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Department of the Interior
United States Geological Survey
YUCCA MOUNTAIN PROJECT
Monthly Highlights and Status Report
JANUARY 1991

DISCLAIMER

Quality Assurance checks on data contained in this report have been performed only to determine that the data have been obtained and documented properly. Any information is preliminary and subject to change as further analyses are performed. This report has not been reviewed for conformity with U.S. Geological Survey technical and editorial standards and stratigraphic nomenclature. Company names are for descriptive purposes only and do not constitute endorsement by the U.S. Geological Survey.

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TABLE OF CONTENTS

1.2.1 SYSTEMS 1

WBS 1.2.1.3 Technical Data Base Management 1
WBS 1.2.1.3.5 Technical Data Base Input 1

1.2.3 SITE 1

WBS 1.2.3.1 Management and Integration 1

WBS 1.2.3.2 Geology 7
WBS 1.2.3.2.2 Rock Characteristics 7
WBS 1.2.3.2.2.1 Geologic Framework of the Yucca Mountain Site 8
WBS 1.2.3.2.2.1.1 Vertical and Lateral Distribution of Stratigraphic Units within the Site Area 8
WBS 1.2.3.2.2.1.2 Structural Features within the Site Area 9
WBS 1.2.3.2.8 Preclosure Tectonics 11
WBS 1.2.3.2.8.4 Preclosure Tectonics Data Collection and Analysis 11
WBS 1.2.3.2.8.4.1 Historical and Current Seismicity 11
WBS 1.2.3.2.8.4.3 Quaternary Faulting within 100 km of Yucca Mountain 12
WBS 1.2.3.2.8.4.4 Quaternary Faulting within Northeast-Trending Fault Zones 13
WBS 1.2.3.2.8.4.6 Quaternary Faulting within the Site Area 13
WBS 1.2.3.2.8.4.7 Subsurface Geometry and Concealed Extensions of Quaternary Faults 14
WBS 1.2.3.2.8.4.10 Geodetic Leveling 15
WBS 1.2.3.2.8.4.12 Tectonic Models and Synthesis 16

WBS 1.2.3.3 Hydrology 16
WBS 1.2.3.3.1 Geohydrology 16
WBS 1.2.3.3.1.1 Description of the Regional Hydrologic System 17
WBS 1.2.3.3.1.1.1 Precipitation and Meteorological Monitoring for Regional Hydrology 17
WBS 1.2.3.3.1.1.2 Runoff and Streamflow 18
WBS 1.2.3.3.1.1.3 Regional Ground-Water Flow System 20
WBS 1.2.3.3.1.1.4 Regional Hydrologic System Synthesis and Modeling 22
WBS 1.2.3.3.1.2 Unsaturated Zone Hydrology 23
WBS 1.2.3.3.1.2.1 Unsaturated Zone Infiltration 23
WBS 1.2.3.3.1.2.3 Percolation in the Unsaturated Zone - Surface Based Study 25
WBS 1.2.3.3.1.2.4 Percolation in the Unsaturated Zone - ESF Study 30
WBS 1.2.3.3.1.2.7 Unsaturated Zone Hydrochemistry 33
WBS 1.2.3.3.1.2.8 Fluid Flow in Unsaturated Zone Fractured Rock 35
WBS 1.2.3.3.1.2.9 Site Unsaturated Zone Modeling and Synthesis 37
WBS 1.2.3.3.1.2.10 Prototype Hydrologic Tests that Support Multiple Site Characterization Activities 38
WBS 1.2.3.3.1.3 Saturated Zone Hydrology 40
WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-Water Flow System 40
WBS 1.2.3.3.1.3.2 Saturated Zone Hydrochemistry 43
WBS 1.2.3.3.1.3.3 Saturated Zone Hydrologic System Synthesis and Modeling 44
WBS 1.2.3.3.2 Preclosure Hydrology 45
WBS 1.2.3.3.2.1 Flood Recurrence Intervals and Levels at Potential Locations of Surface Facilities 45

WBS 1.2.3.6 Climatology and Meteorology 46
WBS 1.2.3.6.2 Climatology 46
WBS 1.2.3.6.2.2 Effects of Future Climatic Conditions on Hydrologic Characteristics 46
WBS 1.2.3.6.2.2.1 Quaternary Regional Hydrology 46
WBS 1.2.3.6.2.2.2 Future Regional Hydrology due to Climate Changes 49

1.2.5 REGULATORY AND INSTITUTIONAL 50

WBS 1.2.5.2 Licensing 50
WBS 1.2.5.2.5 Study Plan Coordination 50

WBS 1.2.5.4 Environment 51
WBS 1.2.5.4.8 Water Resources 51

1.2.9 PROJECT MANAGEMENT 52

WBS 1.2.9.1 Management and Integration 52
WBS 1.2.9.1.1 Management 52
WBS 1.2.9.1.4 Records Management 53

WBS 1.2.9.2 Project Control 55

WBS 1.2.9.3 Quality Assurance 55
WBS 1.2.9.3.1 Quality Assurance Program Development 55
WBS 1.2.9.3.2 Quality Assurance - Audits and Surveillances 56
WBS 1.2.9.3.3 Quality Assurance - Quality Engineering 57
WBS 1.2.9.3.4 Quality Assurance - Quality Overview 58

ACRONYM LIST

A&E ..... architectural and engineering
ABC ..... American Borate Corporation
ACD ..... advanced conceptual design
ACM ..... alternative conceptual model
ACNW ..... Advisory Committee on Nuclear Waste
ACP ..... Area Characterization Plan
ACS ..... American Chemical Society
ACWP ..... actual cost of work performed
ADP ..... automated data processing
AEC ..... Atomic Energy Commission
AECB ..... Atomic Energy Control Board
AECL ..... Atomic Energy of Canada, Ltd.
AEG ..... Association of Engineering Geologists
AFOS ..... Automated Field Operating System
AFR ..... Audit Finding Report
AGU ..... American Geophysical Union
AIH ..... American Institute of Hydrology
ALARA ..... as low as reasonably possible
ALTS ..... Apache Leap Tuff Site
AMA ..... Assistant Manager for Administration
AMFM ..... alternative means of financing and managing
AMP ..... Administrative Management Procedure
ANS ..... American Nuclear Society
ANSI ..... American National Standards Institute
ANSTO ..... Australian Nuclear Science and Technical Organization
AO ..... Administrative Officer
AP ..... Administrative Procedure
APQ ..... Administrative Procedure Quality
ARR ..... Area Recommendation Report
ARS ..... Automated Records System
ASA ..... American Statistical Association
ASME ..... American Society of Mechanical Engineers
ASQC ..... American Society for Quality Control
ASR ..... Annual Status Report
ASTM ..... American Soceity for Testing and Materials
ATC ..... Asynchronous Terminal Concentrator
ATLAS ..... Alternatives to License Application Strategies
ATS ..... Activity Tracking System
AVL ..... Approved Vendors List
BA ..... Biological Assessment
BAC ..... budgets at completion
BBC ..... British Broadcasting Company
BBS ..... Bulletin Board System
BCWP ..... budgeted cost for work performed
BCWS ..... budgeted cost for work scheduled
BDR ..... Basic Data Recorder
BFD ..... Basis for Design
BG&H ..... Bond Gold and Hydrosearch

BGRA ..... Branch of Geologic Risk Assessment
BLM ..... Bureau of Land Management
BP ..... before present
BPA ..... blanket purchase agreement
BPO ..... blanket purchase order
BQA ..... Branch of Quality Assurance
BRC ..... below regulatory concern
BRG ..... Branch of Central Regional Geology
BSR ..... Bi-annual Status Report
BWIP ..... Basalt Waste Isolation Project
C/SCR ..... Cost and Schedule Change Report
C&C ..... consultation and cooperation
CA ..... Construction Authorization
CADD ..... Computer-Aided Drafting and Design
CAE ..... Computer-Aided Engineering
CAM ..... Cost Account Manager
CAP ..... cost account plan
CAR ..... Corrective Action Report
CASY ..... Committee for the Advancement of Science in the YMP
CATS ..... Corrective Action Tracking System
CBI ..... Controlled Blasting Investigation
CCB ..... Change Control Board
CCC ..... Configuration Control Committee
CD ..... Consultative Draft
CDP ..... Career Document Profile
CDR ..... Conceptual Design for the Repository
CFR ..... Code of Federal Regulations
ChemTrec ..... Chemical Transportation Emergency Center
CHLW ..... commercial high-level waste
CIRF ..... Configuration Identification Request Form
CMR ..... Branch of Central Mineral Resources
COB ..... close of business
COGS ..... Computer-Oriented Geological Society
COSIM ..... conditional simulation
CPR ..... Cost Performance Report
CR ..... Central Region
CRF ..... Central Records Facility
CRF ..... Comment Response Form
CRG ..... Central Regional Geology
CRGB ..... Central Regional Geology Branch
CRW ..... comment resolution workshop
CSCS ..... Cost Schedule Control System
CSM ..... Colorado School of Mines
CVO ..... Cascade Volcanoes Observatory
CY ..... calendar year
D&E ..... development and evaluation
DAA ..... Design Acceptability Analysis
DAS ..... data acquisition system
DCP ..... data collection platform
DDP ..... Director's Decision Plan
DEC ..... Digital Equipment Corporation

DECUS ..... Digital Equipment Corp Users Group
DEIS ..... Draft Environmental Impact Statement
DFC ..... Denver Federal Center
DHLW ..... defense high-level waste
DISA ..... Downhole Instrument Station Apparatus
DOE ..... Department of Energy
DOE/HQ ..... Department of Energy Headquarters
DOE/NV ..... Department of Energy/Nevada Operations Office
DOE/NVO ..... Department of Energy/Nevada Operations Office
DOP ..... Department Operating Procedures
DOT ..... Department of Transportation
DR3M ..... Distributed Routing Rainfall-Runoff Model
DRI ..... Desert Research Institute
DRMS ..... Data Records Management System
DRS ..... document review sheet
DTN ..... document transmittal notice
DTP ..... Detailed Test Plan
DWMD ..... Defense Waste Management Department (REECo)
DWPF ..... Defense Waste Processing Facility
DVNM ..... Death Valley National Monument
EA ..... Environmental Assessment
EAC ..... estimate at completion
EAEG ..... Euroean Association of Exploration Geophysicists
EBS ..... engineered barrier system
ECR ..... Engineering Change Report
EDBH ..... engineered design borehole
EDF ..... Environmental Defense Fund
EEI ..... Edison Electric Institute
EEP ..... Emergency Evaluation Plan
EFAP ..... Environmental Field Assessment Plan
EIA ..... Emergency Information Administration
EIS ..... Environmental Impact Statement
EKES ..... Electonic Keyed-Entry System
EM ..... electromagnetic
EMP ..... electron-microprobe
EPA ..... Environmental Protection Agency
EPRI ..... Electric Power Research Institute
ERDA ..... Energy Research and Development Administration
EROS ..... Earth Resource Observatory System
ERTP ..... Environment Requirements Training Program
ES ..... exploratory shaft
ESF ..... Exploratory Shaft Facility
ESQAT ..... Earth Science Quality Assurance Team
ESR ..... electron spin resonance
ESTC ..... Exploratory Shaft Test Coordination
ESTP ..... Exploratory Shaft Test Plan
ESTP-C ..... Exploratory Shaft Test Plan Committee
EV ..... earned value
FEHMS ..... Finite Element Heat Mass and Stress
FEIS ..... Final Environmental Impact Statement
FEMA ..... Federal Emergency Management Agency
FFS ..... Federal Financial System

FFS ..... Federal financial system
FID ..... Flame Ionization Detector
FIS ..... Federal interim storage
FITS ..... Facilities Important to Safety
FMMG ..... Fracture Matrix Mesh Generator
FP ..... final procedures
FPC ..... final procurement and construction
FQI ..... Federal Quality Institute
FR ..... Federal Register
FRD ..... Functional Requirement Document
FRHP ..... Fractured Rock Hydrology Program
FSN ..... Fenix and Scisson, Nevada
FSU ..... Florida State University
FTE ..... full-time equivalent
FWP ..... field work proposal
FY ..... fiscal year
G&A ..... Goodson and Associates
GAO ..... Government Accounting Office
GCM ..... Global Climate Model
GCP ..... Geochronological Procedure
GD ..... Geologic Division
GEOEAS ..... Geostatisical Environmental Software
GETT ..... grants equal to taxes
GID ..... Ground Water Site Investigation
GIS ..... Graphic Information System
GOCO ..... government-owned contractor-operated
GOES ..... Geostatisical Environmental Operational Satellite
GP ..... Geologic Procedure
GPO ..... Government Printing Office
GPP ..... Geophysical Procedure
GPR ..... ground-penetrating radar
GPS ..... global positioning satellite
GQA ..... Graded Quality Assurance
GRESS ..... Gradient Enhanced Software System
GSA ..... Geological Society of America
GSA ..... General Services Administration
GSIS ..... Geoscientific Information System
GTUF ..... G-Tunnel Underground Facility
GW ..... ground water
GWE ..... Gigawatts Electrical
GXP ..... Geochemical Procedure
H&N ..... Holmes and Narver
HIP ..... Hydrologic Investigations Program (formerly NHP)
HLRW ..... high-level radioactive waste
HLW ..... high-level waste
HP ..... Hewlett Packard
HP ..... Hydrologic Procedure
HQ ..... Headquarters
HRF ..... Hydrologic Research Facility
HRMP ..... Hydrology and Radionuclide Migration Program
HSPF ..... Hydrological Simulation Program
IBM ..... International Business Machines

