	January 25-27, 1982-----	36

Table 2.--Alphabetical listing of courses--Continued

Title	Date	Page
ORGANIC SUBSTANCES IN WATER (G0232)-----	January 25-29, 1982-----	37
ORIENTATION TO WATER-QUALITY ACTIVITIES IN WRD (G0942)-----	November 30- December 4, 1981-----	29
PARAMETER ESTIMATION TECHNIQUES FOR GROUND-WATER MODELS (G0931)-----	January 18-29, 1982----- May 10-21, 1982	36
PROCESSING AND INPUT PROCEDURES FOR WATSTORE DAILY VALUES AND ASSOCIATED FILES-----	February 1-5, 1982-----	39
PROJECT PLANNING AND MANAGEMENT (G0064)-----	May 25-27, 1982----- August 3-5, 1982	53
REAL-TIME DATA MANAGEMENT (HYDRECS) (G0124)-----	April 19-23, 1982-----	49
REPORT PLANNING AND MANAGEMENT SEMINAR (G0264)-----	October 5-9, 1981-----	23
REPORT PLANNING, POLICY, AND REVIEW FOR NEW AUTHORS (G0144)-----	March 8-12, 1982-----	44
RETRIEVAL PROCEDURES AND WATSTORE DAILY VALUES AND ASSOCIATED FILES (G0294)-----	February 8-12, 1982-----	39
SAS FOR WATER RESOURCES DATA (G0974)-----	June 28-July 2, 1982-----	54
SATELLITE DATA COLLECTION PLATFORM INSTALLATION AND OPERATION (G0174)-	October 5-9, 1981-----	23
SEDIMENT DATA-COLLECTION TECHNIQUES (G0912)-----	November 2-6, 1981-----	28
SEDIMENT DATA-COLLECTION TECHNIQUES (Sacramento) (G0912)-----	October 19-23, 1981-----	25
SEDIMENT DATA-COLLECTION TECHNIQUES (Harrisburg) (G0912)-----	May 10-14, 1982-----	52
SEDIMENT LABORATORY TECHNIQUES (Albuquerque) (G0922)-----	October 5-9, 1981-----	24
SEDIMENT-RECORDS COMPUTATION AND INTERPRETATION (G0962)-----	February 22-26, 1982----- September 13-17, 1982	41

Table 2.--Alphabetical listing of courses--Continued

Title	Date	Page
SEMINAR FOR NAWDEX ASSISTANCE CENTERS (G0054)-----	March 30-April 2, 1982----	40
SEMINAR FOR WRD MANAGERS (G0674)-----	October 26-30, 1981-----	26
SEMINAR ON ADMINISTRATIVE MANAGEMENT (G0664)-----	December 7-11, 1981-----	31
SEMINAR ON MECHANICS OF COMPRESSIBLE AQUIFER SYSTEMS AND LAND SUBSIDENCE (G0901)-----	July 26-28, 1982-----	56
SEMINAR ON NAWDEX DATA SYSTEMS (G0044)-----	February 9-12, 1982-----	40
STATISTICAL ANALYSIS OF WATER-QUALITY DATA (G0062)-----	October 26-30, 1981----- April 12-16, 1982	27
STATISTICAL APPROACH TO SURFACE-WATER HYDROLOGIC ANALYSIS (G0113)-----	August 23- September 3, 1982-----	58
STEP-BACKWATER AND FLOODWAY ANALYSIS (G0303)-----	April 26-30, 1982-----	50
SURFACE GEOPHYSICS IN WATER-RESOURCES INVESTIGATIONS (G0821)-----	February 1-5, 1982-----	39
SURFACE-WATER HYDRAULIC ANALYSES (G0093)-----	September 13-24, 1982-----	60
SURFACE-WATER TECHNIQUES FOR TECHNICIANS (G0833)-----	January 11-15, 1982----- June 7-11, 1982	33
SYSTEM 2000 ADVANCED RETRIEVAL TECHNIQUES (G0114)-----	January 11-15, 1982-----	33
SYSTEM 2000 NATURAL LANGUAGE (version 2.9) RETRIEVAL COMMANDS (G0941)-	December 7-11, 1981-----	31
THEORY AND APPLICATION OF TRACERS IN HYDROLOGIC STUDIES (G0034)-----	October 5-9, 1981-----	24
UNSATURATED FLOW IN POROUS MEDIA (G0841)-----	April 5-16, 1982-----	47
URBAN RUNOFF ANALYSIS (G0133)-----	March 22-26, 1982-----	45

Table 2.--Alphabetical listing of courses--Continued

Title	Date	Page
WATER-QUALITY ADP (G0862)-----	December 7-11, 1981----- June 7-11, 1982	32
WATER QUALITY APPLICATION PROGRAMS (G0132)-----	December 14-18, 1981----- June 14-18, 1982	32
WATER-QUALITY CONCEPTS FOR NEW PROFESSIONALS (G0122)-----	January 18-22, 1982-----	35
WATER-QUALITY FIELD TECHNIQUES (G0042)-----	June 14-18, 1982----- June 21-25, 1982 August 16-20, 1982 August 23-27, 1982	53
WATER-QUALITY INSTRUMENTATION (G0872)-----	January 12-15, 1982----- July 27-30, 1982	34
WATER-RESOURCES DATA FOR TECHNICIANS (G0884)-----	November 16-20, 1981----- March 29-April 2, 1982 May 3-7, 1982 August 9-13, 1982	28
WATERSHED SYSTEMS MODELING (G0083)-----	August 9-20, 1982-----	57
WATER-USE WORKSHOP (G0234)-----	October 19-22, 1981----- October 20-23, 1981	25
WATSTORE (G0944)-----	April 20-22, 1982-----	50

Table 3.--Description of courses

<p>1981 October 5-9</p>	<p><u>Description:</u> REPORT PLANNING AND MANAGEMENT SEMINAR (G0264). This 5-day course will provide guidelines for improving the planning and preparation of reports. A systematic approach to improving the quality, timeliness, and readability of our reports is stressed. The course also will provide current information on report format, report content, illustrations, and press releases. Emphasis will be placed on report policy, supervisory report responsibility, methods to improve reports, and technical colleague review. The agenda for the course includes: (1) Report planning and management, (2) report assistance, (3) report review and evaluation, (4) report problem sessions with each attendee, (5) report policy, (6) methods to improve reports, and (7) review of Publications Guide.</p> <p><u>Course Coordinator:</u> J. E. Moore.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is designed for new district chiefs and management personnel who are responsible for reports. Attendance limited to 20.</p>
<p>October 5-9</p>	<p><u>Description:</u> SATELLITE DATA-COLLECTION PLATFORM INSTALLATION AND OPERATION (G0174). This workshop is designed to familiarize personnel on the telemetry of hydrologic data using satellite data-collection systems. The practical aspects of the installation and operation of the LaBarge and Handar data-collection platforms will be emphasized. Classroom training will include an overview of satellite data-collection systems, instrument interfacing to the platform, programming the platform for operation, and an overview of data-processing activities. The participants will be provided ample "hands-on" experience installing a data-collection platform for actual operation through the GOES Data-Collection System.</p> <p><u>Course Coordinator:</u> E. H. Cordes</p> <p><u>Location:</u> Hydrologic Instrumentation Facility, Bay St. Louis, Miss.</p> <p><u>Attendees:</u> Personnel who presently or soon will be actively engaged in the installation of data-collection platforms may attend. Those personnel nominated for the subject training, who presently or soon will be engaged in the management of</p>

Table 3.--Description of courses---Continued

October 5-9

data-collection platform networks or data-processing activities for real-time telemetry data, are encouraged to attend the "REAL-TIME DATA MANAGEMENT (G0124)" course to be held on April 20-22, 1982. Attendance limited to 20.

Description: THEORY AND APPLICATION OF TRACERS IN HYDROLOGIC STUDIES (G0034).

This is a highly specialized course intended to cover the basics of fluorometry; the properties and use of various dyes; the concepts and models for time of travel, dispersion and mixing, and linear decay of wastes in streams and estuaries; the basics of dilution gaging, and the application of hydrocarbon gas tracers to measure the reaeration coefficient in small streams. The course will emphasize student participation in: (1) dye tests for time of travel, dilution discharge measurement, and reaeration coefficient measurements; (2) laboratory use of fluorometry equipment, preparation of dye standards, and analysis of field samples; and (3) computation, interpretation, and presentation of results.

Course Coordinator: F. A. Kilpatrick.

Location: National Training Center.

Attendees: This course requires a college level knowledge of mathematics and fluid mechanics; participants will be limited to personnel with pertinent educational background. Attendance limited to 24.

October 5-9

Description: SEDIMENT LABORATORY TECHNIQUES (G0922). This course is a workshop designed to provide training in all aspects of standard analysis of the physical properties of fluvial sediment. Included will be analysis for concentration, particle-size distribution by sieve, visual-accumulation tube, bottom-withdrawal tube, and pipet. Trainees will analyze samples, make computations, and prepare computations for storage and retrieval for publication.

Course Coordinator: A. B. Commings.

Location: Albuquerque, N. Mex.

Attendees: Prerequisite for this course is the course "SEDIMENT DATA-COLLECTION TECHNIQUES (G0912)," or equivalent experience. Personnel who are actively engaged in the interpretation, collection, or the laboratory analysis of sediment samples may attend. Attendance limited to 16.