ICG ..... International Geologic Congress
ICN ..... Interim Change Notice
IFS ..... Iterated Function Systems
IGT ..... Institute of Gas Technology
ICWG ..... Interface Control Working Group
IDAS ..... Integrated Data Acquisition System
IDS ..... Information Data System
IFS ..... Iterated Function System
IG ..... Integration Group
IGT ..... Institute of Gas Technology
IHLWM ..... International High Level Radioactive Waste Management
IMS ..... Information Management System
INEL ..... Idaho National Engineering Laboratory
INSTAAR ..... Institute of Arctic and Alpine Research
INTRAVAL ..... International Transport Code Validation
IR ..... infrared
IRG ..... Interagency Review Group
ISA ..... Instrument Society of America
ISD ..... Information Systems Division
ISO ..... International Standards Organization
IVV ..... Independent Verification and Validation
JGR ..... *Journal of Geologic Research*
LA ..... license application
LACT ..... laser alignment and centering target
LAN ..... local area network
LANL ..... Los Alamos National Laboratory
LBL ..... Lawrence Berkeley Laboratories
LCS ..... Liquid Scintillation Counter
LDRP ..... litigation discovery request procedure
LLNL ..... Lawrence Livermore National Laboratory
LLP ..... Lightning Location & Protection, Inc.
LLW ..... low-level waste
LOE ..... level of effort
LRC ..... Local Records Center
LRE ..... latest revised estimate
LRP ..... long-range planning
LRS ..... Litton Resource System
LSP ..... laser safety plan
LSS ..... Licensing Support System
LWS ..... Lathrop Wells aeromagnetic survey
LV ..... Las Vegas
MADS ..... Meteorological Alert Distribution System
MCL ..... Maximum Contaminant Level
MEDA ..... Meteorological Data Acquisition Network
MGDS ..... Mined Geologic Disposal System
MIC ..... Management Information Center
MISIS ..... Micro Integrated Storm Information System
MLT ..... materials testing laboratory
MMDS ..... Martin Marietta Data Systems
MOT ..... Management Overview Team
MOU ..... Memorandum of Understanding
MPBA ..... multipurpose borehole activity

MPBH ..... multipurpose borehole
MPM ..... Management Procedure Manual
MPU ..... Manuscript Prep Unit
MRIR ..... Material Receiving and Inspection Report
MRS ..... monitored retrievable storage
MSA ..... major system acquisition
MSHA ..... Mine Safety and Health Administration
MSL ..... mean sea level
MT ..... magneto-telluric
M&TE ..... measuring and test equipment
MTU ..... metric tons of uranium
MW ..... mixed waste
NARUC ..... National Association of Regulatory Utility Commissioners
NBS ..... National Bureau of Standards (now NIST)
NCAR ..... National Center for Atmospheric Research
NCR ..... Nonconformance Report
NEA ..... Nuclear Energy Agency
NEPA ..... National Environmental Policy Act
NFS ..... Nuclear Fuel Services
NHP ..... Nuclear Hydrology Program (now HIP)
NIST ..... National Institute of Standards and Technology
NMD ..... National Mapping Division
NMIMT ..... New Mexico Institute of Mining and Technology
NNWSI ..... Nevada Nuclear Waste Storage Investigation
NOAA ..... National Oceanic and Atmospheric Administration
NOO ..... Nevada Operations Office
NPS ..... National Park Service
NRC ..... Nuclear Regulatory Commission
NRP ..... National Research Program
NSTF ..... near-surface test facility
NTC ..... National Training Center
NTS ..... Nevada Test Site
NTSO ..... Nevada Test Site Office
NVO ..... Nevada Operations Office
NWF ..... Nuclear Waste Fund
NWIS ..... Nevada Water Information System
NWIS ..... National Water Information System
NWM ..... Nuclear Waste Management
NWN ..... *Nuclear Waste News*
NWPA ..... Nuclear Waste Policy Act
NWPO ..... Nuclear Waste Projects Office
NWQL ..... National Water Quality Laboratory
NWTRB ..... Nuclear Waste Technical Review Board
OBS ..... organization breakdown structure
OCRWM ..... Office of Civilian Radioactive Waste Management
OF ..... Open file
OFR ..... open-file report
OGR ..... Office of Geologic Repositories
OMB ..... Office of Management and Budget
OMR ..... Office of Mineral Resources
OPCNM ..... Organ Pipe Cactus National Monument
OPFM ..... Office of Project and Facilities Management

OPIO	Office of Policy, Integration, and Outreach
ORM	Office of Resource Management
ORNL	Oak Ridge National Laboratory
OSTS	Office of Storage and Transportation Systems
P&S	planning and scheduling
PA	performance assessment
PAC	planning and control
PACE	Performance Assessment Calculation Exercise
PACS	Planning and Control System
PAGEOPH	*Pure and Applied Geophysics*
PAGIS	Performance Assessment of Geological Isolation Systems
PAL	Project Acronym List
PAMP	Performance Assessment Management Plan
PAP	Performance Assessment Plan
PASP	Performance Assessment Strategy Plan
PBEI	prototype blast effects on instrumentation
PBQ&D	Parson, Brinkerhoff, Quade, and Douglas
PBS	pyramid beam splitter
PC	personal computer
PCBI	Prototype Controlled Blasting Investigation
PCCB	Program Change Control Board
PCM	pivoting camera mount
PCSB	Program Cost and Schedule Baseline
PC&TS	Program Coordination and Technical Support
PDCR	prototype dry coring of rubble
PDHI	prototype drill hole instrumentation
PDM	Problem Definition Memorandum
PDS	Project Decisions Schedule
PEET	prototype excavation effects test
PI	Principal Investigator
PIP	Prototype Investigation Plan
PIR	Precision Infrared Radiometer
PL	Public Law
PMF	probable maximum flood
PMIS	Program Management Information System
PMP	Program Management Plan
PMR	performance measurement review
PMS	Program Management System
PNL	Pacific Northwest Laboratories
PPWE	prototype pore-water extraction
PQM	Project Quality Management
PRBP	project review briefing package
PRC	Project Records Center
PRDA	Program Research and Development Announcement
PRESS	Project-related Engineering and Scientific Studies
PRMS	Precipitation Runoff Modeling System
PSAR	Preliminary Safety Analysis Report
PSI	pounds per square inch
PTP	Prototype Test Plan
PTS	Petroleum Testing Services
QA/QC	quality assurance/quality control
QA	Quality Assurance

QAG	Quality Assurance Grading
QAGR	Quality Assurance Grading Report
QALA	Quality Assurance Level Assignment
QALAS	Quality Assurance Level Assignment Sheet
QAM	Quality Assurance Manager
QAP	Quality Assurance Program
QAPD	Quality Assurance Program Description
QAPO	Quality Assurance Project Officer
QAPP	Quality Assurance Program Plan
QAR	Quality Assignment Records
QARD	Quality Assurance Requirements Document
QASC	Quality Assurance Support Contractor
QMP	Quality Management Procedure
QMPR	Quality Management Policies and Requirements
QRA	Quality Related Activities
QVC	Quality Verification Check
QWL	quality of work life
R&D	research and development
R&H	receiving and handling
R&LSD	Research and Laboratory Services Division
RALD	right angle laser deflectometer
RAM	responsibility assignment matrix
RASA	Regional Aquifer Study Assessment
RASRA	radial arm strike rail assembly
RCR	Regional Characterization Report
RCRA	Resource Conservation and Recovery Act
REBS	Radiation Energy Balance Systems
REECo	Reynolds Engineering and Electrical Company
RFP	Request for Proposal
RIB	Reference Information Base
RIS	Records Information System
RMF	Records Management Facility
RMNMD	Rocky Mountain National Mapping Division
RMP	Records Management Plan
RMS	Records Management System
ROD	Record of Decision
RPC	Report Package Collection
RQPG	right angle prism goniometer
RRL	reference repository location
RSN	Raytheon Services Nevada
RTISA	request to initiate site activity
RW	radioactive waste
RWMS	Radioactive Waste Management Site
s-p	surface-propagated
SA	study activities
SAGEEP	Symposium on the Application of Geophysics to Engineering and Environmental Problems
SAIC	Science Applications International Corporation
SAR	Safety Analysis Report
SAS	Statistical Analysis System
SBTFRD	Surface-Based Test Facility Requirements Document
SBTP	Surface-Based Test Prioritization

SCA ..... Site Characterization Analysis
SCC ..... substantially complete containment
SCI ..... Software Configuration Items
SCIF ..... software checklist and indexing form
SCM ..... Software Configuration Management System
SCP ..... Site Characterization Plan
SDR ..... Standard Deficiency Report
SDRD ..... Subsystems Design Requirement Document
SE ..... Senior Engineer
SE&D ..... Systems Engineering and Development
SEM ..... scanning electron microscopy
SEMP ..... System Engineering Management Plan
SEPBD ..... Site and Engineering Properties Base Data
SES ..... Scientific and Engineering Software
SF ..... spent fuel
SG ..... Senior Geologist
SGB ..... Southern Great Basin
SGBSN ..... Southern Great Basin Seismic Network
SGR ..... Seismic Group Recorders
SIP ..... Scientific Investigation Plan
SIR ..... Scientific Investigations and Research
SIR ..... Special Investigative Review
SIT ..... Site Integration Team
SKB ..... Swedish Nuclear Fuel and Waste Management Company
SMF ..... Sample Management Facility
SMS ..... Sample Management System
SNF ..... spent nuclear fuel
SNL ..... Sandia National Laboratories
SNP ..... Scientific Notebook Plan
SNSN ..... Southern Nevada Seismic Network
SOBART ..... Southern Basin and Range Transects
SOC ..... Sample Overview Committee
SOIR ..... status of open items report
SOP ..... Standard Operating Procedure
SP ..... Seismic Procedure
SP ..... Study Plan
SPA ..... Study Plan Assessment
SPE ..... Society of Petroleum Engineers
SPOC ..... submersible pressurized outflow cells
SPR ..... Semi-annual Progress Report
SQA ..... Software Quality Assurance
SQAP ..... Software Quality Assurance Plan
SRD ..... system requirements and description
SRG ..... strike rail goniometer
SRP ..... Site Recommendation Report
SSF ..... software summary forms
SSF ..... specified software forms
SSR ..... Site Selection Report
SSSA ..... Soil Science Society of America
SWO ..... stop-work order
SZ ..... saturated zone
T&MSS ..... Technical and Management Support Services

TAR	Technical Assessment Review
TBD	to be determined
TBM	Tunnel Boring Method
TC	Technical Contact
TC	Training Coordinator
TCP	telescoping camera pedestal
TCPAL	Thermocouple Psychrometer Calibration
TDAG	Technical Data Advisory Group
TDD	Test Descriptions Document
TDF	task definition form
TDIF	Technical Data Information Forms
TDR	time domain reflectometry
TDS	total dissolved solids
TEF	Test and Evaluation Facility
TIC	Technical Information Center
TM	thematic mapper
TP	Technical Procedure
TPO	Technical Project Officer
TPT	Testing Prioritization Task
TQM	Total Quality Management
TRIG	Technical Review and Integration Group
TRIMS	Technical and Regulatory Information Management System
TRU	Transuranic
TVA	Tennessee Valley Authority
UNE	Underground Nuclear Explosion
UNLV	University of Nevada at Las Vegas
UNR	University of Nevada, Reno
UPS	Uninterrupted Power Supply
URL	underground research laboratory
USBR	U.S. Department of the Interior Bureau of Reclamation
USDI	U.S. Department of the Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Trans Mercator
UZ	unsaturated zone
UZFRHP	Unsaturated Zone Fractured Rock Hydrology Project
UZIG	Unsaturated Zone Interest Group
UZSBP	Unsaturated Zone Surface-Based Borehole Project
VAR	Variance Analysis Report
VARS	Video Archival Retrieval System
VLF	very low frequency
VOC	Validation Oversight Committee
VOG	Validation Oversight Group
VSP	vertical seismic profiling
WA	Western Atlas
WAC	Waste Acceptance Criteria
WAS	Work Authorization Submission
WBS	work breakdown structure
WIPP	Waste Isolation Pilot Plant
WIT	Working Integration Team
WMSD	Waste Management Systems Description

WNRE ..... Whiteshell Nuclear Research Establishment
WORM ..... Write Once Read Many
WP ..... waste package
WRD ..... Water Resources Division
WRI ..... Water Resources Investigations
WRIR ..... Water Resources Investigations Report
WRR ..... Water Resources Research
WSNSO ..... Weather Service Nuclear Support Office
WSP ..... Water Supply Paper
WT ..... water table
WVDP ..... West Valley Demonstration Project
YM ..... Yucca Mountain
YMP ..... Yucca Mountain Project
YMPB ..... Yucca Mountain Project Branch
YMPO ..... Yucca Mountain Project Office

1.2.1 SYSTEMS

OBJECTIVE
To integrate systems with the Geologic Repository Program and to describe the YMP Mined Geologic Disposal System (MGDS); and to evaluate the performance of the natural, engineered barrier, and total systems for meeting regulatory standards.

WBS 1.2.1.3 Technical Data Base Management

OBJECTIVE
To manage, maintain, and accumulate technical data and information produced by site characterization, design development, and performance assessment activities for the Project.

WBS 1.2.1.3.5 Technical Data Base Input
Principal Investigator - L. Hayes

OBJECTIVE
To provide the hardware, software, personnel, and procedures needed to provide data to the technical base.

ACTIVITIES AND ACCOMPLISHMENTS
A new NCR 91-18 was initiated to identify the improper use of Technical Data Information Forms (TDIF) prior to modification of QMP-8.03, R3.

A modification of QMP-8.03, R3 was prepared, approved, and became effective 1/7/91.

The preliminary draft of QMP-8.03, R4 was prepared and distributed for informal review.

A number of problems were identified and corrected related to the initial submittal of 102 data sets to the SEPDB. The SEPDB administrator has requested a quantity of additional information on each of the 102 USGS submittals and this task has been initiated.

Information was requested by and transmitted to LATA for final inclusion of the "Fault Location and Ages" item in the RIB.

As requested by T&MSS the initial task of identifying packages for the TDB concerning publication record packages presently in the Record Information System that may include data were completed.

1.2.3 SITE

OBJECTIVE
To characterize Yucca Mountain and vicinity to identify and technically qualify a possible site for the construction and operation of a mined geologic repository for high-level radioactive waste.

WBS 1.2.3.1 Management and Integration
Principal Investigator - L. Hayes

OBJECTIVE
To manage and integrate the work performed within the site WBS elements.

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

HIP is currently processing 86 YMPB-HIP Scientific Reports and 12 YMPB-LBL Scientific Reports.

The report, "Overview of the geology and hydrology of the Yucca Mountain area and a summary of the USGS on-going studies for the Yucca Mountain Project," received verbal USGS Director's approval on January 30, 1991.

The report, "Geoscientific information systems (GSIS) and three-dimensional ground-water flow modeling, Yucca Mountain, Nevada," by A. Turner, E. Ervin and J. Downey, received USGS Director's approval on January 14, 1991.

The report, "Geohydrologic and drill-hole data for test hole USW UZ-1, Yucca Mountain, Nye County, Nevada," by M. Whitfield, W. Thordarson, D. Hammermeister and J. Warner was published and distributed as OFR 90-354.

The HIP review of the following reports was completed by T. Brady: (a) "Assessment of Fracture Sampling Techniques for Laboratory Tests on Core," by G. Severson, and J. Boernge; (b) "Lubrication Theory Analysis of the Permeability of Rough-Walled Fractures," by R. Zimmerman, S. Kumar, and G. Bodvarsson; (c) "Potential Applications of Three-Dimensional Geoscientific Mapping and Modeling Systems to the Yucca Mountain Project," by A. Turner, and J. Downey; (d) "Stream Related Water-Level and Fluid-Pressure Responses in Selected Wells, Yucca Mountain," by D. Galloway, G. Patterson, and J. Gemmell; (e) "Possible Validation of the simulated Ground-Water Flow System near Yucca Mountain with Paleohydrologic Evidence," by J. Czarnecki; (f) "Monitoring Gas and Water Vapor for Chemical and Isotopic Composition at Test Hole USW UZ-1, Yucca Mountain, 1984-1990," by C. Peters, I. Yang, and D. Thorstenson; (g) "A Three-Dimensional Approach for Simulating Regional Ground Water Flow Systems in the Yucca Mountain Area," by J. Downey, K. Kolm, and E. Gutentag; (h) "Conceptual Model of the Future Ground-Water Flow Systems, Yucca Mountain Area," by K. Kolm and J. Downey; (i) "Observation on Gas Composition and Flow at Open Boreholes on the Crest of Yucca Mountain," by D. Thorstenson, E. Weeks, H. Haas, and J. Woodward; (j) "Preliminary Isotopic Data on Unsaturated Zone Flows at Yucca Mountain, Nevada," by I. Yang; (k) "Overview of the Geology and Hydrology of the Yucca Mountain Area and a Summary of the USGS on-going Studies for the Yucca Mountain Project," by A. Buono and L. Hayes; (l) "Developing a Conceptual Model of Ground-Water Flow at UE-25c-Hole Complex, Yucca Mountain," by K. Karasaki, M. Lansfeld, K. Grossenbacher, D. Galloway, and A. Geldon; (m) "Combined Analytical/Numerical Approaches to Solving Fluid-Flow Problems in the unsaturated Zone at Yucca Mountain," by R. Zimmerman, G. Bodvarsson, E. Kwicklis; (n) "Introduction to Selected U.S. Geological Survey Studies of the Yucca Mountain Area, Nevada - California, through 1989," by W. Wilson; (o) "Study of Fractal Aperture Distribution and Permeability of Fractures," by S. Kumar, R. Zimmerman, and G. Bodvarsson; (p) "Selection of Geohydrologic Boundaries for Ground-Water Flow Models, Yucca Mountain, Nevada," by J. Downey, K. Kolm, and E. Gutentag; and (q) "Origin of Ground Water in the Yucca Mountain Area - An Analog Study," by P. McKinley.

The report "Overview of the Geology and Hydrology of the Yucca Mountain Area and a Summary of the USGS on-going Studies for the Yucca Mountain Project," by A. Buono and L. Hayes was transmitted to the Regional Hydrologist for approval and to DOE for concurrence.

The following manuscripts were transmitted to the Project Office for DOE approval:

"Density Adjustment in Air-Filled Boreholes in Volcanic Rocks" by U. Schimschal (WBS 1.2.3.2.2.1.1) to be submitted to the Log Analyst.

"Aeromagnetic Map of the Beatty Quadrangle, Nevada-California" by J. Glen and D. Ponce (WBS 1.2.3.2.2.1) to be released as an Open-File Report.

"Physical Properties of Ash-Flow Tuff from Yucca Mountain, Nevada" by P. Nelson and L. Anderson (WBS 1.2.3.2.2.1) to be submitted to the Journal of Geophysical Research.

"Results of Rock Property Measurements Made on Core Samples from Yucca Mountain Boreholes, Nevada Test Site, Nevada. Part 1. Boreholes UE25a-4, -5, -6, -7. Part 2. Borehole UE25p#1" by L. Anderson (WBS 1.2.3.2.2.1) to be released as an Open-File Report.

"Morphology and Genesis of Calcic Soils on the Kyle Canyon Fan, Nevada" by M. Reheis, J. Sowers, E. Taylor, L. McFadden, and J. Harden (WBS 1.2.3.6.2.1.4) to be submitted to the journal Catena.

"Major Results of Gravity and Magnetic Studies at Yucca Mountain, Nevada" by H. Oliver, D. Ponce, and R. Sikora (WBS 1.2.3.2.2.1.1) to be submitted to the Proceedings of the International High Level Radioactive Waste Management Conference. DOE telephone approval was received for this manuscript on January 4.

"Revision of an Aeromagnetic Survey of the Lathrop Wells Area, Nevada" by V. Langenheim, S. Carle, D. Ponce, and J. Phillips (WBS 1.2.3.2.2.1) to be released as an Open-File Report.

"Close-Range Geophotogrammetric Mapping of Trench Walls using Multi-Media Stereo Restitution Software" by J. Coe, E. Taylor, and S. Schilling (WBS 1.2.3.2.4.1) to be submitted for publication in the Proceedings of the 1991 American Society of Photogrammetry and Remote Sensing Meeting.

"Seismicity and Detection/Location Threshold in the Southern Great Basin Seismic Network" and "Seismicity and Shear Strain in the Southern Great Basin of Nevada and California" by J. Gomberg (WBS 1.2.3.2.8.3). The papers are planned for companion articles to be submitted to the Journal of Geophysical Research.

"Relict Colluvial Boulder Deposits, Indicators of Climatic Change and Long-Term Slope Stability in the Yucca Mountain Region, Southern Nevada" by J. Whitney and C. Harrington (LANL) (WBS 1.2.3.2.3.1) to be submitted to the Geological Society of America Bulletin.

"Close Range Geophotogrammetric Mapping of Trench Walls Using Multi-Media Stereo Restitution Software" by J. Coe, E. Taylor, and S. Schilling (WBS 1.2.3.2.4.1) to be submitted to the Proceedings of the American Society of Photogrammetry and Remote Sensing meeting.

The following technical procedures were approved:

GPP-01, R2	Gravity Methods
GPP-18, R1	Magnetotelluric Measurements

HP-91, R1 Collection and Field Analysis of Surface-Water Samples

Technical procedures HP-199T, R0 Collection of Aquatic Micro-Organisms and HP-204, R0, Liquid Scintillation Spectrometry Method of Tritium Measurement of Water Samples were edited and returned to HIP as requested. GCP-07, R1, Mineral Separation for Geochemistry and Isotopic Analysis, was returned from the author and is in preparation for technical review.

HP-200, R0, Collection of Ground-Water Samples from Wells, is on hold and awaiting information regarding the preparation of HP-23. As a result of Observation 3 from Audit 91-01, a meeting was held regarding changes to HP-91, R2. It was agreed that Revision 3 of this technical procedure will be prepared with the agreed upon changes.

Quality Assurance Grading (QAG) Reports were prepared and submitted in accordance with AP-5.28Q for 24 Study Plan level applications. Of an initial submittal of 14 reports, 12 were approved at month end. The two rejected QAG Reports are ready for resubmittal. Including an earlier approved QAG Report, the following is a list of the 15 approved QAG Reports:

G1232212 -	Characterization of the Structural Features Within the Site Area (Except Activities 3 & 5)
G1232841 -	Historic and Current Seismicity
G1232846 -	Quaternary Faulting Within the Site Area
G1233111 -	Characterization of the Meteorology for Regional Hydrology
G1233112 -	Characterization of Runoff and Streamflow
G1233113 -	Characterization of the Regional Ground-Water Flow System
G1233121 -	Characteristics of Unsaturated-Zone Infiltration
G1233123 -	Characterization of Percolation in the Unsaturated Zone
G1233126 -	Characterization of Gaseous-Phase Movement in the Unsaturated Zone
G1233127 -	Hydrochemical Characterization of the Unsaturated Zone
G1233131 -	Characterization of the Site Saturated Zone Ground-Water Flow System
G123321 -	Characterization of Flood Potential of the Yucca Mountain Site
G1236221 -	Characterization of the Quaternary Regional Hydrology

Documents were obtained from Duke Scientific Corporation that will assist in closing out USGS-AFR-EA9001-01.

The Geologic Division (GD) was assisted with responses to and/or remedial/investigative actions for SDR-554, SDR-559, AFR-9013-03, EA9001-01,R1, CAR-89-09, CAR-91-03, NCR-90-30, NCR-90-36, NCR-90-37, NCR-91-10, NCR-91-11, NCR-91-16, and NCR-91-17.

Efforts to collect raw data used in publications were continued and reviews for QMP-2.08, QMP-5.03, and AP-5.28Q were coordinated for the GD.

A vendor qualification for the Branch of Geochemistry was initiated.

A preliminary investigation into the USGS's role in the use of AP-5.21Q, Job Packages, AP-5.32Q, Test Planning and Implementation Requirements was conducted.

J. Whelan, B. Marshall, L. Kwak, and R. Zartman (USGS) were assisted in completing the required QMP-3.03 documentation to baseline six software products. Later, assistance was given to the above people in compiling all the documentation. C. Bush (USGS) was also assisted in documenting two software products. The software CCC Chairman and Librarian met to baseline the software documentation for the eight products.

Review comments for QMP-3.03, R3 were distributed to the committee members.

Planning Documents

Study Plan 8.3.1.5.2.2, "Characterization of the Future Regional Hydrology Due to Climate Changes", by J. Downey, was reviewed by T. Brady and submitted to YMPO for review on January 16, 1991.

Study Plan 8.3.1.2.2.9, "Site UZ Modeling and Synthesis", by B. Lewis, was reviewed by T. Brady and submitted to YMPO for review on January 25, 1991.

The study plan package for Study Plan 8.3.1.5.2.2, "Future Hydrology Due to Climate Changes", by J. Downey, was submitted to the LRC by J. LaMonaca.

G. Shideler participated in the IG meeting for SCP comment response (both NWTRB and State of Nevada comments).

Quality Assurance

The HIP review of QMP-3.04, R4 was performed by W. Causseaux, T. Brady and J. LaMonaca; QMP-2.02, R5 by T. Brady; QMP-5.06, R6 by W. Causseaux; and QMP-3.03, R3 by M. Ciesnik, J. Czarnecki, R. Luckey, and R. Zimmerman.

Raw data for OFR 90-355, "Chemical analysis of water from selected wells and springs in the Yucca Mountain area, Nevada, Southeastern California," by P. McKinley, J. Long and L. Benson, was submitted to the LRC by J. LaMonaca.

The published report package including raw data for OFR 90-354, "Drilling and geohydrologic data for test hole USW UZ-1, Yucca Mountain, Nye County, Nevada, Nye County, Nevada," by M. Whitfield, W. Thordarson, D. Hammermeister, and J. Warner, was submitted to the LRC by J. LaMonaca.

J. Woolverton met with A. Flint and his meteorological staff to assess and finalize proposed actions needed to resolve deficiencies in the Meteorologic Study and M. Mustard, W. Rodman, and B. Langsteiner to discuss the strategies developed to resolve deficiencies related to the Meteorologic Study.

J. Woolverton wrote a memo to the USGS-YMPB QA office requesting that REECo be recertified as a USGS-YMPB approved vendor for calibration services.

W. Causseaux and J. Woolverton assisted HIP Principal Investigators and Section Chiefs with the completion of Quality Assurance Grading Reports for ongoing monitoring activity Study Plans.

V. Glanzman reviewed Drafts of QMP-2.08, R1, and QMP-5.03, R6.

An updated Technical Procedure Master List was updated and forwarded to the YMP-USGS QA Office as scheduled.

Six records packages were prepared and transmitted for approved technical procedures, Quality Management Procedures and/or modifications, and surveillances.

Operations

L. Roadway transmitted December accounting report to WRD; and processed, posted, and submitted GD YMP QA Level I and GD YMP Capital Equipment procurement documents to the QA office, USGS YMP Local Records Center, and Procurement and Contracts Office as required.

V. Glanzman transmitted manuscript package segments for the following reports to the LRC:

> "Ages and Stable-Isotope Compositions of Secondary Calcite and Opal in Drill Cores from Tertiary Volcanic Rocks of the Yucca Mountain Area, Nevada" by B. Szabo and T. Kyser (WBS 1.2.3.3.5.1) published in the Geological Society of America Bulletin.
>
> "Geologic Framework and Cenozoic Evolution of the Yucca Mountain Area, Nevada" by K. Fox, Jr., R. Spengler, and W. Myers (WBS 1.2.3.2.8.4.12) published in the Proceedings of the Symposium on Unique Underground Openings.