Table 3.--Description of courses--Continued

October 14-16	<p><u>Description:</u> FUNDAMENTALS OF PS-69 PUMPING SAMPLER OPERATION (G0092). This course is a workshop designed to provide training in site selection, installation, operation, calibration, and maintenance of the PS-69 pumping sampler. The course will consist of lectures and discussion followed by demonstration and "hands-on" workshops on trouble shooting and routine maintenance.</p> <p><u>Course Coordinator:</u> C. A. Onions.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel who are personally responsible for the installation and operation of PS-69 pumping samplers. Attendance limited to 20.</p>
October 19-22 October 20-23	<p><u>Description:</u> WATER-USE WORKSHOP (G0234). Background of the National Water-Use Information Program and the interrelations between the State and Federal elements will be discussed, as will development of water-use program plans. Emphasis will be placed on techniques for acquiring water-use data, including both field measurements, and indirect methods such as statistical sampling and remotely sensed data; on quality control; on data storage and retrieval; on instrumentation; and on demand modeling. End use of the data and feedback loops from users also will be discussed.</p> <p><u>Course Coordinator:</u> W. B. Mann.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> District and cooperator personnel who are responsible for development and operation of water-use data programs. Attendance limited to 24.</p>
October 19-23	<p><u>Description:</u> SEDIMENT DATA-COLLECTION TECHNIQUES (G0912). This course is a workshop providing training in the fundamentals of sediment data collection. Trainees will spend 1-2 days in the field collecting suspended-sediment and bed-material samples using most of the available samplers. Emphasis will be on careful study of the various techniques that can be used to collect representative samples of water-sediment mixtures. A brief laboratory tour and examples of sediment record computation will be included.</p> <p><u>Course Coordinator:</u> B. L. Jones.</p>

Table 3.--Description of courses--Continued

	<p><u>Location:</u> Subdistrict Laboratory, Sacramento, Calif.</p> <p><u>Attendees:</u> Personnel who are actively engaged in sediment activities or those who plan to become involved prior to the next presentation of the course. Attendance limited to 24.</p>
<p>1981 October 26-30 1982 June 21-25</p>	<p><u>Description:</u> BASIC HYDRAULIC PRINCIPLES (G0043). This 1-week course combines lectures and class problems in basic open-channel flow problems. With the addition of the "BASIC HYDRAULIC PRINCIPLES (G0043)" training course, a system of prerequisites can be established that should better prepare participants for the more advanced courses. The following prerequisite course system will be adhered to concerning hydraulic courses taught by the Surface Water Branch.</p> <ol style="list-style-type: none"> 1. Participants for the "SURFACE-WATER HYDRAULIC ANALYSES (G0093)" course must have attended the course "BASIC HYDRAULIC PRINCIPLES (G0043)," or have completed college-level courses in hydraulics or fluid mechanics. 2. Participants for the course "STEP-BACK-WATER AND FLOODWAY ANALYSES (G0303)" must have attended the "SURFACE-WATER HYDRAULIC ANALYSES (G0093)" course. <p><u>Course Coordinator:</u> H. E. Jobson and V. R. Schneider.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Hydrologists who have little or no background in the principles of basic hydraulics and fluid mechanics or who need a review of these basic concepts may attend. This course, or its equivalent, is a prerequisite to "SURFACE-WATER HYDRAULIC ANALYSES (G0093)." Attendance limited to 16.</p>
<p>October 26-30</p>	<p><u>Description:</u> SEMINAR FOR WRD MANAGERS (G0674). This course will cover a number of concepts that should be of value to WRD Managers. Included will be subjects such as management by objectives, ethics, values, and the public executive, assessment of interpersonal</p>

Table 3.--Description of courses--Continued

	<p>style, improving your interpersonal skills and productivity. Most of the course will be presented by management consultants. Each participant will receive constructive feedback on how others see their interpersonal skills as compared with how they see these skills themselves.</p> <p><u>Course Coordinator:</u> T. J. Buchanan.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is intended for WRD Managers. Included in this category will be District Chiefs, Assistant District Chiefs, and any other managers nominated by members of the Senior Staff. Attendance is limited to 24.</p>
<p>1981 October 26-30</p> <p>1982 April 12-16</p>	<p><u>Description:</u> STATISTICAL ANALYSIS OF WATER-QUALITY DATA (G0062). This workshop is designed to provide attendees with an introduction to statistics and a computer package, Statistical Analysis System (SAS), which can be used for statistical analysis of hydrologic data. The course will cover sampling statistics, statistical testing, regression analysis, analysis of variance and covariance, and provide a working knowledge of the computer program package SAS. The emphasis of the course will be on statistical analysis of water-quality data stored in WATSTORE. Attendees will have the opportunity to run SAS jobs on the computer during evening sessions.</p> <p><u>Course Coordinator:</u> D. A. Goolsby and D. V. Maddy.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is intended for personnel who are or will be involved in projects or data-handling activities that require statistical analysis of hydrologic data. Attendees should have taken an introductory course in statistics and a basic algebra course. Attendance limited to 24.</p>
<p>November 2-6</p>	<p><u>Description:</u> NETWORK DESIGN FOR STREAMFLOW INFORMATION (G0914). The course will present regression analysis techniques and their use in regionalization of hydrologic information. Regionalization is extended to demonstrate the effects of differing amounts of hydrologic data on the accuracy of the regional estimates of hydrologic parameters. Inclusion of the economics of the costs and benefits associated with the data permits an objective specification of the design of the data-collection network. The theory of</p>

Table 3.--Description of courses--Continued

	<p>network design will be presented, and illustrated examples will be worked by the staff and the participants.</p> <p><u>Course Coordinator:</u> M. E. Moss.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel must: (1) anticipate involvement in network design activities within 1 to 2 years, (2) be mathematically inclined, and (3) have an appreciation for the statistical consequences of hydrologic data. Attendance limited to 16.</p>
November 2-6	<p><u>Description:</u> SEDIMENT DATA-COLLECTION TECHNIQUES (G0912). This course is a workshop providing training in the fundamentals of sediment data collection. Trainees will spend 1-2 days in the field collecting suspended-sediment and bed-material samples using most of the available samplers. Emphasis will be placed on careful study of the various techniques that can be used to collect representative samples of water-sediment mixtures. A brief laboratory tour and examples of sediment record computation will be included.</p> <p><u>Course Coordinator:</u> J. R. Ritter.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel who are actively engaged in sediment activities or those who plan to become involved prior to the next presentation of the course. Attendance limited to 24.</p>
1981	
November 16-20	
1982	
March 29-April 2	
May 3-7	
August 9-13	<p><u>Description:</u> WATER-RESOURCES DATA FOR TECHNICIANS (G0884). This course is aimed at presenting a well-rounded, interdisciplinary picture of the Water Resources Division activities in all aspects of water-data collection. Basic principles on sampling and measurement are emphasized. Material presented will require a background of mathematics through trigonometry.</p> <p><u>Course Coordinator:</u> November 16-20, 1981-- R. T. Kirkland, Jr. March 29-April 2, 1982-- E. D. Cobb. May 3-7 (To be announced) August 9-13--K. D. Wahl.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Technicians of the Water Resources Division or its cooperators who are involved in collecting or analyzing water-resources data may attend. Attendance limited to 24.</p>

Table 3.--Description of courses--Continued

1981 November 16-20 1982 April 19-23	<p>Description: GROUND WATER--SURFACE WATER RELATIONSHIPS (G0154). This seminar focuses on the utilization of streamflow data in determining aquifer parameters, ground-water recharge, and the consumptive use of ground water by evapotranspiration. The techniques illustrated also are useful conversely for separating stream hydrographs, calculating rates of flow recession, and forecasting low flow.</p> <p>Course Coordinator: J. F. Daniels.</p> <p>Location: National Training Center.</p> <p>Attendees: Experienced personnel of the Water Resources Division and its cooperators may attend. Attendance limited to 24.</p>
November 30-December 4	<p>Description: ORIENTATION TO WATER-QUALITY ACTIVITIES IN WRD (G0942). The course will familiarize the attendees with the broad scope of water-quality activities carried out by the Division. Special emphasis will be placed on Water Resources Division practices and policies related to the acquisition and dissemination of water-quality information. The course will provide information that will be useful in planning, conducting, and overseeing water-quality services; processing and publishing data; obtaining assistance on projects; and in assuring the quality of products. An overview of the Division's District, research, and National programs in water quality will be provided. The course is intended to be informative rather than instructional.</p> <p>Location: National Training Center.</p> <p>Attendees: The course is designed primarily for new Division employees who will be actively involved in water-quality activities; however, the course is open to all Water Resources Division employees. Due to the nature of the course, attendance will be restricted to Water Resources Division personnel only. Attendance limited to 40.</p>
November 30-December 4	<p>Description: ADVANCED SEMINAR ON WATER QUALITY (G0012). This seminar will present concepts and techniques that are useful in planning and executing interpretive, water-quality oriented, environmental studies. The seminar also is designed to provide the attendees.</p>