V. Glanzman attended a meeting with W. Langer, D. Appel, and T. Chaney on January 24 to revise the guidance document for QMP-2.02, R5.

R. Craig attended (a) the Prototype Management Team Meetings on January 4, 11, and 25; (b) the Test Prioritization Task meeting of Testing Experts as invited expert on January 17; (c) the Midway Valley Readiness Review meeting January 9 to ensure that any USGS-related actions were completed; (d) the TPO meeting on January 11; (e) the ESF design restart meeting on January 23; (f) an information meeting on the criteria letter for auger holes at the Hydrologic Research Facility (HRF); (g) a meeting on the soils investigation work the USBR will do to support RSN and the ESF design; and (h) project training on Orientation and Environmental Awareness (January 24) and Health and Safety (January 28).

R. Craig attended Sample Overview Committee (SOC) meeting at the Sample Management Facility on January 15 at USGS representative. Six core-sample requests from J. Stuckless, USGS, tabled at the December SOC meeting, were approved. One was disapproved due to uncertainty as to which piece was being requested.

R. Craig attended a Calcite-Silica Status meeting January 30. As the Midway Valley effort has reached a state of readiness, only the Calcite-Silica effort will have a weekly status meeting.

R. Craig attended the Integration Group Meeting as a substitute hydrology representative January 29-31. Draft responses to the recommendations in the NWTRB's Second Report to Congress were agreed to and submitted to DOE/HQ. Comments on the SCP by the State of Nevada were also addressed. This will be an ongoing effort over a number of months.

R. Craig met with A. Flint's group January 18 at the NTS to better understand the operations at the HRF.

During the past 6 months there has been much activity in setting up the new computer systems to aid the users. This included the addition to the Novell system of various management utilities to aid the administrator of the Novell system and the utilities added to the Novell menu for file maintenance for the users of the system. Various printers have been setup to allow the users access to several types of equipment. The users of the Novell system now number about 15-20 during the heavy-use part of the day.

The Sun system has undergone a number of changes, including the installation of the operating system Sun OS 4.1.1 and the setup of a Spare work station. There has also been the setup of a 1 Gigabyte disk drive and a 8mm tape backup system.

A new TCP/IP used in telecommunication has been set up on the Prime computer. The INFO package has been upgraded and the system backup CPL procedures have been modified to work with the satellite transmission to provide for a minimum of down time. Because of limited disk

space on the Prime computer and the expansion of the NWIS (National Water Information System) database, restriction on each user space has been implemented.

Recent activities concerning the update of the NWIS database have included implementation of an automated retrieval of data from Nevada and California. This system is now ready for processing and will be run at least every 2 months. This will keep our database up to date for the users of these data. The size of the NWIS database has increased during the life of this database as follows:

HIP NWIS DATABASE GROWTH

Database #1 Local		Database #2 Reference	
6/90	Established with HIP data originally kept on Colorado PRIME	3/90	Established with Nevada tape; GWSI and QW files only
7/90	size 4,164 records	7/90	size 31,248 records
	Started satellite transmission system (SATIN)		Added selected California sites and some Nevada SW sites
11/90	size 11,740 records	11/90	size 38,774 records
	Started entry of back file data		
		12/90	WAT_MOVE update of Nevada sites
1/91	size 23,268 records	1/91	size 39,134 records

Work was done on the retrieval of Ground Water site inventory data as well as water quality data to be passed through ARC/INFO programs to produce maps of the site locations. When these procedures are complete the user of NWIS will then be able to produce the ARC/INFO maps to be overlaid on other ARC/INFO maps in the GIS.

WBS 1.2.3.2 Geology
Principal Investigator - W. Langer

OBJECTIVE
To conduct geologic investigations to evaluate the suitability of the surface and subsurface environment for siting a nuclear waste repository.

WBS 1.2.3.2.2 Rock Characteristics

OBJECTIVE
To describe present and expected rock characteristics of the Yucca Mountain site and to develop a three-dimensional model of rock characteristics. (SCP Section 8.3.1.4)

WBS 1.2.3.2.2.1 Geologic Framework of the Yucca Mountain Site

OBJECTIVE
To conduct field studies, including surface and subsurface geophysical surveys and geologic mapping on the surface and in the exploratory shaft facility to characterize the geologic framework of the Yucca Mountain site. (SCP Investigation 8.3.1.4.2)

WBS 1.2.3.2.2.1.1 Vertical and Lateral Distribution of Stratigraphic Units within the Site Area
Principal Investigator - R. Spengler

OBJECTIVE
To determine the vertical and lateral variability and emplacement history of stratigraphic units and lithostratigraphic subunits within the Yucca Mountain site area. (SCP Study 8.3.1.4.2.1)

SCP 8.3.1.4.2.1.1 Surface and subsurface stratigraphic studies of the host rock and surrounding units

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
S. Mahan split and ground 45 bulk-rock samples of drill core from USW H1 and UE25B-1H for energy dispersive X-ray fluorescence analyses (K, Ca, Tl, Rb, Sr, Y, Zr, Nb, Ba, La, and Ce). The data have been added to our (BIG) data base for Yucca Mountain samples, but they have not yet been transferred to R. Spengler's data base.

S. Mahan and Z. Peterman developed a sample preparation protocol for QA Level I outcrop samples of volcanic rocks collected in September. Preparation will begin in the next two weeks.

S. Mahan devoted extra time to general support work in the mass spectrometer laboratory (filament making and degassing, source cleaning). Work continued on sample preparation and EDXRF analyses.

S. Mahan completed the chemistry of 17 water samples obtained from C. Kamineni and M. Gascoyne of the Atomic Energy of Canada, Ltd., Pinawa, Manitoba. Strontium isotope analyses have been completed on about half of these as part of a joint study designed to better understand the acquisition and modification of strontium isotope signals of ground water at recharge and along flow paths.

S. Mahan and Z. Peterman obtained samples of carbonate vein fillings for strontium isotope analyses from a collection of drill core obtained from LANL. Drill core selected by J. Stuckless, J. Whelan and Peterman for carbonate vein fillings has arrived from the Sample Management Facility and reorganization of the "Yucca Mountain Room" is being done to accommodate these new samples.

Z. Peterman prepared a proposal to the DOE Environmental Restoration Program (through J. Cole, USGS) for isotope work on rock and water samples that will be obtained in the proposed new drilling on the NTS. Existing analyses of ground water from the Ash Meadows flow system and from the Tertiary aquifer, obtained under the auspices of YMP, would be the basis for the proposed work which would be normally beneficial to both programs.

Planning Documents

Quality Assurance

Operations
Adequate temperature control in the mass spectrometer laboratory continues to be a problem. It appears to continue to be related to problems that developed during renovation of the laboratory wing. Because of this, additional calibration runs have been required for the 6-inch NBS mass spectrometer.

SCP 8.3.1.4.2.1.3 Borehole geophysical surveys

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
A paper titled "Density adjustments in air-filled boreholes in volcanic rocks" by U. Schimschal was submitted for Director's approval.

A field test of a variety of nuclear and resistivity tools was conducted at borehole G-2 at Yucca Mountain. U. Schimschal was the USGS representative for the Western Atlas field test. J. Mikesell was the USGS representative for the Schlumberger field test.

Some of the difficulties encountered by the contractors in the field are being addressed. Possible recommendations may be forthcoming after the review of the field data.

Planning Documents

Quality Assurance

Operations

WBS 1.2.3.2.2.1.2 Structural Features within the Site Area
Principal Investigator - R. Spengler

OBJECTIVE
To determine the frequency, distribution, characteristics, and relative chronology of structural features within the Yucca Mountain site area. (SCP Study 8.3.1.4.2.2)

SCP 8.3.1.4.2.2.1 Geologic mapping of zonal features in the Paintbrush Tuff

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
At the request of DOE, R. Spengler participated in a performance assessment meeting held in Las Vegas January 15 and 16, 1991. The purpose of USGS involvement was to explain current thinking on models of tectonics, basaltic volcanism, and saturated zone processes for the development of "event trees" and refinement of calculational approaches to performance assessment.

At the request of DOE, R. Spengler participated in a two-day meeting, January 16 and 17, 1991, in Las Vegas, to continue to refine the phase one approach to the prioritization of testing at Yucca Mountain. This meeting was one of a series of meetings and focused specifically on evaluating combinations of tests and their accuracies related to three top-ranked potential concerns of complex geology (aqueous), complex geology (gas flow), and basaltic volcanism.

L. Nealey organized, hosted, and participated in a USGS short course on rare earth elements

(January 18 and 22, 1991). Presentations and exercises included rare-earth element geochemistry of volcanic, sedimentary, and metamorphic rocks. Nealey demonstrated the use of electronic spreadsheets for modeling rare earth elements in igneous rocks. The course provided considerable insight into applying rare earth elements and other trace elements to studies of volcanic rock at Yucca Mountain.

L. Nealey and Z. Peterman continued to work with representatives of the Branch of Geochemistry to identify elements and geochemical analytical techniques, which are anticipated to be needed for ongoing graded level I activities. These discussions are intended to provide information to aid in instrument calibration.

Planning Documents

Quality Assurance
R. Spengler reviewed and submitted updated QA graded packages for study plans "Characterization of structural features within the site" and "Characterization of the vertical and lateral distribution of stratigraphic units within the site area."

Operations

SCP 8.3.1.4.2.2.2 Surface-fracture network studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Field work continued on fracture outcrop studies at Yucca Mountain.

Responses to GNC review comments of were completed for manuscript submitted for inclusion for a USGS Bulletin by C. Throckmorton entitled "Mapping linear features at Yucca Mountain from large-scale aerial photographs: Methods and results."

Planning Documents

Quality Assurance
An informal review QMP-2.02, R4 (USGS Personnel Qualification and Performance Evaluation) was completed.

Training was completed on AP-5.1Q.

Operations
PACS schedule revisions were completed for this Activity.

SCP 8.3.1.4.2.2.5 Seismic tomography/vertical seismic profiling

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Personnel at USGS Denver were contacted regarding use of the most recent digital well log information for several wells, including G-4. The C-hole complex was selected in addition to the G-4 because of the extent of the wells and the long sections in the saturated and unsaturated zones. These data will be used to determine the sensitivity of the different modeling approaches and to compare with previous models.

Planning Documents
Meeting with the DOE Tiger Team on the conduct of operations in this project resulted in a review of the manner in which we intend to conduct field operations. They seemed to accept the technical procedure and scientific investigation plan approach that has been adopted by USGS.

Quality Assurance
QA reading assignments were completed by various personnel.

Operations
The workscope was modified because LBL funding was lower than anticipated.

WBS 1.2.3.2.8 Preclosure Tectonics

OBJECTIVE
To develop an understanding of and to characterize the tectonic events and processes that could impact proposed repository structures, systems, or components considered to be important to safety through the operational phase and that could affect the design and operation of certain structures, systems, and components required for exercising the retrieval option. (SCP Section 8.3.1.17)

WBS 1.2.3.2.8.4 Preclosure Tectonics Data Collection and Analysis

OBJECTIVE
To provide data and analyses required by other investigations including the assessments of fault displacement and vibratory ground motion that could affect repository design or performance. (SCP Investigation 8.3.1.17.4)

WBS 1.2.3.2.8.4.1 Historical and Current Seismicity
Principal Investigator - K. Shedlock

OBJECTIVE
To compile information on reported and instrumentally recorded earthquakes that characterize the earthquake potential near Yucca Mountain and to attempt to purge explosion and triggered earthquakes related to weapons testing from existing catalogs of instrumentally determined earthquakes. (SCP Study 8.3.1.17.4.1)

SCP 8.3.1.17.4.1.2 Monitor current seismicity

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
K. Shedlock and J. Gomberg attended Warren Hamilton's class "Continental Plate Tectonics."

Two manuscripts by J. Gomberg submitted to CTR and DOE for review.

A draft of an Open-File Report summarizing the September 13-14, 1990 CASY symposium was submitted to CTR and DOE for review.

Portable seismographs were modified and final testing is underway.

The second shipment of seismometers was received and test procedures are being developed.

Planning Documents

Quality Assurance

Operations
Final negotiations are underway for a contract for the new telemetry equipment.

Arrangements were made with USNSN for deployment of USNSN stations.

WBS 1.2.3.2.8.4.3 Quaternary Faulting within 100 km of Yucca Mountain
Principal Investigator - K. Fox, Jr.

OBJECTIVE
To identify Quaternary faults within 100 km of Yucca Mountain and to characterize those faults capable of future earthquakes with magnitude such that associated ground shaking could impact design or affect performance of the waste facility. (SCP Study 8.3.1.17.4.3)

SCP 8.3.1.17.4.3.1 Conduct and evaluate deep geophysical surveys in an east-west transect crossing the Furnace Creek fault zone, Yucca Mountain, and the Walker Lane

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
A draft of a manuscript entitled, "Seismic reflection profiling across Tertiary extensional structure in the eastern Amargosa Desert, Basin and Range, USA" by T. Brocher, M. Carr, and K. Fox, Jr. was submitted to internal USGS reviewers on November 28, 1990. Since that date, the reviewers comments have been received and the manuscript is currently being modified to address these comments.

On October 31, 1990, V. Glanzman was sent T. Brocher's response to DOE Review NN1-1990-0693 of "How effectively do high-fold Vibroseis methods image the lower crust?" by Brocher and P. Hart. Nearly all of the DOE reviewers suggestions for revising the manuscript were accepted.

D. Klein contributed to the scientific investigation plan by revising and editing the section on magnetotelluric studies.

Planning Documents
In January, a draft of a section for a study plan on Quaternary faulting was sent to H. Oliver's staff.

Quality Assurance
GPP-19, R1 was approved and distributed.

Operations
In the period from November, 1990, to January, 1991, some time was spent in planning work for FY 1991 and in preparing a budget for planned work.