Table 3.--Description of courses--Continued

	<p>with up-to-date Division activities in water quality, as well as state-of-the-science and progress in new water-quality techniques. The theme this year will be concerned with Water Resources Division studies and progress in organic chemistry, radiochemistry, overview of Water Resources Division water quality related energy studies, ground-water quality, wetlands, and technology transfer.</p> <p><u>Course Coordinator:</u> W. L. Bradford.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> This course is open to district water-quality specialists and all water-quality professionals who are engaged (or will be in the near future) in water-quality studies. District water-quality specialists are encouraged to attend the seminar at least once every 3 years. Attendance limited to 40.</p>
<p>1981</p> <p>November 30-</p> <p>December 4</p> <p>1982</p> <p>June 7-11</p>	<p><u>Description:</u> EDITORIAL TECHNIQUES (G0244).</p> <p>This 5-day course provides instruction and class problems in manuscript preparation and editing as stipulated by the Water Resources Division. Emphasis will be placed on: Suggestions to Authors, Publication Guide, GPO Style Manual, and report policy memorandums. The course agenda will include: (1) Water Resources Division report planning, (2) editing process, (3) editors reference, (4) punctuation, (5) editing sentences, (6) editing a report or memorandum, (7) Water Resources Division report policy, and (8) example report training exercise.</p> <p><u>Course Coordinator:</u> D. Aronson and K. T. Iseri.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Editorial clerks and others who are actively assigned, or about to be assigned, to the editing of District or project reports. Attendance limited to 16.</p>

Table 3.--Description of courses--Continued

December 7-11

Description: SYSTEM 2000 NATURAL LANGUAGE (VERSION 2.9) RETRIEVAL COMMANDS (G0941). The course stresses the basic principles of the SYSTEM 2000 natural language (version 2.9) for retrieving data from SYSTEM 2000 data bases. Workshops each day will have exercises to be coded or run on the computer using TSO. Exercises will address the NAWDEX Master Water Data Index and Water Data Sources Directory data bases and the WATSTORE Ground-Water Site-Inventory and Water-Use data bases. An overview of each of these data base structures and related application software will also be given.

Course Coordinator: O. O. Williams.

Location: National Training Center.

Attendees: All persons who are engaged in retrieving data from the WATSTORE Ground-Water Site-Inventory and Water-Use data bases and the NAWDEX data bases. It is recommended that the attendees be familiar with basic computer terminology. Attendance limited to 20.

December 7-11

Description: SEMINAR ON ADMINISTRATIVE MANAGEMENT (G0664). The course combines lectures by session leaders with class participation on various subjects related to the duties of administrative personnel in Water Resources Division. Methods and procedures will be discussed pertaining to budget administration, financial management, program development, procurement personnel, and general services. The attendees also will be acquainted with regulations and procedures governing the administrative functions within the Water Resources Division.

Location: National Training Center.

Attendees: Administrative personnel (Series 341) from Water Resources Division Districts or Regions. Attendance limited to 24.

Table 3.--Description of courses--Continued

1981 December 7-11 1982 June 7-11	<p><u>Description:</u> WATER-QUALITY ADP (G0862). The workshop will include discussions and sample problems regarding the procedures used to enter, update, and retrieve water-quality data. The Station Header File and the Water Quality File will be discussed. Job Control Language (JCL) also will be discussed and sample problems will be coded and run on the computer. The first week of the workshop will cover Station Header File input, update, and output procedures; Water Quality File input, update, and output procedures; and water-quality data editing. The second week of the workshop will cover the use of the Statistical Analysis System (SAS) with water-quality data, water-quality data mapping, and water-quality data tables.</p> <p><u>Course Coordinator:</u> D. V. Maddy.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is designed so that personnel can attend "WATER-QUALITY ADP (G0862)" the first week, or only attend "SAS FOR WATER QUALITY APPLICATIONS PROGRAMS (G0132)" the second week, or attend both courses. The first week is designed for personnel actively involved with the routine processing of water-quality data, storage, retrieval, and editing. The second week is designed for personnel utilizing and analyzing water-quality data. Attendance limited to 30.</p>
1981 December 14-18 1982 June 14-18	<p><u>Description:</u> WATER-QUALITY APPLICATION PROGRAMS (G0132). The workshop will cover the use of the Statistical Analysis System (SAS) with water-quality data, water-quality data mapping, and water-quality data tables. The workshop will include a discussion of Job Control Language (JCL) and sample problems will be coded and run on the computer.</p> <p><u>Course Coordinator:</u> D. V. Maddy.</p> <p><u>Attendees:</u> The course is designed for personnel utilizing and analyzing water-quality data. Familiarity with water-quality data storage and retrieval is assumed (through experience or attendance at prior water-quality ADP courses--G0862). Attendance limited to 30.</p>

Tables 3.--Description of courses--Continued

1982
January 11-15

Description: SYSTEM 2000 ADVANCED RETRIEVAL TECHNIQUES (G0144). This training course describes advanced data retrieval techniques available with SYSTEM 2000 data base management system. Topics covered include the use of the SYSTEM 2000 report writer feature in the preparation of customized reports, techniques of interfacing SYSTEM 200 data bases with Statistical Analysis System (SAS) for report writing and statistical analysis, and methods of obtaining graphical displays from data bases using the S2KPL0T and SAS/GRAPH software packages. This course is taught in a workshop environment, with attendees required to employ the techniques on at least one of the following data systems:

1. Water-Data Sources Directory (WDSD) and Master Water-Data Index (MWDI)--NAWDEX.
2. National Water-Use Data System (NWUDS)--WATSTORE.
3. Ground-water Site-Inventory System (GWSI)--WATSTORE.

Course Coordinators: R. E. Booker and
C. F. Merk.

Location: National Training Center.

Attendees: Personnel involved in projects or data-handling activities that require analysis of data from one of the above named data systems. Attendees should have taken the WRD course "SYSTEM 2000 NATURAL LANGUAGE (G0941)" or have demonstrated proficiency in the use of the SYSTEM 2000 self contained facility (Natural Language). Attendance limited to 20.

January 11-15
June 7-11

Description: SURFACE-WATER TECHNIQUES FOR TECHNICIANS (G0833). This 1-week course combines lecture and class problems on surface-water hydraulic problems. Techniques for the better definition and extension of stage-discharge rating curves are discussed. Trainees are introduced to the general theory behind indirect measurements of peak discharge, such as, conveyance-slope slope-area, culverts, and contracted openings. The step-backwater method of rating extension is described.

Tables 3.--Description of courses--Continued

Course Coordinator: J. Davidian.

Location: National Training Center

Attendees: The course is designed for data-section chiefs, supervisory and lead technicians, and senior technicians who are responsible for the training of others and for the review of the basic field data and office computations of others. Experience comparable at least to that of a Grade GS-9 is required. The course coordinator will review names of the nominees. Participants are required to have a thorough knowledge of the stream-gaging techniques, methods, and computations described in U.S. Geological Survey Techniques of Water Resources Investigations, Book 3, Chapters A7 and A8; they must have completed the Water Resources Division Training Manual for Technicians, Phase 1; and they must particularly be thoroughly familiar with stage-discharge ratings as described in Surface-Water Techniques Book 1, Chapter 12. Attendance limited to 20.

January 12-15
July 27-30

Description: WATER-QUALITY INSTRUMENTATION (G0872). This is an introductory course on the proper use, calibration, and maintenance of water-quality instruments. The subjects covered include: (1) Portable individual-parameter monitors and servo programmers, (2) portable multi-parameter instruments, (3) multi-parameter monitors and servo programmers, (4) sediment samplers and automatic samplers, (5) ground-water samplers, and (6) data-collection and data-relay platforms.

Special Topic: Each participant is requested to prepare a 5- to 10-minute presentation on any interesting or unique installation, field laboratory or boat, water-quality related problem, equipment developed, or any other topic of interest that is related to the course. The use of handouts, pictures, and slides is encouraged.

Course Coordinator: R. F. Middelburg.

Location: National Training Center.

Attendees: Personnel who are now or will be engaged in the operation and maintenance of field equipment and the collection of water-quality data. Attendance limited to 24.

Table 3.--Description of courses--Continued

January 18-22	<p><u>Description:</u> WATER-QUALITY CONCEPTS FOR NEW PROFESSIONALS (G0122). This introductory course is designed primarily for professionals who expect to become actively engaged in water-quality activities. The course will include a study of the concepts of the inorganic and organic chemistry of water, sedimentation and erosion, biological characteristics of water, water-quality instrumentation, and sampling.</p> <p><u>Course Coordinator:</u> W. L. Bradford.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is designed primarily for new professionals in the Water Resources Division water-quality program, including those recently placed on the personnel roles or those whose experience has been in a hydrological field other than water quality. Attendance limited to 24.</p>
January 18-22	<p><u>Description:</u> INTRODUCTION TO BOREHOLE GEOPHYSICS (G0791). The emphasis will be on the basic principles of well logging equipment utilized within the Water Resources Division. The operation, calibration, and standardization of logging equipment will be discussed. The interpretation of the following kinds of logs will be stressed: Resistance, Resistivity, Spontaneous Potential, Caliper, Natural Gamma, Gamma-gamma, Neutron, Acoustic Velocity, Temperature, Fluid Conductivity, and Flowmeter. This course will be given on alternate years.</p> <p><u>Course Coordinator:</u> W. S. Keys.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> This course is intended for personnel with some background or experience in the application of borehole geophysics to ground-water problems or those who will soon be engaged in this field. Attendees are invited to bring their own logs or logging problems for discussion in class. Attendance limited to 24.</p>

Table 3.--Description of courses--Continued

January 18-29
May 10-21

Description: PARAMETER ESTIMATION TECHNIQUES FOR GROUND-WATER MODELS (G0931). The course is intended to describe numerical methods of: (1) estimation values for the parameters (transmissivity or hydraulic conductivity, leakance of confining beds, recharge, and discharge) for models of steady-state ground-water flow; and (2) analyzing the parameter estimates and the resulting model in terms of reliability and significance of the estimated parameters, and reliability of the calculated head distribution and predictions to be made with the model. Basic statistical concepts will be reviewed as background material. This will be followed by a discussion of methodology for parameter estimation by multiple regression techniques and techniques for analysis of the resulting model. A set of operational computer programs will be given out and discussed so that the course participants will be able to carry out the analyses themselves upon course completion. Laboratory exercises will allow each student to use programs for analysis of realistic problems. The basic ground-water model employed uses the standard Water Resources Division finite difference methodology.

Course Completion: R. L. Cooley.

Location: National Training Center.

Attendees: Attendees must: (1) be Water Resources Division employees experienced in ground-water quantitative analysis, (2) have attended the training course "MODELING OF GROUND-WATER FLOW (G0911)" and have used and be familiar with the material presented in this course (or have equivalent background), and (3) be engaged in a project in which the parameter estimation techniques can be applied in the next 1 or 2 years. Background in elementary statistics would be desirable. Attendance limited to 20.

January 25-27

Description: OPERATION AND MAINTENANCE OF GEOPHYSICAL LOGGING EQUIPMENT (G0061). It is important that all personnel operating the equipment understand basic log interpretation as well as principles of operation of the equipment in order to collect the most useful data. The "INTRODUCTION TO BOREHOLE GEOPHYSICS (G0791)" course offered January 19-23, 1981,

Table 3.--Description of courses--Continued

	<p>will cover the basic physical principles and interpretation of geophysical logs. This course will stress the operation and maintenance of logging equipment. Trainees will be sent a copy of "APPLICATIONS OF BOREHOLE GEOPHYSICS TO WATER RESOURCES INVESTIGATIONS" which they are requested to review before coming to the class.</p> <p><u>Course Coordinator:</u> A. J. Boettcher.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> This course is intended for the technician or professional who will be operating geophysical well-logging equipment for ground-water applications. Attendance limited to 20.</p>
January 25-29	<p><u>Description:</u> ORGANIC SUBSTANCES IN WATER (G0232). This course is intended to provide background fundamentals and describe techniques available for studying the source, behavior, and fate of organic substances in surface and ground water. Both natural and man-made compounds are considered. Techniques for sampling, sample processing, availability and limitations of analytical methodology, and the evaluation and interpretation of data are discussed.</p> <p><u>Course Coordinator:</u> W. L. Bradford.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> District water-quality specialists and project personnel responsible for planning and executing water-quality studies. Attendance limited to 30.</p>
January 25-29	<p><u>Description:</u> GEOPHYSICAL LOG ANALYSIS AND FORMATION EVALUATION (G0751). Although the basic principles of various logging techniques will be reviewed briefly, the major part of the course will stress quantitative log interpretation techniques, such as, cross plotting, statistical analyses, digitization, and computer interpretation. The emphasis will be on problem solving in the classroom. The following applications will be among those discussed: (1) Calculation of mineral composition, porosity, and water quality; (2) logs as a guide to well construction; and (3) the use of logs in geothermal exploration, subsurface waste storage and artificial recharge.</p>

Table 3.--Description of courses--Continued

	<p>Course Coordinator: W. S. Keys.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> This course is intended for professionals and technicians with a thorough background of experience or training in borehole geophysics. Because of the advanced nature of this course, each prospective student must submit a resume of experience in borehole geophysics. Resumes will be reviewed by the teaching staff to determine if the student's qualifications are sufficient for acceptance into the course. Attendance limited to 20.</p>
February 1-4	<p><u>Description:</u> ADVANCED MODELING OF GROUND-WATER TRANSPORT (G0071). The purpose of this course is to develop proficiency in simulating three-dimensional, non-isothermal, variable-density ground-water flow and solute transport with chemical reactions. The course will review fundamental concepts, governing equations, relevant numerical methods for solving the equations, and data requirements. Much of the discussions and examples will focus on the relevance and limitations of the simulation model developed for the Survey by INTERA Environmental Consultants, Inc. Typical examples of field problems for which this model could be used include deep-well waste disposal, saltwater encroachment, cyclic storage of freshwater or of hot water, and migration of leachate plumes. Students will be able to obtain a practical working knowledge of this model through "hands-on" use. Discussions of recent (1979-81) revisions to the code will be presented. Part of the course will be devoted to a seminar format in which each student can contribute to discussions of modeling problems, experiences, and alternative approaches.</p> <p>Course Coordinator: L. F. Konikow.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel must have taken the course, "MODELING TRANSPORT OF GROUND-WATER SOLUTES (G0801)," or have equivalent training and experience with solute-transport modeling, differential equations, numerical methods, and FORTRAN IV computer programming language. Attendance limited to 20.</p>

Table 3.--Description of courses--Continued

February 1-5

Description: PROCESSING AND INPUT PROCEDURES FOR WATSTORE DAILY VALUES AND ASSOCIATED FILES (G0274). The workshop will include a discussion and example problems of the procedures used to enter data into the Station Header File, Daily Values File, Unit Values File, and the Peak Flow File. There will be sufficient information on retrievals to assist in verification of input data and to make publication tables. Approximately 2 days will be devoted to the processing of records collected by digital recorders including streamflow, ground-water levels, digital-monitor data, deflection-meter data, and tide-gage data. Reading and interpretation of Job Control Language (JCL) also is included.
Course Coordinator: N. G. Stuthmann.

Location: National Training Center.

Attendees: The material to be presented at the workshop is directed to these individuals who are actively involved in processing and storing data into WATSTORE files. Attendance limited to 24.

February 1-5

Description: SURFACE GEOPHYSICS IN WATER-RESOURCES INVESTIGATIONS (G0821). Discussions, interpretation exercises, and field practice provide introduction to surface-geophysical methods, such as, magnetic, seismic, and electrical resistivity, and their application to a variety of hydrologic problems. Geophysicists from the Regional Geophysics Branch (Geologic Division) specializing in hydrologic applications serve as instructors.

Course Coordinator: F. P. Haeni.

Location: National Training Center.

Attendees: Personnel who are or who will be engaged in projects requiring surface geophysics may attend. Attendance limited to 24.

February 8-12

Description: RETRIEVAL PROCEDURES FOR WATSTORE DAILY VALUES AND ASSOCIATED FILES (G0294). The workshop will include a discussion and example problems of the procedures used to retrieve data and setup application programs. The files discussed will be the Station Header File, Daily Values File, Unit Values File, and the Peak Flow File. A discussion of Job Control Language (JCL) also is included. Example problems using the application

Table 3.--Description of courses--Continued

	<p>programs for the various files will be coded and run on the computer. These will include the various publication table programs, inventory, plots, statistics and use of the Statistical Analysis System (SAS).</p> <p><u>Course Coordinator:</u> N. G. Stuthmann.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is designed for these individuals who are actively involved in retrieving data for publication and project personnel who have the need to retrieve data from the files to obtain statistics and process other application programs. Attendance limited to 24.</p>
February 9-12	<p><u>Description:</u> SEMINAR ON NAWDEX DATA SYSTEMS (G0044). The seminar provides instruction and workshops in the use of the National Water Data Exchange (NAWDEX) data bases and associated software. Emphasis will be placed on new features resulting from the redesign of the Master Water Data Index (MWDI) data base and the associated software. Instruction is provided for the retrieval of data for the MWDI data base to generate listings, and hoc reports, reports for publication, data base summaries, plots, use of the Xerox 9700 for processing pre-formatted reports from the MWDI, and generating microfiche. Instruction in the use of the Water Data Sources Directory (WDSD) and associated software as well as on the encoding, editing, and submission of data for both data bases also is provided.</p> <p>This session does not include detailed instruction in the use of SYSTEM 2000 Natural Language which is offered in the course entitled "SYSTEM 2000 NATURAL LANGUAGE (Version 2.9) RETRIEVAL COMMANDS," (G0941).</p> <p><u>Course Coordinator:</u> O. O. Williams.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel should be those individuals having "hands-on" responsibilities for the computer processing, storage, and retrieval of data in the NAWDEX data bases. Attendance limited to 24.</p>

Table 3.--Description of courses--Continued

February 22-26
September 13-17

Description: SEDIMENT RECORDS COMPUTATION AND INTERPRETATION (G0962). This course is a workshop designed to provide training in the computation of sediment-discharge records of both suspended sediment and bedload. It will include the use of data collected on a daily or near daily basis also and that collected on a periodic or intermittent basis. Emphasis will be placed on analysis and interpretation of records and on types of records for various data needs.

Course Coordinator: B. H. Ringen.

Location: National Training Center.

Attendees: Personnel who are engaged in the following activities are eligible to attend:

1. Those currently engaged in sediment record computation and data handling.
2. Supervisors who need more background in the analysis and interpretation of sediment records.
3. Program planners who need more information on designing data-collection programs to meet data needs.