Substantial effort during the 1st quarter was devoted to "Evaluation of Geoelectric Methods" [WBS 1.2.3.2.8.4.7, Activity 8.3.1.17.4.7.5], whereas initial funding indications that just came out this month show that YMP priorities this FY91 are pointed to the MT work. The branch chief is aware of this and is working to resolve this problem.

Problem: Lack of response by DOE regarding our response to their review of a manuscript entitled "How effectively do high-fold Vibroseis methods image the lower crust?" by T. Brocher and P. Hart. Also, the absence of a written report on the peer panel which convened last September to evaluate the seismic reflection method near Yucca Mountain.

WBS 1.2.3.2.8.4.4 Quaternary Faulting within Northeast-Trending Fault Zones
Principal Investigator - K. Fox, Jr.

OBJECTIVE
To evaluate the potential for ground motion resulting from future movement on Quaternary left-lateral strike-slip faults located east and south of the site area. (SCP Study 8.3.1.17.4.4)

SCP 8.3.1.17.4.4.1 Evaluate the Rock Valley fault system

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Planning Documents
J. Yount completed and submitted a first draft of the study plan for Study 8.3.1.17.4.4 (Quaternary faulting within northeast-trending fault zones).

Quality Assurance

Operations

WBS 1.2.3.2.8.4.6 Quaternary Faulting within the Site Area
Principal Investigator - J. Whitney

OBJECTIVE
To evaluate the age and recurrence interval of Quaternary faulting and to analyze the probability of future faulting; to determine which faults moved during the Quaternary; and to assess fault probability on the basis of rates of faulting during the Quaternary. (SCP Study 8.3.1.17.4.6)

SCP 8.3.1.17.4.6.1 Evaluate Quaternary geology and potential Quaternary faults at Yucca Mountain

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
J. Whitney and M. Reheis attended a field trip at Yucca Mountain, Crater Flat, and Travertine Point on January 29 and 30. The field trip was designed to acquaint members of the National Academy of Sciences Panel on Coupled Processes with tectonic and hydrologic features of the Yucca Mountain area. Preparation for the field trip included reconnaissance of the Fatigue Wash Fault scarp, and the Windy Wash fault trenches (in company with J. O'Neill and K. Fox, Jr.). The scarp appears very youthful -- perhaps Late Pleistocene or Holocene, judging from its geomorphic expulsion. During the field trip, Reheis found slickensides at Trench CF-2 (Windy Wash fault) indicating left oblique slip.

J. O'Neill, J. Whitney, and Hudson completed a first draft of a report entitled "Photogeologic analysis of lineaments at Yucca Mountain, Nevada, and implications for strike-slip faulting and

orodinal bending." The report presents results of analysis of large-scale, low-sum aerial photographs of Yucca Mountain.

Planning Documents

Quality Assurance

Operations

WBS 1.2.3.2.8.4.7 Subsurface Geometry and Concealed Extensions of Quaternary Faults
Principal Investigator - W. Mooney

OBJECTIVE
To provide data on distribution of mass, magnetic gradients, geoelectric features, and seismic velocities and reflections that will aid in evaluating the continuity and geometry of Quaternary faults where concealed by Holocene and late Pleistocene surficial deposits. (SCP Study 8.3.1.17.4.7)

SCP 8.3.1.17.4.7.1 Evaluate intermediate depth (2 to 3 km) reflection and refraction methods and plan potential application of these methods within the site area

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
A draft of a manuscript entitled "Seismic reflection profiling across Tertiary extensional structure in the eastern Amargosa Desert, Basin and Range, USA" by T. Brocher, M. Carr, and K. Fox was submitted to internal USGS reviewers on November 28, 1990. Since that date, the reviewers comments have been received and the manuscript is currently being modified to address these comments.

Planning Documents
In January, a draft of a section for a study plan on Quaternary faulting was sent to H. Oliver's staff.

Quality Assurance

Operations
In the period from November, 1990, to January, 1991, some time was spent in planning work for FY 1991 and in preparing a budget for planned work.

Problem: Lack of response by DOE regarding our response to their review of a manuscript entitled "How effectively do high-fold Vibroseis methods image the lower crust?" by T. Brocher and P. Hart. Also, the absence of a written report on the peer panel which convened last September to evaluate the seismic reflection method near Yucca Mountain.

SCP 8.3.1.17.4.7.5 Evaluate surface geoelectric methods and plan potential application of these methods within the site area

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Work continued to complete plates showing unpublished dipole-dipole data on Yucca Mountain. As described before, this work is aimed toward presenting an integrated picture of data acquired on

Yucca Mountain up to about 1982. The extent of the data is indicated in Chapter 2, DOE Report YMP/90-38. In addition to the data reported in YMP90-38, there are 34 additional dipole-dipole lines which have not been released but may have value. Work in the first quarter of FY91 has been largely focused on putting this data into presentable form for analysis. Recent (January 1991) budget information indicates this work has low priority for FY91; the branch chief and D. Klein are working to resolve the apparent dilemma regarding the focus of work during October - December 1990.

Planning Documents

Quality Assurance

Operations

WBS 1.2.3.2.8.4.10 Geodetic Leveling
Principal Investigator - K. Fox, Jr.

OBJECTIVE
To evaluate possible historical and contemporary vertical displacements across potentially significant Quaternary faults within 100 km of Yucca Mountain; to characterize the historical rate of uplift and subsidence in the Yucca Mountain region; and to evaluate the possible existence of tectonic boundaries that separate domains with differing rates of uplift and subsidence. (SCP Study 8.3.1.17.4.10)

SCP 8.3.1.17.4.10.1 Relevel base-station network, Yucca Mountain and vicinity

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Approximately 15% of the leveling is complete.

Planning Documents

Quality Assurance
G. Perasso traveled to the site for the surveillance of the activity and was required to "catch-up" with the QMPs (Perasso was assigned the PI 12-03-90). All individuals with this activity have completed ALL KNOWN training requirements.

Technical Procedures need rewriting. Two NCRs issued (1 corrected - other requires rewrite of Technical Procedure).

Operations

WBS 1.2.3.2.8.4.12 Tectonic Models and Synthesis
Principal Investigator - K. Fox, Jr.

OBJECTIVE
To synthesize data relevant to tectonics; and to develop a model or range of models that establishes the causal relationship between application of tectonic forces and formation of structures observed at Yucca Mountain and vicinity; link observed rates of formation of those structures with regional rates of crustal strain; forecast changes in tectonic setting and the manner in which those changes will affect both the regional crustal strain rate and tectonic stability in the Yucca Mountain region; and estimate the effect of those changes on rate and nature of crustal strain at Yucca Mountain and vicinity and the future rate of tectonic processes at Yucca Mountain. (SCP Study 8.3.1.17.4.12)

SCP 8.3.1.17.4.12.1 Evaluate tectonic processes and tectonic stability at the site

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
K. Fox, Jr. and M. Carr participated in a performance assessment meeting at DOE Las Vegas, on January 15, 1991. The meeting was devoted to discussion of tectonic event trees.

K. Fox, Jr. and M. Carr participated in a field trip at Yucca Mountain, Crater Flat, and Travertine Point on January 29 and 30. The field trip was designed to acquaint members of the National Academy of Sciences Panel on Coupled Processes with tectonic and hydrologic features of the Yucca Mountain area.

M. Carr began revision following technical review of a report by T. Brocher, Carr, and K. Fox that presents an interpretation of seismic reflection line AV-1.

Planning Documents

Quality Assurance

Operations

WBS 1.2.3.3 Hydrology
Principal Investigator - D. Gillies

OBJECTIVE
To conduct hydrologic investigations to evaluate the suitability of the surface and subsurface environment for siting a nuclear waste repository.

WBS 1.2.3.3.1 Geohydrology

OBJECTIVE
To provide information about geohydrologic characteristics, processes, and conditions, both favorable and potentially adverse, to support resolution of the performance and design issues through the development of a credible geohydrologic model of Yucca Mountain and vicinity. (SCP Section 8.3.1.2)

WBS 1.2.3.3.1.1 Description of the Regional Hydrologic System

OBJECTIVE
To develop a conceptual model of the regional hydrologic system to assist in assessing the site's suitability to contain and isolate waste. (SCP Investigation 8.3.1.2.1)

WBS 1.2.3.3.1.1.1 Precipitation and Meteorological Monitoring for Regional Hydrology
Principal Investigator - A. Flint

OBJECTIVE
To characterize the area surrounding Yucca Mountain in terms of precipitation and other meteorological data and their relationship to surface runoff and infiltration; and to provide input into rainfall-runoff model development for the Fortymile Wash drainage basin. (SCP Study 8.3.1.2.1.1)

SCP 8.3.1.2.1.1.1 Precipitation and meteorological monitoring

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
The first rainfall of the new year fell on January 3 and 4. A low pressure center developed off the coast west of San Diego, drifted onshore, and made its way slowly across southern California, Arizona and New Mexico. Although light rain fell over most the two-day period, Yucca Mountain's areal average amounted to only 0.09 inch. The most fell at the HRF (0.14 inch). By comparison, Las Vegas received .21 inch since it was much closer to the storm than was Yucca Mountain.

A meeting of the Meteorology Working Group was held on January 28. The purpose of this working group is to organize and spearhead investigation efforts, promote efficiency, set priorities, review work, and chart the path for the immediate future. The Meteorology Working Group consists of six members.

J. Woolverton was at the HRF January 2-4 to help with the Meteorology QA Program. The Setra Barometric Pressure Transducer was received from the HIF and deployed to the field for a 30-day test with the instrument already in the field.

D. Ambos provided more assistance to the Surface Water Project, Water Resources Division, Las Vegas. D. Beck is preparing an open file report consisting of precipitation data from the Nevada Test Site raingage network for the water years 1983-1985. Ambos has been resolving questions concerning the data with Weather Service Nuclear Support Office personnel who collected the data.

The antennae and associated equipment were received for establishing a ground downlink with geostationary and polar orbiting weather satellites. REECo contractors installed a mast for the helix antenna (polar orbiting satellites) and prepared a platform for the dish antenna (GOES satellite). Cables were run into the building for connection with a PC.

J. Hevesi completed a preliminary study of historical temporal distribution of precipitation at Desert Rock, Nevada. The database used was from the period 1979-1989. A longer record exists and a more extensive study will be completed to include in this record when it is obtained. Desert Rock is located about 30 miles southeast of Yucca Mountain and will be important in characterizing the precipitation of the region from an historical perspective.

D. Ambos prepared a preliminary memo on the thunderstorms of July 14 and 15, 1990. Two storms produced significant precipitation over Yucca Mountain, in excess of 1 inch at one raingage in

Midway Valley and 1.75 inch at the HRF. The Southwest Monsoon, described in the meteorology Study Plan, was the storm type that produced the precipitation event. The subtropical jet stream had been pumping a great deal of moisture in surges from the eastern Pacific, setting the stage for heavy rainfall in southern Nevada. Other locations received larger amounts. The memo was provided to P. Glancy at his request.

D. Ambos gave a talk on the meteorology of Yucca Mountain and vicinity at the January 3 meeting of the Southern Nevada Chapter of the American Meteorological Society. He also discussed planned research topics and approaches to understanding the regional meteorology.

Planning Documents
Comment resolution for USGS YMP Study Plan 8.3.1.2.1.1, Characterization of Meteorology for Site and Regional Hydrology, was completed and will be submitted to DOE for approval in early February.

Quality Assurance
All required QA assignments were accomplished.

Operations
The monthly progress report for December was completed.

J. Gonzales placed clean plastic rain wedges with oil and antifreeze at some of the neutron holes, as required.

The abnormally cold weather has required more frequent replacement of propane tanks at all heated snow gages. All tanks were replaced in January.

WBS 1.2.3.3.1.1.2 Runoff and Streamflow
Principal Investigator - D. Beck

OBJECTIVE
To collect basic data on surface-water runoff at, and peripheral to, Yucca Mountain and its hydrologic flow system; to use the streamflow data to describe the runoff characteristics of the area and assess the response of runoff to precipitation; to assess the potential for flood hazards and related fluvial-debris hazards to the Yucca Mountain Project; and to provide basic data and interpretations of surface-water runoff to investigations that evaluate the amounts and processes of infiltration and ground-water recharge at Yucca Mountain and surrounding areas. (SCP Study 8.3.1.2.1.2)

SCP 8.3.1.2.1.2.1 Surface-water runoff monitoring

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Technical activities achieved during the month were limited in scope, due to the effects of the flu on D. Beck and D. Bauer; a three-week detail for M. Pabst to the Kansas District Office; and a two-week field camp attended by J. Johnson, student.

The latest draft of the 1983-85 data report was returned from the Nevada District office after undergoing an editorial review by the Reports Section.

D. Ambos completed a review of the tables summarizing precipitation data for the NTS compiled by

the National Weather Service Nuclear Support Office which will be included in the 1983-85 data report.

Inquiries made to observers situated in a number of locations within the study area indicated that runoff was neither observed nor reported during the month.

Planning Documents
Modifications were made to the PACS which reflected the 20% cut in funding for the surface-water activities.

Quality Assurance
Required reading assignment by the YMPB-QA office were completed and properly documented.

Quarterly water-quality proficiency testing was completed by D. Beck and D. Bauer for measuring Ph, specific conductance, and alkalinity.

Training and reading assignments for the new YMP participant, D. Blackstun, were coordinated with K. Kohn.

P. Glancy, D. Beck, D. Bauer, and D. Blackstun attended Health and Safety training at the NTS sponsored by the YMPO training center.

Modifications were made to the QA grading package for surface-water activities and submitted to the HIP-QA office on January 16.

Operations
Written permission was received on January 4 from DOE allowing the Subdistrict Office to install and operate three streamgaging stations planned for the Upper Fortymile Wash Watershed.

SCP 8.3.1.2.1.2.2 Transport of debris by severe runoff

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Vigilance for rainfall and severe runoff was continued during January.

Current literature on flooding and severe debris movement were scanned and articles appropriate to this investigation were duplicated for addition to the library. Select articles were studied in detail.

Data compilations and analysis for recent regional flooding will continue during the foreseeable future.

Planning Documents
The study plan for this activity is still undergoing DOE review.

A substantial amount of time was spent revising the PACS input to coincide with funding changes.

Quality Assurance
Much technical work will be delayed in February to allow time to prepare for and undergo an internal QA audit.

Operations
R. Carman and P. Glancy attended health and safety training at the YMP training facility at NTS.

WBS 1.2.3.3.1.1.3 Regional Ground-Water Flow System
Principal Investigator - J. Czarnecki

OBJECTIVE
To define the potentiometric distribution hydraulic properties, and recharge and discharge for the regional ground-water flow system to determine the magnitude and direction of ground-water flow. (SCP Study 8.3.1.2.1.3)

SCP 8.3.1.2.1.3.2 Regional potentiometric level distribution and hydrogeologic framework studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Planning Documents
J. Czarnecki provided a table of planned field activities for the remainder of the fiscal year as part of an information request initiated by the Nuclear Regulatory Commission.

Quality Assurance
J. Czarnecki and C. Savard installed two 1 1/4" PVC piezometer strings in two drillholes in the Amargosa Desert. During the installation, J. Ziemba (SAIC/Golden) and D. Rosenberry (USGS Central Regional Research) conducted a QA Surveillance of the activity. The Surveillance Plan on Activity 8.3.1.2.1.3 was reviewed by M. Ciesnik prior to implementation.

M. Ciesnik reviewed technical procedure HP-183, R2 (Investigation into the chloride ion leaching from fresh rhyolitic tuffs).

J. Czarnecki reviewed and provided information to assemble graded QA packages for Studies 8.3.1.2.1.3 and 8.3.1.2.1.4.

M. Ciesnik reviewed USGS Nonconformance Report 91-12 on software documentation for SCP Activity 8.3.1.2.3.1 which resulted from surveillance 91-S04. As part of this review, all pertinent documents were reviewed in order to draw the disposition for the NCR.

Operations
J. Czarnecki solicited input from other program participants regarding possible tests and activities that they would like to perform in three deep drillholes to be drilled in the Amargosa Desert by an oil company in the Spring of 1991.

J. Czarnecki and W. Oatfield installed a SOTA accelerator card, floppy disk drive controller, and 1.2 Mb disk drive in a Compaq PC-XT, which upgrades it to a 386SX class microcomputer. Oatfield also installed a 65Mb hard drive and controller in this machine.

W. Oatfield checked YMP-GWSI database #1 entries pertaining to depth-to-water measurements in the regional ground-water flow system and found a few errors that he noted. He also resolved the GWSI "Site Name" entry format problem with B. Kerans. Only capital letters may be used; no special characters such as apostrophes or commas may be used. Oatfield made GWSI retrievals from database #1 and #2 to evaluate water-level data within the regional ground-water flow system.

W. Oatfield searched USGS literature for published water level contours within the regional ground-water flow system; initiated a request to restore a key PRIME file needed for running the contouring package Surface II which was lost last December during a disk clean up; and conducted a field trip to better determine locations of selected wells within the Amargosa Desert.

W. Oatfield inquired through R. Laczniak about the apparent potentiometric high in area 12 (Ranier Mesa). Analyses are still pending to determine whether elevated water-level altitudes (1700-1800 m) are caused by perched water.

W. Oatfield worked at producing potentiometric contour lines of the Yucca Mountain area from GWSI water-level data. The resulting plots will be supplied to DOE for use in a project wide display of site characterization activities.

W. Oatfield obtained orthophoto quadrangle maps from USGS National Mapping Division (NMD) as well as Coast and Geodetic Survey elevation control data within the Amargosa Desert. He also inquired as to the availability of Global Positioning Station (GPS) equipment from within the NMD. NMD will not lend out their equipment. USGS-WRD Sacramento owns some GPS equipment which may potentially be borrowed.

J. Czarnecki assembled a data package for J. Sass (USGS Flagstaff) of temperature log data obtained in 1986 from drillholes in the Amargosa Desert.

J. Czarnecki and C. Savard performed maintenance on the project house/lab trailer in the Amargosa Desert consisting of repairing broken water pipes, fixing the furnace, and rebuilding the outside steps.

J. Czarnecki reviewed PACS budget information with D. Gillies.

SCP 8.3.1.2.1.3.3 Fortymile Wash recharge study

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
No streamflow was observed in Fortymile Wash.

C. Savard updated a bibliography on chaos and strange attractors with articles on correlation integral methodology and applications. He also updated a bibliography on recharge in arid regions.

C. Savard began development of an algorithm to illustrate the concept of sensitivity to initial conditions in nonlinear systems. The algorithm uses the Lorenz system of equations, which models thermally induced fluid convection. Model variables are plotted against time and in three variable space. The Lorenz strange attractor can also be displayed.

Planning Documents

Quality Assurance
C. Savard read QMP-17.01, R4 (USGS-YMP Records Management).

C. Savard and J. Czarnecki completed a Controlled Documents Configuration Check of Documents in their possession.

C. Savard updated his QA procedures manual to include controlled copies of HP-61, R0 and HP-89,

R0.

Operations
C. Savard led a field trip through the Fortymile Wash watershed. Attending were Levy Kroitoru (Weston) and J. Czarnecki, both of whom are analyzing hydrochemical data to help determine the path and ages of ground-water recharge.

WBS 1.2.3.3.1.1.4 Regional Hydrologic System Synthesis and Modeling
Principal Investigator - J. Czarnecki

OBJECTIVE
To synthesize hydrologic, geologic, hydrochemical, and geophysical data into a model and make a qualitative analysis of how the system is functioning; and to represent quantitative observations of hydrologic data pertaining to the ground-water flow system in a comprehensive flow model. (SCP Study 8.3.1.2.1.4)

SCP 8.3.1.2.1.4.4 Regional three-dimensional hydrologic modeling

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
J. Czarnecki helped organize and chair a meeting of the Hydrology Integration Task Force. The meeting was held 1/31/91 in Las Vegas and included representatives from LLNL, LANL, SNL, DOE/YMPO, and SAIC. The meeting centered around technical interface concerns and needs among the project participants related to characterizing flow and transport in the saturated zone.

J. Czarnecki prepared a "call for papers" package soliciting abstracts for a special session to be held at the American Geophysical Union Spring Meeting in Baltimore entitled "The Potential of Tectonism and Volcanism for Producing Significant Excursions of the Water Table."

J. Czarnecki attended a workshop in Las Vegas directed at fulfilling a DOE Headquarters request to address performance assessment issues related to the Saturated Zone. The upshot of the workshop is that SNL wants USGS input data and support in the construction of a preliminary transport model of the Saturated Zone which includes Yucca Mountain.

J. Czarnecki gave a short presentation to HIP staff and A. Robinson (DOE/LV) on the components involved in characterizing the regional ground-water flow system.

J. Czarnecki prepared an IBM compatible diskette containing computer programs, and input and output files used in the preparation of a report entitled "Simulated effects of increased recharge on the ground-water flow system of Yucca Mountain and vicinity, Nevada-California" by J. Czarnecki. The diskette was transmitted to the NRC by L. Hayes.

Planning Documents

Quality Assurance
J. Czarnecki and M. Ciesnik both performed technical reviews on USGS-QMP-3.03, R3 (Software Quality Assurance) as apart of the formal review process. Ciesnik also prepared a consolidated list of comments from four independent technical reviews of QMP-3.03, R3 resulting in a total of 55 comments.

M. Ciesnik reviewed a draft of QMP-3.14, R3 prior to a meeting of the committee responsible for

preparation of the document. Ciesnik also participated in a series of meetings related to preparation of this QMP.

M. Ciesnik reviewed a software package called MICRODEM, which was developed by the U.S. Navy and may have potential GIS applications within the project.

Operations

WBS 1.2.3.3.1.2 Unsaturated Zone Hydrology

OBJECTIVE
To develop a model of the unsaturated zone hydrologic system at Yucca Mountain that will assist in assessing the suitability of the site to contain and isolate waste. (SCP Investigation 8.3.1.2.2)

WBS 1.2.3.3.1.2.1 Unsaturated Zone Infiltration
Principal Investigator - A. Flint

OBJECTIVE
To determine the effective hydraulic conductivity, storage properties, and transport properties pertinent to unsaturated zone infiltration as functions of moisture content or potentia; and to determine the present and to estimate the future spatial distribution of infiltration rate over the repository block at Yucca Mountain. (SCP Study 8.3.1.2.2.1)

SCP 8.3.1.2.2.1.1 Characterization of hydrologic properties of surficial materials

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
M. Chornack continued work on defining the subsurface distribution of some of the tuff units on Yucca Mountain. This information will help to determine the appropriate way to account for the deep alluvium/tuff interaction.

Planning Documents
USGS YMP-SP 8.3.1.2.2.1 is awaiting DOE approval.

Quality Assurance
All QA related reading assignments were completed as required.

Operations

SCP 8.3.1.2.2.1.2 Evaluation of natural infiltration

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Work continued on (a) writing the paper "Temperature Effects on a Hand-held Neutron Moisture Meter"; (b) collecting data from the radiation instrumentation in Jackass Flats; (c) geostatistical analysis of precipitation data to determine spatial distribution of individual storm events; (d) monitoring the moisture in the shallow unsaturated zone through the neutron logging program; (e) monitoring the class A evaporation pan in Jackass Flats in order to determine potential evaporation rates; (f) writing a research paper on the calibration of tipping bucket rain gages; (g) monitoring the

instrument string, which was designed to monitor unsaturated conditions in alluvium, in a drill hole in Topopah Wash near Test Cell "C"; (h) closely monitoring propane consumption at the heated snow gages on and around Yucca Mountain; (i) the literature search for information on computer modeling of rainfall-runoff relationships, since runoff is one of the quantities in the water budget equation; and (j) collecting class A evaporation pan data from other agencies operating pans in the southern Nevada and southeastern California areas.

Calibrations were performed on one of the four presently fielded Sierra Misco tipping bucket rain gages.

A. Flint attended a meeting in Tucson, Arizona, entitled "Workshop 5 - Flow and Transport through Unsaturated, Fractured Rock".

A field trip with HRF personnel was conducted to Pagany Wash in order to help develop ideas concerning the significance of channels during infiltration events. This effort is directed at developing and refining a conceptual model of natural infiltration at Yucca Mountain.

Planning Documents
USGS YMP-SP 8.3.1.2.2.1 is awaiting DOE approval.

Quality Assurance
All QA related reading assignments were completed as required.

Preparations began for the upcoming internal audit to be conducted on February 21 and 22, 1991.

Operations
Five Campbell Scientific 207, temperature and relative humidity probes were purchased and then sent to the HIF for calibration or evaluation. When these probes are returned to the HRF, they will be swapped out with the instruments on the weather stations presently operating on Yucca Mountain.

Five Campbell Scientific CR-10 dataloggers were sent to Campbell Scientific for calibration and five Campbell Scientific 21X dataloggers for re-calibration.

SCP 8.3.1.2.2.1.3 Evaluation of artificial infiltration

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Preparations continued for a field test of the automated, time domain reflectometry station. This system uses time domain reflectometry to determine the water content in the top 50 cm of the soil. Each automated platform will sample up to 12 sites within a 10 meter radius.

Planning Documents
Comments were signed off for USGS-YMP SP 8.3.1.2.2.1; awaiting DOE approval.

Quality Assurance
All QA related reading assignments were accomplished as required.

Operations

WBS 1.2.3.3.1.2.3 Percolation in the Unsaturated Zone - Surface Based Study
Principal Investigator - J. Rousseau

OBJECTIVE
To determine the present *in situ* hydrologic properties of the unsaturated zone hydrogeologic units and structural features; to determine the present vertical and lateral variation of percolation flux through the hydrogeologic units and structural features; to investigate the relationships between present flux and past climatic conditions; and to determine the effective hydraulic conductivity, storage properties, and transport properties as functions of moisture content or potential. (SCP Study 8.3.1.2.2.3)

SCP 8.3.1.2.2.3.1 Matrix hydrologic-properties testing

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
The liquid saturation procedure testing on core samples from Apache Leap prototype drilling site continued. Some samples were placed in relative humidity ovens to be dried at several relative humidities to determine the water content at which the pores have emptied and the water begins to leave the structure of the minerals. This is important to identify, because physical properties can be influenced from this resultant change in structure.

The development of a SPOC system to solve problems encountered and automated data collection continued.

An evaluation of mathematical models, reported in the soil science literature, for relative permeability that require moisture retention characteristic data continued for use on tuff.

Simulations of imbibition of water into rock core using the TOUGH code are being conducted to evaluate the appropriate formulations of moisture retention characteristic and relative permeability functions and to determine sensitivities to various physical parameters. This will also aid in the identification of appropriateness of different types of methods of measurement for the same parameter.

The construction of a gas permeameter to determine gas permeability of rock core continued.

The Matrix-Property Working Group met in January.

The programmable water baths ordered several months ago have arrived and will be used to calibrate thermocouple psychrometers.

The relative humidity ovens have been modified with fiberglass domes with an access door. A study is underway that will assess the temperature and humidity stability of the ovens with this new cover.

Preliminary mineralogy work with the scanning electron microscope by S. Diehl was completed. This study was conducted to visually assess any pore structure change due to severe drying in a vacuum oven as compared to drying in a relative humidity oven. The report is now being evaluated.

A. Flint, L. Flint and K. Richards attended the workshop on "Flow and Transport Through Unsaturated Fractured Rock" in Tucson, Arizona. A. Flint presented a paper entitled "Characterization of Rock Hydrologic Properties Using Model Verification" with co-authors, Richards and L. Flint. L. Flint presented a paper entitled "Use of a Submersible Pressure Outflow Cell for Determination of Moisture Characteristic Curves on Rock Core" with co-author, A. Flint.