Prerequisite for this course is "SEDIMENT DATA-COLLECTION TECHNIQUES (G0912)" or equivalent experience. Participation or equivalent experience in "SEDIMENT LABORATORY TECHNIQUES (G0922)" also is recommended. Attendance limited to 24.

February 22-26

Description: INTRODUCTION TO GEOMORPHIC PROCESSES (G0112). The course will include a study of: (1) drainage basin characteristics and hydrologic response, (2) basin morphometry, (3) erosional processes and sediment sources, (4) predictive equations, (5) hydrogeomorphology of stream channels, (6) sources, transport, and deposition of sediment, measurement of and modeling of sediment yield, and (7) water-quality aspects of sediment. (This course includes much of the material presented in the discontinued courses, "SEDIMENTATION AND EROSION CONCEPTS (G0902)" and "GEOMORPHIC PROCESSES AND SEDIMENT YIELD (G0032)".)

Table 3.--Description of courses--Continued

	<p><u>Course Coordinator:</u> R. F. Hadley.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is open to supervisory personnel, district water-quality specialists, and project chiefs who are involved in the planning or programming of hydrologic investigations that include either river morphology or the water-quality aspects of sedimentation. Attendance limited to 32.</p>
February 22-March 5	<p><u>Description:</u> CHEMISTRY FOR GROUND-WATER SOLUTE-TRANSPORT MODELS (G0702). This course provides lectures and workshop sessions on quantitative interpretations of geochemical processes in ground-water systems and how these processes are incorporated into solute-transport models. It is a companion course to MODELING TRANSPORT OF GROUND-WATER SOLUTES (G0801). Topics to be presented include: (1) equilibrium concepts, (2) solution-mineral interactions, (3) kinetics, (4) surface chemistry, (5) bio-organic processes, (6) Water Resources Division mineral equilibrium models, (7) conservative and nonconservative models, (8) chemical parameter evaluation procedures, and (9) finite difference methods, explicit and implicit linear equations relative to solute-transport equations.</p> <p><u>Course Coordinator:</u> D. B. Grove.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel must be: (1) experienced in geochemical quantitative analysis; (2) familiar with the concepts of ground-water flow; and (3) have recent programming experience preferably in FORTRAN IV. Attendance limited to 20.</p>
March 1-5 June 14-18	<p><u>Description:</u> ANALYTICAL METHODS TO DETERMINE AQUIFER PROPERTIES AND TO PREDICT AQUIFER RESPONSE (G0461). The course is designed to acquaint or refresh field personnel with current analytical methods used in the ground-water discipline. Methods of analyzing bounded, leaky, anisotropic, layered, and confined aquifers will be described by staff specialists, and exercises will be worked by the class participants. Special problems in aquifer-test analysis and prediction of aquifer response will be discussed. Analysis of observation-well data near streams, and of stream aquifer interactions will be stressed.</p>

Table 3.--Description of courses--Continued

March 1-12
July 26-August 6

Course Coordinator: E. P. Weeks.

Location: National Training Center.

Attendees: Personnel must: (1) have a basic understanding of aquifer mechanics and aquifer-test analysis; (2) have a need for additional knowledge on analytical methods or aquifer analysis; and (3) should be familiar with the use of the Theis equation for analyzing aquifer tests and predicting drawdowns. Attendance limited to 24.

Description: MODELING OF GROUND-WATER FLOW (G0911). The differential equations that describe transient and steady-state flow in saturated porous media are reviewed, but the main emphasis of the course is on techniques for obtaining approximate solutions of the equations using finite-difference techniques programmed on the digital computer. Solution techniques discussed include: (1) Reduction of the differential equations to a system of finite-difference equations of the explicit and implicit types in one and two dimensions; and (2) solution of the resulting equation system using both direct and iterative techniques. Direct techniques include marching methods and the Thomas method for one-dimensional problems, and the direct alternating direction implicit procedure and D4 in two dimensions. Iterative techniques for two-dimensional problems include the strongly implicit procedure, line successive over relaxation, and the iterative alternating direction implicit procedure. Students will write simple FORTRAN IV programs for one-dimensional problems. The laboratory section during the second week of the course is designed to instruct and provide experience in the use of the Water Resources Division two-dimensional flow model. Theory, programming approaches, data requirements, and idiosyncrasies of the Water Resources Division model are stressed. For this part of the course, each student will learn to use the model and will make an analysis of a real modeling problem.

Course Coordinator: C. A. Appel.

Location: National Training Center.

Attendees: Personnel must: (1) experienced in ground-water quantitative analysis; (2) familiar with the differential equations of ground-water flow; and (3) have programmed scientific problems using FORTRAN IV and have used digital computers, or demonstrated an equivalent level of achievement. Attendance limited to 20.

Table 3.--Description of courses--Continued

March 8-12	<p><u>Description:</u> REPORT PLANNING, POLICY, AND REVIEW FOR NEW AUTHORS (G0144). This 5-day course combines lectures and class problems on the basic techniques to plan, outline, format, review, and publish a technical report. Report planning, report review, and report approval will be described. Emphasis will be placed on providing guidelines for improving quality, timeliness, readability, and attractiveness of our reports. The agenda for the course includes: (1) report planning and management, (2) report writing aids, (3) preparation of outline, introduction, press releases, abstract, conclusions, and illustrations, (4) report format, (5) report policy, (6) report review, and (7) report improvement methods.</p> <p><u>Course Coordinator:</u> J. E. Moore.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Professional employees who are or will be assigned to report writing. Attendance limited to 24.</p>
March 8-12	<p><u>Description:</u> BIOLOGICAL ADP (G0882). The workshop will include discussions and sample problems regarding the procedures used to enter, update, and retrieve data. The Station Header File and the Biological File will be discussed. Job Control Language (JCL) also will be discussed and sample problems will be coded and run on the computer. The workshop will cover Station Header File input, update, and output procedures and Biological File input, update, and output procedures.</p> <p><u>Course Coordinator:</u> D. V. Maddy.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> The course is designed for personnel actively involved with the routine processing of biologic data, storage, and retrieval. Attendance limited to 30.</p>

Table 3.--Description of courses--Continued

March 15-19 March 22-26	<p><u>Description:</u> HYDROLOGIC INSTRUMENTATION (G0023). This training course emphasizes theory of operation, and the trouble-shooting and maintenance of specialized equipment and instruments used in field studies. Included are instruments and equipment for: (1) measuring and recording water stage, (2) measuring discharge and precipitation, (3) sampling for sediment, (4) measuring water levels in wells, and (5) data transmission.</p> <p><u>Course Coordinator:</u> W. H. Hammond.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> New personnel of the Water Resources Division and its cooperators. Attendance limited to 24.</p>
March 15-19	<p><u>Description:</u> GROUND-WATER SITE-INVENTORY WORKSHOP (G0921). This is the basic Ground-Water Site-Inventory (GWSI) training course. The workshop provides the training for preparation, editing, inputting, and retrieval of GWSI data. Problems will be given for each phase of the course including Job Control Language (JCL) coding, data coding, data editing, data input, and retrieval by use of SYSTEM 2000 natural language and application programs.</p> <p><u>Course Coordinator:</u> M. Mercer.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel requiring a basic understanding of the preparation, editing, inputting, and retrieval of GWSI data in the National File. Attendance limited to 25.</p>
March 22-26	<p><u>Description:</u> URBAN RUNOFF ANALYSIS (G0133). Much data are being collected for urban storm-runoff studies. This course provides classroom instruction on the use of a data-management system designed for the USGS/USEPA urban-hydrology studies program. Statistical methods will be presented for the analysis of urban runoff data. Class problems, applying available computer programs, will be used to demonstrate approaches to data interpretation for urban studies.</p> <p><u>Course Coordinator:</u> E. D. Cobb.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Persons involved with computer input/retrieval of data from urban-runoff projects or those involved in the application of statistical models for interpretation of urban-runoff data may attend. Attendance will be limited to 24.</p>

Table 3.--Description of courses--Continued

March 22-26	<p><u>Description:</u> AQUATIC BIOLOGY: INTERPRETATION AND APPLICATION (G0692). The purpose of this course is to demonstrate the meaning, use, and limitations of aquatic biological data obtained in hydrological studies. Emphasis will be placed on the practical application of the data. All topics will be illustrated with examples of how investigators have used aquatic biological information to understand the environment or for solving some problem.</p> <p><u>Course Coordinator:</u> P. E. Greeson.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel must be involved in the interpretation and application of aquatic biological data and must have attended at least one of the two courses, "WORKSHOP ON LAKE LIMNOLOGY (G0052)," or "WORKSHOP ON STREAM BIOLOGY (G0892)" (listed in this Bulletin as "FUNDAMENTALS OF LAKE LIMNOLOGY (G0052)" AND "FUNDAMENTALS OF STREAM BIOLOGY (G0892)") or equivalent (for example, academic degree in biology). Attendance limited to 30.</p>
March 30-April 2	<p><u>Description:</u> SEMINAR FOR NAWDEX ASSISTANCE CENTERS (G0054). The seminar provides instructions and class workshops in the functions and operation of the Assistance Centers of the National Water Data Exchange (NAWDEX). Emphasis is placed on the receipt of and response to data-user requests for water-data information, and the use of the NAWDEX data bases and information products to specifically identify and locate requested water data and data-source organizations. Documentation and instructions also are given in the use of the new NAWDEX User Accounting System data base for automated request tracking and computer-generated reports. An overview is provided on NAWDEX services and products that are available through NAWDEX data-base systems and the member organizations.</p> <p>This session does not include detailed instruction in the use of System 2000 Natural Language and the NAWDEX data systems. Instruction in these areas is offered in the courses entitled "SYSTEM 2000 NATURAL LANGUAGE (Version 2.9) RETRIEVAL COMMANDS" (G0941) and "SEMINAR ON NAWDEX DATA SYSTEMS" (G0044).</p>

Table 3.--Description of courses--Continued

	<p>Coordinator: G. L. Thompson.</p> <p>Location: National Training Center.</p> <p>Attendees: Attendees should be those individuals serving as NAWDEX Assistance Center Contacts or having the responsibility for receiving, responding, and reporting requests for water-data or information. Attendance limited to 24.</p>
<p>March 30-April 8</p> <p>September 14-23</p>	<p>Description: ADVANCED MODELING OF GROUND-WATER FLOW (G0681). This course covers the theory and application of: (1) Water Resources Division's three-dimensional ground-water flow model; and (2) Galerkin finite element methods for one- and two-dimensional ground-water flow problems. Discussions of the three-dimensional model will focus on: (1) Reduction of the differential equation to a system of finite difference equations; (2) methods for transient leakage through confining beds; and (3) techniques for solution of the system of finite difference equations. Coverage of the Galerkin finite element method will include discussion of: (1) theory, (2) reduction of integro-differential equations to matrix form, (3) solution of the matrix equation, and (4) practical programming aspects. For both the finite difference and finite element models, students will get "hands-on" experience using Water Resources Division programs. In addition, students will write a one-dimensional finite element model. Attendees will be encouraged to discuss aspects of their modeling experience that may be useful to others.</p> <p>Course Coordinator: C. A. Appel.</p> <p>Location: National Training Center.</p> <p>Attendees: Those individuals that have taken the prerequisite course "MODELING OF GROUND-WATER FLOW (G0911)" or have equivalent training or experience. Attendance limited to 20.</p>
<p>April 5-16</p>	<p>Description: UNSATURATED FLOW IN POROUS MEDIA (G0841). The basic principles governing the occurrence and movement of water in the unsaturated zone are described in this course. Methods of measurement of the hydraulic properties of unsaturated materials are taught through lecture, laboratory experimentation, and class problems. Methods of measuring or estimating evapotranspiration also are discussed. Analytical solutions of governing steady flow will be presented with class exercises demonstrating their</p>

Table 3.--Description of courses--Continued

use. Numerical techniques to analyze transient unsaturated flow will be taught, and the attendees will write programs to numerically simulate unsteady unsaturated flow for several conditions of practical interest. Project applications include those requiring estimates of ground water contribution to evapotranspiration, effects of changes in land use on ground-water recharge, and prediction of and timing of irrigation return flows. The course also should be useful to project personnel involved in studies of artificial recharge and of pollution hazards from sanitary landfills, feedlots, mine tailings, waste dumps or ponds, and other surface sources of ground-water pollution. The course also may be useful to those involved in projects considering overland runoff.

Course Coordinator: E. P. Weeks.

Location: National Training Center.

Attendees: Attendees must be: (1) Water Resources Division employees experienced in quantitative ground-water analysis; (2) familiar with differential equations of flow; (3) have taken either the Water Resources Division course on "MODELING OF GROUND-WATER FLOW (G0911)," or the course on "NUMERICAL ANALYSIS FOR ONE-DIMENSIONAL STREAMFLOW MODELS (G0194)," or have equivalent training or experience with numerical analysis of ground-water flow problems using FORTRAN IV; and (4) should have current or planned involvement in a project requiring knowledge of water movement in the unsaturated zone. Attendance limited to 20.

April 6-8

Description: NATIONAL WATER USE DATA SYSTEM (NWUDS) WORKSHOP (G0964). The workshop is designed to familiarize water-use project personnel with the National Water Use Data System (NWUDS). Emphasis will be placed on "hands-on" experience with: (1) coding the NWUDS national level aggregated coding forms, (2) executing the edit/update program; and (3) executing the NWUDS Retrieval and Report Programs (batch and interactive retrievals). It is required that: (1) attendees bring water-use data for at least one functional use category for the purpose of updating during the workshop. The data should be coded and keypunched prior to the workshop; (2) one attendee from each

Table 3.--Description of courses--Continued

	<p>State should be prepared to make an overview presentation to their water-use data management system and interface to the NWUDS. The overview may address: (1) Current automated or manual State level data processing activities, and (2) proposed State level water-use data system.</p> <p><u>Course Coordinator:</u> C. F. Merk.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Two nominees from each district will be selected. The attendees should be water-use project personnel from WRD or cooperator agencies. This workshop is designed for (1) the project leader engaged in the management/operations of the cooperative water-use data collection program and (2) the computer analyst/specialist engaged in (a) the data processing management operations of the State level water-use data system and (b) updating the National Water Use Data System. Attendance limited to 40.</p>
April 19-23	<p><u>Description:</u> REAL-TIME DATA MANAGEMENT (HYDRECS) (G0124). This workshop is designed to familiarize personnel with the management of satellite data collection system networks and associated data processing activities. Emphasis will be placed on Hydrologic Data Real-Time Computer Processing System (HYDRECS) and processing satellite telemetry data through WATSTORE programs. Participants will be provided "hands-on" experience with HYDRECS. An overview of real-time hydrologic data collection activities will be presented.</p> <p><u>Course Coordinator:</u> S. E. Dreyer.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel who are presently or soon will be engaged in: (1) Management of data collection platform networks or (2) data processing activities for the real-time telemetry data may attend. Those personnel nominated for the subject training, who presently or soon will be engaged in the field installation of satellite data collection platforms, are encouraged to attend the "SATELLITE DATA COLLECTION PLATFORM INSTALLATION AND OPERATION (G0174)" course to be held on October 5-9, 1981. Attendance limited to 20.</p>

Table 3.--Description of courses--Continued

April 20-22	<p><u>Description:</u> WATSTORE (G0944). The course includes an overview of WATSTORE, a discussion of IBM Job Control Language (JCL), input and output from the Station Header File and Daily Values File, and the retrieval of data from the Peak Flow File including Log-Pearson statistics as outlined in the Water Resources Council Bulletin 17.</p> <p><u>Course Coordinator:</u> C. R. Showen.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> This course is designed for WATSTORE users who are not members of the Survey. Attendance limited to 30.</p>
April 26-30	<p><u>Description:</u> STEP-BACKWATER AND FLOODWAY ANALYSES (G0303). The course will provide lecture and workshop sessions on the uses both of computer program E431 and of J635, which is a version that can be used to compute profiles through supercritical-flow reaches of channel. These programs are used for stage-discharge rating analyses, rating extensions, flood map0 ping, and special studies in reaches where various types of encroachment are to be studied with respect to their effects on the water-surface elevations. Hydraulic principles, theory of the step-backwater techniques, field data requirements, determination of water-surface profiles or floodway limits by computer, and the handling of unusual field conditions will be discussed.</p> <p><u>Course Coordinator:</u> J. Davidian.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Hydrologists who are involved in extension of rating curves, delineation of flood limits and studies of effects of various types of channel encroachments on the water-surface elevations in a channel may attend. Prerequisite to this course is "SURFACE-WATER HYDRAULIC ANALYSES (G0093)." Attendance limited to 20.</p>
April 26-May 7	<p><u>Description:</u> NUMERICAL ANALYSIS FOR ONE-DIMENSIONAL STREAMFLOW MODELS (G0194). The training course emphasizes in the first week, practical understanding of basic numerical analyses of the partial differential equations applicable to streamflow problems. This understanding is reinforced by the student programming simple numerical models illustrating the principal methods of analyses. In the second</p>

Table 3.--Description of courses--Continued

week, general purpose, sophisticated numerical models of one-dimensional flow are introduced. The student learns to modify the programs for these models to solve flow routing, slope-discharge, estuarine flow, transient storage above bridges, and lake circulation problems. Solutions to these problems involve treatment of data from on-going field projects.

Course Coordinator: P. H. Carrigan.

Location: National Training Center.

Attendees: Personnel must have: (1) some experience in computer programming; (2) completed a first-year course in calculus; and (3) will be immediately engaged in projects which involve numerical analyses of streamflow. Attendance limited to 16.

May 3-14
July 12-23

Description: GROUND-WATER CONCEPTS (G0761).

This course stresses the basic physical and mathematical concepts that are requisite to the effective modeling of ground-water systems. During the first week, emphasis is placed on a review of fundamentals; Darcy's Law, ground-water storage, the differential equations of flow, boundary conditions, superposition, the nature of coefficients, and analytical solutions. Finite difference concepts are developed in detail by reference to electrical analogy and the governing equations. Throughout this course attendees will reinforce theoretical concepts with laboratory exercises using electrical models, and with finite difference simulations, carried out both by hand calculation and by digital computer. The second week emphasizes applications to typical ground-water problems; the characteristics of various boundary conditions, coordinate systems and model types are evaluated. Actual flow systems will be discussed, and the group will "conceptualize" the systems and evaluate the fundamental assumptions and decisions that lead to successful modeling.

Course Coordinator: T. E. Reilly.

Location: National Training Center.