Both of these papers have been written and submitted for USGS review.

The research paper entitled "The Influence of Scale on Calculated Sorptivity Values From Imbibition Experiments on Welded and Nonwelded Tuff" written by A. Flint, L. Flint, and K. Richards that A. Flint presented at the NEA workshop in Paris, France, has been written and submitted for USGS review.

D. Soeder, A. Flint and L. Flint wrote and submitted for USGS review an abstract entitled "Applications of Oil-field Core Analysis Technology to Hydrologic Studies in Volcanic Tuff." This will be presented at the Society of Core Analysts annual meeting in August, 1991, by Soeder.

Planning Documents
Matrix-property study plan comments have been resolved and will be sent to DOE for approval in February, 1991.

Quality Assurance
All QA related reading assignments were completed as required.

Operations

SCP 8.3.1.2.2.3.2 Site vertical-boreholes studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
C. Loskot reduced the model, calibration regression equations for the thermocouple psychrometers to a subset of three potential candidates. A final calibration equation will be selected from calibration data being developed for the HRF borehole program.

J. Kume and machinists from the Isotope Geology section finalized the design for the thermistor mounts. Twenty-one units were delivered for the HRF borehole program.

J. Kume submitted the final revisions to the UZ-13 basic data report. The report is in final typing.

C. Loskot and J. Rousseau met with the regional representatives of General Eastern Corporation for a demo of their M3 precision hygrometer. Unit is being evaluated for use in the deep UZ borehole gas sampling program.

C. Cope coordinated with design engineers at Ruska Instruments and Druck Inc. for information on recalibrating the Druck DPI-140 units using the Ruska deadweight tester.

Work on calibration of the pressure transducers, thermocouple psychrometers, and thermistors for the HRF borehole program was conducted during the last week of January. This work will continue throughout the months of February and March.

The Ruska precision deadweight tester was installed at the HRF calibration laboratory. C. Cope conducted familiarization testing of the equipment in preparation for pressure transducer calibrations during February and March.

The 20 KVA, AC power conditioning system for the HRF calibration laboratory was installed.

M. Kurzmack completed user documentation for TCPCAL, PTCAL, THMCAL and the HRFDAS

programs. The HRFDAS program for the HRF borehole data acquisition system is mostly complete and will be tested and verified once the electronic data acquisition rack is built.

Work continued on the Yucca Mountain VSP computer model and the simplified physical model. A total of 28 computer calculated synthetic VSP's, and 5 VSP's from the physical model have been obtained. These are being imaged to test all revisions to the imaging software, and especially to check the ability of the software to image variable velocity media. Only a few images have been created so far. The images themselves appear to be satisfactory, but there may be some small mis-alignments from image to image. These need to be accounted for, before the images are combined or "stacked".

Development work is under way to transfer VSP data (model or otherwise) to the Cray. The imaging program is up and running on the Cray. On one test a run that took three hours on the Gould Mainframe ran in 20 seconds on the Cray. With optimization it is believed that the time can be cut down to less than 10 seconds.

Using the experience and data from the Apache Leap Test Site (ALTS) prototype testing, a steady state gas injection analysis method for single hole injection was developed. The method is a modification of Hvorslev's 1951 solution corrected for gas compressibility. It is essentially the same radial flow solution for compressible fluids as developed by several others.

Using the ALTS prototype data, a semilog pseudo-pressure analysis method for highly compressible fluids was selected and adapted for single hole transient air permeability testing. The method is based on the Jacob solution of the exponential integer function modified for gas compressibility.

January 17 and 18, G. LeCain participated in the Test Prioritization Task Force conference in Las Vegas. This conference dealt with complex geology and its influence on probable success of saturated and unsaturated zone testing.

J. Baer has been tracking down bugs in the IDAS data conversion routines; and began work on network hardware acceptance test for evaluating GEMlink replacements.

J. Baer has been writing programs to test the new Keithley 182 Nanovoltmeter; testing shows improper response of meter to invalid commands; the report is to be completed by February 6.

R. Getzen and J. Rousseau met with IFT Technical Services, fire-protection engineers/consultants, in Berkeley to determine a strategy for specifying a prototype IDAS insulated instrument shelter that will meet our technical requirement and DOE/SHD's safety requirements at a reasonable cost. A contract for $2450 has been let for IFT to prepare a report on suitable insulation/fire-barrier systems and to negotiate their acceptability with DOE/SHD. Getzen has been preparing and submitting to IFT the requirements for the shelters.

Work continued on writing the IDAS Set-Up Example. Three different types of experiments are being described: (a) routine environmental monitoring; (b) a single borehole test; and (c) a multiple borehole test. The Set-Up Example serves several purposes. It is invaluable for training as it indicates the amount and type of preparation necessary before creating an IDAS experiment as well as the data entry involved. Furthermore, the process of creating this example becomes part of the software testing that must be conducted before IDAS is operational: it has shown where the software conforms with or deviates from both the design specifications and the user's manuals.

The routine environmental monitoring portion is almost complete.

Planning Documents
J. Rousseau attended the final meeting for comment resolution of the Surface Based Borehole Investigation Study Plan in Las Vegas on January 8. All disputed comments are now resolved.

The Yucca Mountain draft technical procedure is still in progress.

Quality Assurance
M. Kurzmack attended several meetings for revision QMP-3.14 to ensure that it agrees with QMP-3.03. These included a software QA workshop in Las Vegas on January 22 and 23.

E. Kwicklis and M. Kurzmack performed software technical reviews of TCPCAL.PAS, THMCAL.PAS, and PTCAL.PAS.

A. Balch and J. Rousseau were in Las Vegas on January 7 and 8 to resolve comments on SAIC's review of the investigation plan. Late in the evening of January 7, we were advised that SAIC (E. Hardin) had conceded all disagreements. All comments were resolved in our favor. The trip was thus highly successful.

G. LeCain completed QA reading assignments and updated QMP as assigned.

After concluding that IDAS Manuals would not be self-explanatory without a realistic data-acquisition example, R. Getzen and A. Greengard began composing and describing an "IDAS Set-Up Example." This example will describe and explain all the data-entry steps required for creating and operating a new IDAS field site for typical Deep-UZ measurements. This document will include approximately 30 tables and 60 illustrations. Work on the example has been temporarily stymied by an inconsistency in the data-conversion routines, but completion is expected in February.

A. Sims has completed a first draft of HP-144, (Procedures for Installation, Testing, and Handling of DEC Computers and Equipment) and J. Baer is reviewing it. A final draft of HP-144 may be complete by early March. Sims and REECo technicians have been physically confirming installation options on all computers for documentation in HP-144.

Operations
J. Rousseau, C. Loskot, K. Thomas, J. Kume, M. Kurzmack, M. Chornack, and M. Whitfield attended mandatory health and safety and NTS orientation training classes at the NTS on February 28 and 29.

J. Rousseau, J. Kume met with NTS contractors and DOE YMP operations personnel to review and finalize criteria letter requirements for the HRF borehole program. A drilling start date of April 1 was set for the three planned augured holes at the HRF-NTS.

Purchasing documents and a sole source justification for a Thunder Scientific two-pressure humidity generator were prepared by C. Loskot and J. Rousseau. It will take approximately eight months to build the required unit upon receipt of a purchase order by Thunder Scientific.

W. Thordarson prepared purchasing documents for Datametrics and MKS mass flow and multi-channel flow controllers. Requisitions for this equipment were placed during the last week of January.

J. Rousseau and C. Warren met with P. Hofreichter, D. Johnson, and J. Walker with RSN to review grout design requirements for the HRF borehole and deep UZ borehole instrumentation program. RSN staff will prepare a grout mix design matrix using $CaSO_4$ (calcium sulfate) as the primary

cementing agent. Laboratory and field tests will be conducted to evaluate characteristics of the design mix and problems associated with grout emplacement.

A work package for the HRF borehole program was initiated following the January 23 meeting in Las Vegas between USGS, NTS contractors, and DOE-YMP personnel. Development of this work package is a high priority, if the April 1, 1991 start date for drilling is going to be realized.

The field site at Bergen Park is awaiting landowner's permission to drill four shallow seismic holes.

The software problems associated with the Vseis VSP processing package have been resolved, temporarily at least, by resorting to a HGS VSP package, resident on the IBM PS-2 computer. If HGS makes good on their promise to create a RS-6000 version of this software, we may abandon Vseis altogether. If Vseis is adapted to the RS-6000, it will require many man hours of effort. Another possibility being investigated is to persuade the vendor, Spectrum Geophysical, to adapt the package. So far, they have shown little inclination to do this.

On January 28 a reply was received from L. Hayes concerning the memo on construction of a prototype and equipment test site in Area 25. He said that due to restrictions on drilling by the State of Nevada, there is nothing that can be done.

On January 28 G. LeCain attended the technical presentations for A. Robinson and staff from the DOE. LeCain escorted the DOE participants to Building 56 to examine the 8" packer assembly.

Continued monitoring by A. Sims and S. Breshears shows no new problems with batteries since generators were shut down in late September.

REECo technicians have been preparing "as built" electrical diagrams for EKES systems. R. Getzen will incorporate this information into HP-140, (Procedure for Entry and Identification).

REECo technicians and A. Sims have been reconfiguring one of the spare IDAS computers as a DEVLOP system, which will provide a temporary test-and-development platform in Nevada that parallels the system returned to Denver for J. Baer's use in November.

R. Getzen and J. Rousseau have been working with DOE on redesign of prototype instrument shelter to improve performance, reduce cost, and create an easily reproducible unit; hope to resolve impasse with DOE Health and Safety by obtaining a simulated (calculated) FM corner test for a proposed transportainer-based shelter. Getzen and Rousseau contacted a likely container vendor in mid-January.

A. Sims has been working with K. Thomas and REECo on equipment inventory, using REECo's bar-code ID tags.

One solution for archiving and transferring IDAS data to Denver is the use of VMS-DECnet to transfer data from ARC-1 to a PC-LAN optical disk system. This requires replacing ARC-2 with a MicroVAX, which can run Phase-V VMS DECnet. The PDP-11/73s run Phase-IV RMS-DECnet, which is not compatible with PC-based LANs. This looks like a viable technique, and use of a MicroVAX for ARC-2 has other operational advantages, primarily improved security and data protection. FY91 costs are estimated at $20,000, including DECnet and system software; future hardware cost increases would be negligible, as the cost of a spare MicroVAX would be offset by salvage cost of the PDP that can be used at a field site. ISD has approved use of their MicroVAX at the Denver Federal Center for software development; if no other problems are discovered, a procurement strategy should be in place by mid-February. J. Baer has spent some time this month

obtaining and evaluating equipment specifications.

WBS 1.2.3.3.1.2.4 Percolation in the Unsaturated Zone - ESF Study
Principal Investigator - B. Lewis

OBJECTIVE
To conduct hydrologic tests in the ESF to supplement and complement the surface-based hydrologic information needed to characterize the Yucca Mountain site; to provide phenomenological information for analyzing fluid flow and the potential for radionuclide transport through unsaturated fractured tuff; and to provide information about water flow through unsaturated fractured tuffs. (SCP Study 8.3.1.2.2.4)

SCP 8.3.1.2.2.4.1 Intact-fracture test in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Dr. Cardenas is continuing the application of the Fast-Fourier Analysis approach to topographical mapping of fracture surfaces in conjunction with the Moire Projection Project. G. Severson submitted photocopies of diffraction Moire work done at ENEL/EG&G to Dr. Cardenas.

Laboratory results on water from the vacuum oven cold trap are being evaluated. The water moving through the oven has corroded the vacuum line. Corrosion has also been experienced in percolation test studies. C. Boughton contacted W. Hasey, LLNL, to discuss his experience in corrosion during the G-tunnel heater experiments. Investigation into this phenomenon will continue.

G. Severson responded to review comments from the Colorado District on the paper entitled "Assessment of fracture sampling techniques for laboratory tests on core" which was submitted to ANS on January 7, 1991, for presentation at the 1991 International High-Level Radioactive Waste Management Conference to be held in Las Vegas on April 28 through May 3, 1991.

G. Severson and J. Boernge have met and discussed the progress of the technical procedure for radial fracture sampling. Severson has modified the procedure and will submit it to Boernge for review during February.

G. Severson received a mineralogical analysis of the fracture fillings found in Block D from S. Sutley (Branch of Geochemistry). X-ray diffraction showed a similar distribution of minerals to that which B. Carlos, LANL, has found. Of particular interest is the smectite (montmorillonite) clays which may account for the poor fracture conductivities at moderately saturated conditions.

Due to closure of G-Tunnel, projected axial sampling continues to be suspended and due to spending freeze, procurement of needed equipment is temporarily delayed.

Planning Documents

Quality Assurance
All project personnel completed required Quality Assurance reading assignments, AP manuals were updated, and annual inventory of Controlled Documents was completed.

Operations
S. Anderton and G. Severson disassembled and cleaned the vacuum saturation table. Anderton and C. Mallon are drafting an SOP for use of this equipment in the hope that such extensive remedial

work can be avoided in the future.

Shelving was installed and painted in Building 810 and Building 20. This allows better organization of samples and helps to eliminate tripping hazards from having rock samples on the floor.

Three telephone lines in the Building 20 laboratory area were activated. Two will serve as modem lines and the third services the computer room at extension 236-0499.

G. Severson consulted with G. Dinkle from Space and Facilities Management regarding frozen water pipes which affected the operation of the lab during December and concerning estimates for electrical work for our emergency power system. The pipes have been protected to avoid freezing in the future. The electrical estimates are necessary before the emergency power system can be put in place.