Attendees: Personnel who enroll in this course are expected to enroll subsequently in the correspondence course "FINITE DIFFERENCE NUMERICAL METHODS IN HYDROLOGY (G0041)" and "MODELING OF GROUND-WATER FLOW (G0911)" unless they have demonstrated and equivalent level of achievement. Attendees must have ground-water project experience. Attendance limited to 20.

Table 3.--Description of courses--Continued

May 10-14

Description: SEDIMENT DATA-COLLECTION TECHNIQUES (G0912). This course is a workshop providing training in the fundamentals of sediment data collection. Trainees will spend 1-2 days in the field collecting suspended-sediment and bed-material samples using most of the available samplers. Emphasis will be on careful study of the various techniques that can be used to collect representative samples of water-sediment mixtures. A brief laboratory tour and examples of sediment record computation will be included.

Course Coordinator: J. R. Ritter.

Location: District Office, Harrisburg, Pa.

Attendees: Personnel who are actively engaged in sediment activities or those who plan to become involved prior to the next presentation of the course. Attendance limited to 24.

May 17-28

Description: ONE-DIMENSIONAL SURFACE-WATER TRANSPORT MODELS (G0903). The course enables the students to write and understand computer programs for predicting the dispersive transport of various dissolved and suspended substances in unsteady surface-water flow. Emphasis will be on programming the various solution techniques in numerical analyses for the one-dimensional convective-transport equation with dispersion and distributed sources and sinks. In presenting these concepts, it will be necessary to introduce a range of specific water-quality problems, for example, problems relating to temperature and sediment. Course format will in general consist of morning lectures and afternoon programming laboratories. Upon completion of the course, the students should have a good basic understanding of the physical process, finite-difference mathematics, and a comprehensive library of programs for solving the surface-water-quality modeling problems encountered in Water Resources Division.

Course Coordinator: J. P. Bennett.

Location: National Training Center.

Attendees: Personnel must have some experience in computer programming and completed a first-year course in calculus. Attendance limited to 16.

Table 3.--Description of courses--Continued

May 25-27
August 3-5

Description: PROJECT PLANNING AND MANAGEMENT (G0064). The purpose of the workshop is to provide guidelines for improving project planning and management. It is designed for lectures and active discussion by attendees on the planning and management of projects. The agenda for the course includes: (1) how to plan a project, (2) planning project costs, (3) the ideal project, (4) how to manage a project, (5) project document file, (6) project review, (7) decision analysis, (8) non-ideal projects, (9) management principals, (10) report policy, (11) report planning and management, (12) report review and evaluation, and (13) how to improve reports.

Course Coordinator: J. E. Moore.

Location: National Training Center.

Attendees: Personnel who are or will be assigned to project management. Attendance limited to 20.

June 14-18
June 21-25
August 16-20
August 23-27

Description: WATER-QUALITY FIELD TECHNIQUES (G0042). This course provides training for personnel with limited experience in water-quality work or those who want a review of the basic techniques of sample collection and preservation, aquatic microbiology, and the use and calibration of field instruments used in all phases of water-quality data collection.

Course Coordinator: J. C. Briggs.
H. R. Feltz.

Location: National Training Center.

Attendees: Personnel who are actively engaged in collection and field analysis of water samples. Attendance limited to 24.

June 21-25

Description: GEOCHEMISTRY FOR GROUND-WATER SYSTEMS (G0212). The quantitative interpretation of hydrochemical data for ground waters will be discussed in terms of principal reaction mechanisms and their geologic environment. Consideration will be given to basic solution theory, equilibrium thermodynamics, mineral-water interactions, mass balances and the elements of mass transfer. Examples of computational analysis, relevant programs, and applications to field situations will be included. This course will be given on alternate years.

Table 3.--Description of courses--Continued

	<p>Course Coordinator: L. N. Plummer. <u>Location:</u> National Training Center. <u>Attendees:</u> Personnel must have basic familiarity with chemical analyses of natural waters and general background in chemistry equivalent to first year undergraduate university level. Attendance limited to 24.</p>
June 28-July 2	<p><u>Description:</u> SAS FOR WATER-RESOURCES DATA (G0974). This course is designed to provide attendees with an introduction to the use of Statistical Analysis System (SAS) with the seven major water-resources data files: Water Quality, Daily Values, Peak Flow, Unit Values, Ground-Water Site-Inventory, Basin Characteristics, and Header Information. The course will discuss Job Control Language (JCL) and sample problems will be run on the computer. Permanent data sets on both tape and disk will be demonstrated. Many important procedures within SAS will be applied to data from various combinations of the major files. Attendees will have the opportunity to run SAS jobs during evening sessions.</p> <p>Course Coordinator: D. V. Maddy. <u>Location:</u> National Training Center. <u>Attendees:</u> The course is intended for personnel with need to analyze water-resources data from the major files. Attendance limited to 25.</p>
July 12-16 July 19-23	<p><u>Description:</u> ADVANCED WATER-QUALITY CONCEPTS FOR TECHNICIANS (G0022). The course is designed to address the theoretical concepts of water-quality data collection with emphasis on explaining the reasons of water-quality operations, interpretation and dissemination of the results, and proper methodology. Some topics of discussion are: (1) sediment movement in streams, (2) inorganic, organic, and biological properties of water quality, (3) design and operation of field data programs, and (4) concepts of representative sampling. The technically oriented topics will be presented both as lectures and workshop seminars.</p> <p>Course Coordinator: M. O. Fretwell. <u>Location:</u> National Training Center. <u>Attendees:</u> This is an advanced course for technicians. Attendees must have completed either the course "WATER-QUALITY FIELD TECHNIQUES (G0042)," or "SEDIMENT DATA-COLLECTION TECHNIQUES (G0912)," or have a minimum of 3 years of water-quality field activities experience. Attendance limited to 24.</p>

Table 3.--Description of courses--Continued

July 12-16	<p><u>Description:</u> FUNDAMENTALS OF STREAM BIOLOGY (G0892). This workshop will emphasize the design and conduct of biological studies of stream environments. Field and laboratory activities will include the collection and processing of biological samples. Lectures will cover the theoretical aspects of stream biology with emphasis on indicator organisms and community structure.</p> <p><u>Course Coordinator:</u> P. E. Greeson.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel who are actively engaged or will be engaged in biological studies on streams. Attendance limited to 24.</p>
July 19-23	<p><u>Description:</u> GROUND-WATER FLOW SYSTEMS IN SECONDARY PERMEABILITY TERRANES (G0011). Analysis of ground-water flow in fractured rock, in limestone solution channels and in jointed igneous or metamorphic rocks is commonly based on approximations derived from the study of porous media. Though other models (analytical and numerical) that account for secondary permeability and porosity (or discrete fractures) exist, these have received little attention in ground-water applications. This course is designed to: (1) introduce geologic factors controlling secondary permeability, (2) consider utility and limitations of applying porous media models in secondary permeability terranes, (3) introduce alternative modeling concepts (such as, double porosity and discrete fractures), and (4) provide a forum for exchange of ideas from personnel conducting theoretical and practical studies in secondary permeability terranes. The course will have a format that is about equally divided between seminars and structured lectures. The seminar part of this course is intended to stimulate discussion of the factors controlling secondary permeability and the theoretical or heuristic arguments that allow predictions of ground-water flow in such terrane to be made. Attendees will be expected to contribute to the discussions, to present the results of original work or summaries of pertinent articles from the literature (30- to 40-minute presentations). This course will be given on alternate years.</p>

Table 3.--Description of courses--Continued

	<p>Course Coordinator: R. J. Sun. <u>Location:</u> National Training Center. <u>Attendees:</u> Personnel with practical or theoretical interest in secondary permeability terrane. Familiarity with the ground-water flow equations for porous media and either experience with analytical methods (well test evaluation) or with numerical models is required. Attendance limited to 16.</p>
July 26-28	<p><u>Description:</u> SEMINAR ON MECHANICS OF COMPRESSIBLE AQUIFER SYSTEMS AND LAND SUBSIDENCE (G0901). This course is based on 20 years of field and laboratory research on the mechanics of stressed aquifer systems and relates to the withdrawal of ground water, geothermal fluids, and oil and gas from unconsolidated reservoirs. The course will emphasize: (1) stress-strain characteristics and methods of deriving elastic and inelastic (recoverable and nonrecoverable) storage parameters of a compressible aquifer system; (2) the theory of hydraulic stresses and their relation to vertical and horizontal ground movement; (3) methods of measuring and predicting subsidence in areas of both active overdraft and of little or no development; and (4) the theory and application of modeling the complex treatment behavior of multiaquifer systems. Case histories will be given of selected subsidence areas where interpretive data are available.</p> <p>Course Coordinator: F. S. Riley. <u>Location:</u> National Training Center. <u>Attendees:</u> Attendees should be professional employees of the Survey or its cooperators or experienced technicians of the Water Resources Division who may be involved with field installations. Attendance limited to 24.</p>
August 2-6	<p><u>Description:</u> NATURAL RESOURCE ECONOMIC SHORT COURSE (G0714). This course is intended for persons with no formal training in economics. The objective of the course is to expose the Water Resources Division manager to an economic approach to problems in residual (or environmental) management and project design and evaluation. To do this, it is necessary to explore some basic concepts in the theory of consumer choice, production, market equilibrium,</p>

Table 3.--Description of courses--Continued

and welfare economics. Though the discussion of residuals management techniques and cost-benefit analysis is of direct interest, the basic economic concepts presented are useful in understanding the conflicts over alternative uses of natural resources, in evaluating prescriptive policies for natural resource use, and aiding in managerial resource allocation decisions.

Course Coordinator: J. E. Schefter.

Location: National Training Center.

Attendees: The course is designed for professional employees at the GS-13 and above level who are involved with program management. Attendance limited to 24.

August 9-20

Description: WATERSHED SYSTEMS MODELING (G0083). Water Resources Division hydrologists are significantly involved in disturbed watershed systems modeling applications. These applications include both urban and rural hydrologic settings, typically on small watershed systems. In most instances, both flow and water-quality aspects are of interest. In a few pioneer studies, total hydrologic modeling is involved, for example, surface-water, ground-water, and related water-quality aspects. This 2-week course will address basic watershed hydrologic processes, such as, precipitation, evapotranspiration, infiltration, runoff, overland and channel-flow routing and erosion, and sediment transport both overland and in channels. Water-quality transport will be introduced. The tools of model optimization, sensitivity testing and simulation will then be covered in the context of rural and urban watershed systems. Actual data sets for urban and rural (strip mining) cases will be utilized in illustrated computer programming examples.

Course Coordinator: M. E. Jennings.

Location: National Training Center.

Attendees: Water Resources Division employees working in watershed hydrology who have at least a basic understanding of the FORTRAN IV language. Some understanding of basic hydraulics and water-quality processes would be helpful. Attendance limited to 16.

Table 3.--Description of courses--Continued

August 9-20

Description: INTRODUCTION TO SURFACE-WATER-QUALITY MODELING (G0102). This course will provide an introduction to both the theory and practice of modeling surface-water phenomena. Subject material will focus on water-

quality problems stemming from the discharge of various types of oxygen demanding and plant growth stimulating materials. Emphasis will be placed on formulating nonconservative terms, and the general applicability of certain terms to a wide variety of water-quality phenomena. The course is designed to make use of a time variable, finite volume, transport (or box) model. Sample problems, however, will be provided for conservative terms, impoundments, and estuaries.

Course Coordinator: R. A. Smith.

Location: National Training Center.

Attendees: The course is designed for those who have an interest in the modeling of surface-water quality phenomena. Attendees should have a background in surface-water transport modeling. Attendance limited to 24.

August 23-September 3

Description: STATISTICAL APPROACH TO SURFACE-WATER HYDROLOGIC ANALYSIS (G0113), formerly entitled SURFACE-WATER HYDROLOGIC ANALYSIS. Explanation, discussion, and practice of hydrologic problems related to streamflow are given. Principal subjects covered are: (1) Statistical concepts and definitions, (2) statistical analysis of streamflow data using computer programs, (3) regionalization of streamflow characteristics, (4) extending streamflow records in time, (5) synthetic hydrology, (6) trend analysis, (7) statistical evaluation of flood-frequency estimates based on rainfall-runoff modeling, (8) comparison of procedures for estimating flood peaks, and (9) selected research topics.

Course Coordinator: W. O. Thomas, Jr.

Location: National Training Center.

Attendees: Personnel must: (1) Be actively engaged or anticipate involvement in surface-water hydrologic projects; (2) have previous

Table 3.--Description of courses--Continued

	<p>instruction in statistics (college level course, correspondence course, etc.); (3) be mathematically inclined with a desire to better understand statistical techniques used to analyze and interpret surface-water data. Personnel who attended the previous version of this course are eligible to take this course. Attendance is limited to 30.</p>
August 23-September 3	<p><u>Description: MODELING TRANSPORT OF GROUND-WATER SOLUTES (G0801).</u> The purpose of this course is to introduce Water Resources Division professionals, already proficient in ground-water flow modeling, to modern, numerical methods for modeling transport of conservative and reacting ground-water solutes. At the outset, the following fundamental concepts are introduced: (1) partial differential equations of solute transport in porous media; and (2) rudiments of chemistry required, when chemical effects are considered. Subsequently, the Galerkin numerical method is presented starting with basic principles. In order to learn the essence of this method and the ways of introducing the chemical influence into transport models, the students themselves will program Galerkin models (with linear basis functions) for one-dimensional transport of solutes. Systems treated will be ones with constant water density and either simple (one component, linear) or more complex (two component, either linear or nonlinear) chemical effects. Some of these models may be useful in connection with problems involving recharge-water solutes. In the second part of the course, students will be taught how to use three realistic transport models. These models describe transport of ground-water solutes which are either conservative or subject to simple (single component, linear) chemical effects. These models will be two-dimensional, will assume constant water density, and will employ, respectively, a finite difference method, the method of characteristics and the Galerkin-finite-element techniques. In addition, a brief introduction will be given to a three-dimensional finite difference, transport model, which allows for variation in water density and viscosity.</p>

Table 3.--Description of courses--Continued

	<p>Course Coordinator: J. Rubin.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Personnel must: (1) be experienced in quantitative ground-water analysis; (2) have had ample experience with computer programming; (3) be familiar with differential equations of ground-water flow; (4) have some background in chemistry or geochemistry including at least a high school course in chemistry; and (5) have taken the Water Resources Division course on "MODELING OF GROUND-WATER FLOW (G0911)," or have equivalent training or experience with digital modeling of ground-water systems, using FORTRAN IV. Attendance limited to 20.</p>
September 13-24	<p><u>Description:</u> SURFACE-WATER HYDRAULIC ANALYSES (G0093). The course combines lectures and analyses of surface-water hydraulic problems. The subject matter includes: (1) stage-fall-discharge ratings, (2) rating of control structures, (3) computation of water-surface profiles as related to rating-curve analysis and flood mapping, (4) hydraulics of culvert openings and of bridges, including bridge-site analysis, and (5) indirect measurements of discharge by the slope-area, contracted-opening, culvert, and flow-overdam methods.</p> <p>Course Coordinator: J. Davidian.</p> <p><u>Location:</u> National Training Center.</p> <p><u>Attendees:</u> Hydrologists who: (1) need to apply hydraulic principles in their present or future assignments; (2) have credit for a college-level course in hydraulics or fluid mechanics; (3) have taken the course "BASIC HYDRAULIC PRINCIPLES (G0043);" or (4) have completed the Water Resources Division correspondence course "THE MECHANICS OF FLUIDS (G0554)." This course is a prerequisite to the course "STEP-BACKWATER AND FLOODWAY ANALYSES (G0303)." Attendance limited to 16.</p>
September 13-24	<p><u>Description:</u> FUNDAMENTALS OF LAKE LIMNOLOGY (G0052). The workshop emphasizes the practical conduct of limnological studies with special emphasis on the development of competence in lake techniques. Field endeavors will include the study of physical and chemical lake dynamics and of biological productivity. Attendees will be instructed on the proper design of limnological investigations.</p>

Table 3.--Description of courses--Continued

Course Coordinator: (To be announced).

Location: The workshop will be held at an appropriate field study site to be announced about 2 months prior to scheduled course date.

Attendees: Personnel who are actively engaged or will be engaged in lake studies. Attendance limited to 20.

Table 4.--Video-tape and correspondence-course training

VIDEO-TAPES

Description: The Training Center has a color multicamera television system for recording the training courses presented at the Center. A portable battery-powered color system is used to record selected field activities. The video tapes are for 1/2-inch helical scan video recorders or 3/4-inch video cassette recorders. The tapes are compatible for either color or black and white recorders that conform to EIAJ standards.

The video tapes that are available from the Training Center are listed in the publication entitled, "U.S. Geological Survey, Water Resources Division, Videotape Catalog." The tapes are on file at the U.S. Geological Survey, National Training Center, Mail Stop 414, Denver Federal Center, Lakewood, CO 80225, and may be received on a limited-time loan by written request to that office. Information on the availability of any tape may be obtained by calling the Training Center (FTS 234-2600, or if calling commercially, 303 234-2600).

CORRESPONDENCE
COURSE

Description: THE MECHANICS OF FLUIDS (G0554).

An advanced correspondence course in fluid mechanics.

Location: Course may be obtained from the U.S. Geological Survey, WRD, Manpower Section, Mail Stop 406, Reston, VA 22092.

Enrollees: Personnel having at least one basic course in hydraulics or fluid mechanics. Personnel from agencies other than the Survey also may enroll in this course.

CORRESPONDENCE
COURSE

Description: FINITE DIFFERENCE NUMERICAL METHODS IN HYDROLOGY (G0041). The course contains 12 lessons and is designed for Water Resources Division employees desiring to learn the fundamentals of numerical techniques for approximate solutions to many different types of hydrologic problems. It is good preparation for the introductory modeling courses offered at the National Training Center, and it also enhances communication with modeling colleagues. Although most of the problem examples are from groundwater hydrology, the basic finite-difference methodology presented is applicable to all disciplines.

Table 4.--Video-tape and correspondence-course training--Continued

Location: Registrants should apply through channels to Regional Hydrologists who will furnish names to the Chief, Manpower Section. The only cost involved is the purchase of the required two textbooks. The course is offered once a year and will be announced by training memorandum.

Enrollees: Prerequisites are algebra and introductory calculus. Based on trial runs, approximately 80 hours are necessary to complete the assigned reading and problem sets. Calculations may be made by hand or mini- or desk calculator.