SCP 8.3.1.2.2.4.2 Percolation tests in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

Permeability measurements made by F. Thamir and S. Anderton on a fracture, welded core (sample 13b) were processed, and along with transient imbibition data from tests performed on the same core, were analyzed in a paper entitled "Numerical and Laboratory Investigations of Transient and Steady-State Flow in a Fractured Core," by E. Kwicklis, Thamir, R. Healy, C. Boughton and Anderton. The paper was presented in Tucson, Arizona, on January 9 during Workshop V on Flow and Transport Through Unsaturated Fractured Rock, co-sponsored by the University of Arizona and the Nuclear Regulatory Commission.

Transient and steady-state air-permeability measurements completed last month by S. Anderton and F. Thamir on the large block of welded tuff (54.3 cm long X 29.7 cm wide X 80.6 cm high) are undergoing analysis prior to initiating a water ponding experiment on the same block. The air permeability data will be used to estimate the hydraulic properties of the block prior to the beginning of tests using water, and will also be analyzed to identify connected pathways through the block.

An investigation of the effects on pH of adding formaldehyde or other chemicals in order to inhibit bacteria has been initiated following corrosion of the brass screen used in the steady flow-through experiment involving core 13b.

F. Thamir established a second data collection station using Keithley model 706 scanner and a Hewlett-Packard 3456a multimeter. This will permit multiple experiments to be run simultaneously.

M. Brodie finished the installation of Windows 3.0, LOTUS 123, and mouse support for all computer in the laboratory in Building 20. He also finished the temperature routines for the thermocouple psychrometer calibration program.

Air K testing has been completed; the data were turned over to C. Mallon for reduction. Preparations are being made to set up the big block for imbibition testing. Reasons for the brass screen corroding on F. Thamir's imbibition test are being investigated. A Standard Operating Procedure is being written to cover the use of vacuum equipment and the vacuum oven in the laboratory. References for Thamir's procedures have been researched as well. The laboratory has been refurbished this month with new paint and newly acquired equipment.

Planning Documents

Quality Assurance
Development of the following technical procedures is in progress: (a) fracture location within welded tuff samples; (b) preparation of core samples for imbibition and infiltration tests; (c) saturating rock samples under a vacuum; (d) porosity measurement of welded and nonwelded tuff core samples; and (e) calibration of pressure transducers.

Operations

SCP 8.3.1.2.2.4.7 Perched-water test in the exploratory shaft facility

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
M. Chornack (a) continued to write and draft figures for the "Summary Drilling Report for the Wet versus Dry Drilling Experiment"; (b) began writing the geologic and drilling section for the Drillhole Instrumentation Prototype Test report; (c) wrote the drilling and geology section for the USGS INTRAVAL test case paper; (d) continued preliminary work for the characterization of surficial materials at Yucca Mountain study; (e) participated in TPTF meeting in Las Vegas addressing the issues of Complex Geology -- Aqueous and Gaseous Flow; and (f) attended the meeting concerning the Characterization of the Yucca Mountain UZ Gaseous-Phase Movement.

Planning Documents

Quality Assurance
M. Chornack attended mandatory health and safety training for work at Yucca Mountain.

Operations
M. Chornack prepared and submitted the January 1991 Monthly Report.

SCP 8.3.1.2.2.4.9 Multipurpose-borehole testing near the exploratory shafts

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
M. Chornack (a) continued to write and draft figures for the "Summary Drilling Report for the Wet versus Dry Drilling Experiment"; (b) began writing the geologic and drilling section for the Drillhole Instrumentation Prototype Test report; (c) wrote the drilling and geology section for the USGS INTRAVAL test case paper; (d) continued preliminary work for the characterization of surficial materials at Yucca Mountain study; (e) participated in TPTF meeting in Las Vegas addressing the issues of Complex Geology -- Aqueous and Gaseous Flow; and (f) attended the meeting concerning the Characterization of the Yucca Mountain UZ Gaseous-Phase Movement.

Planning Documents

Quality Assurance
M. Chornack attended mandatory health and safety training for work at Yucca Mountain.

Operations
M. Chornack prepared and submitted the January 1991 Monthly Report.

WBS 1.2.3.3.1.2.7 Unsaturated Zone Hydrochemistry
Principal Investigator - I. Yang

OBJECTIVE
To understand the gas transport mechanism, direction, flux, and travel time within the unsaturated zone; to design and implement methods for extracting pore fluids from the tuff; to provide independent evidence of flow direction, flux, and travel time of water in the unsaturated zone; to determine the extent of the water-rock interaction; and to model geochemical evolution of ground-water in the unsaturated zone. (SCP Study 8.3.1.2.2.7)

SCP 8.3.1.2.2.7.1 Gaseous-phase chemical investigations

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
I. Yang and P. Striffler attended "Unsaturated flow and transport Workshop V" at the University of Arizona, Tucson, January 7-10, 1991. Striffler presented the results of the gas-pumping test on prototype hole UZP-5 at the Apache Leap Site, Arizona, while Yang presented a paper on the unsaturated flow at Yucca Mountain, Nevada, using stable- and radioactive-isotopic data.

I. Yang briefed A. Robinson of DOE/Las Vegas on UZ Hydrochemistry Project Program and toured the hydrochemistry laboratory facility at the Denver Federal Center on January 18, 1991.

P. Striffler prepared the required equipment for the UZ1 field gas-sampling trip. J. Ferarese packed and mailed required equipment to the Nevada Test Site for the UZ1 gas-sampling field trip. The laboratory apparatus was prepared for the processing of incoming samples from UZ1 field-sampling trip.

On the field sampling trip to UZ1 borehole from January 22-31, 1991, whole-gas samples for $C^{13}/_{12}$ analysis in 300cc glass bubblers, various sizes of Tedlar bags, and 2 liter aluminum cylinders were collected; 30-40 mls water vapor in the cold traps were collected for H_3 analyses; and water vapor in silica gel towers and C-14 samples in molecular sieve were collected.

J. Ferarese began a laboratory experiment using 10mL glass syringes to determine the length of time that gas can be stored in the syringes and still retain integrity. Experiment involves using tape, duck-seal and rubber bands to ensure a tight seal.

An extended abstract "Field testing the effectiveness of removing Sulfur Hexaflouride traced drilling air from a prototype borehole near Superior, Arizona" was submitted for inclusion in the NUREG Publication "Proceedings of Unsaturated Zone Flow and Transport Workshop V".

Preparations were made for the upcoming final Apache Leap gas-sampling trip and meetings with the USBR, DOE, NFS, and USGS personnel for logistical support.

The report "Preliminary Isotopic Data on Unsaturated-Zone Flows at Yucca Mountain, Nevada," by I. Yang was transmitted to the Regional Hydrologist for approval and to DOE for concurrence.

Planning Documents

Quality Assurance
The gas chromatograph in Mercury, Nevada, geochemistry laboratory was calibrated for CO_2, CH_4 and SF_6 analysis.

Procurement and calibration sheets were organized and submitted to the Quality Assurance office according to their request.

Operations
Various laboratory supplies were ordered.

SCP 8.3.1.2.7.2 Aqueous-phase chemical investigations

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
I. Yang and P. Striffler attended "Unsaturated flows and transport Workshop V" at the University of Arizona, Tucson, January 7-10, 1991. Striffler presented the results of the gas-pumping test on prototype hole UZP-5 at the Apache Leap Site, Arizona, while Yang presented a paper on the unsaturated flow at Yucca Mountain, Nevada, using stable- and radioactive-isotopic data.

Waxed cores of UE-25 UZ #4 and #5 and USW UZ #6s were shipped from the sample Management Facility in the Nevada Test Site to I. Yang on January 17, 1991. Several cores were taken to distill pore-water for tritium concentration check.

Measurable concentrations of heavy rare earth elements (Tb, Dy, Ho, Er, Tm, Yb, Lu) were found to exist in the unsaturated-zone pore-water, while not existing in J-12 and J-13 ground water.

Clean-up of ^{3}H contaminated areas in the sample-storage room and in the laboratory apparatus is continuing.

Selected Apache-Leap-core samples were prepared for uniaxial compression and distillation and the extraction of pore-water from two cores was finished.

P. Striffler trained M. Beasley on cutting cores with the rock saw.

Development of ^{14}C counting vials made of pure quartz glass with a teflon base and cap is in progress. This vial will be tested against the existing copper-teflon vials in the LKB Wallace Liquid Scintillation Counter for counting efficiency.

Water-vapor samples were collected in air at the Hydrological Research Facility, Sample Management Facility and the Core Library in NTS to analyze for possible tritium contaminations by the G-tunnel samples.

Precipitation Collectors were installed at N2 and N46 for water-chemistry analyses.

Planning Documents

Quality Assurance
All staff members completed their Quality Assurance reading assignments.

Procurement and calibration sheets were organized and submitted to Quality Assurance office according to their request.

Operations
Oxalic acid standard was ordered from NIST. This standard will be converted into a benzene counting standard for the LKB Wallace Liquid Scintillation Counter.

Various laboratory supplies were ordered.

The Dionex Service Agreement requisition was generated and walked through the procurement process. If this requisition is processed before January 31, 1991, we will be exempt from the $1,500.00 requalification fee.

The GSA electrician continued to work on repairing the in-house fan located above the ceiling of the LKB Wallace Liquid-Scintillation-Counter room.

WBS 1.2.3.3.1.2.8 Fluid Flow in Unsaturated Zone Fractured Rock
Principal Investigator - C. Boughton
LBL Principal Investigator - G. Bodvarsson

OBJECTIVE
To develop and validate conceptual and numerical models describing gas flow and liquid water and solute movement in unsaturated, fractured rock at the laboratory and sub-REV scales. (SCP Study 8.3.1.2.2.8)

SCP 8.3.1.2.2.8.1 Development of conceptual and numerical models of fluid flow in unsaturated, fractured rock

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
C. Mallon created Lotus 1-2-3 files from air temperature data files for P. McKinley and then conducted regressional analyses using both Lotus 1-2-3 and Minitab.

E. Kwicklis analyzed data from transient imbibition and steady-state flow through experiments performed on sample 13b, a core of welded tuff with a single fracture parallel to the core axis. The transient imbibition studies were then simulated using the TOUGH code.

E. Kwicklis presented a paper entitled "Numerical and laboratory investigations of transient and steady-state flow in a fractured core," by Kwicklis, F. Thamir, R. Healy, C. Boughton and S. Anderton at Workshop V on Flow and Transport in Unsaturated, Fractured Rock, in Tucson, Arizona, January 7-10, 1991. Graphs and text for the paper were prepared for publication in the workshop proceedings which are to be published as a Nuclear Regulatory Commission Report.

C. Boughton completed plans for a CASY Symposium entitled "Methods of Analysis of Unsaturated Fluid Flow and Transport at Yucca Mountain" to be held on February 12, 1991. Speakers include J. Cardenas-Garcia from Texas Tech University, Y. Tsang from Lawrence Berkeley Laboratory, J. Istok from Oregon State University, and F. Thamir and C. Peters from YMP-HIP.

C. Boughton spoke with V. Montenyohl from Weston in Washington, D.C. regarding the use of optical disks for storage of data for the YMP. She explained issues which have been previously brought up by HIP technical staff concerning the Project Records Center requirement for records to be submitted on magnetic tape. It is hoped that this requirement might be relaxed to allow submission of more contemporary media including floppy disks and optical disks.

R. Zimmerman attended the NRC Workshop on "Flow and Transport through Unsaturated Fractured Rock - Related to High-Level Radioactive Waste Disposal" in Tucson, Arizona, from January 7-10.

The paper "Lubrication Theory Analysis of the Permeability of Rough-Walled Fractures," by R. Zimmerman, S. Kumar, and G. Bodvarsson, was approved for publication by the USGS, and was sent to the 2nd International High-Level Radioactive Waste Management Conference (Las Vegas, April 28 - May 2, 1991). A version of this paper was also accepted for oral presentation at the International Conference on Industrial and Applied Mathematics (Washington, D.C., July 8-12, 1991).

The paper "Fractal Characteristics of Fracture Roughness and Aperture Data," by S. Kumar, G. Bodvarsson and J. Boernge was approved for publication by the USGS, and was sent to the 2nd International High-Level Radioactive Waste Management Conference (Las Vegas, April 28 - May 2, 1991).

The paper "Permeability of a Fracture with Cylindrical Asperites," by S. Kumar, R. Zimmerman, and G. Bodvarsson was accepted for publication in *Fluid Dynamics Research.*

Planning Documents

No response has been received from DOE to the Study Plan for Conceptual and Numerical Modeling in Unsaturated, Fractured Rock which was submitted to DOE for review in September.

C. Boughton reviewed responses to comments regarding her review of the Water Resources Assessment study plan and then responded to the responses.

Quality Assurance

C. Boughton reviewed QMP-3.14 (R3) and participated with the committee to rewrite this document. A meeting was held on January 14 in which general consensus was reached regarding needed changes. These changes are being incorporated and will be reviewed when they are redrafted.

E. Kwicklis conducted a technical peer review of the computer codes PCPCAL.PAS, PTCAL.PAS and THMCAL.PAS which are being used by the 8.3.1.2.2.3 study for psychrometer, pressure transducer and thermistor calibration, respectively.

C. Boughton and E. Kwicklis received DOE project orientation training and Health and Safety training on January 28 and 29 at Area 25.

C. Mallon continued to participate in the committee to revise Software Quality Assurance QMP-3.03 (R3). Formal reviews have been completed and comments submitted to the committee which is reviewing them and responding to them.

C. Boughton attended a Configuration Control Committee meeting as HIP representative on January 25, 1991. In addition to baselining several programs, a discussion regarding the intent of and appropriate mechanism for implementing the exemptions in QMP-3.03 (R2) was held. Boughton was requested to meet with the Acting HIP Chief concerning this issue.

C. Boughton gave input to W. Causseaux concerning QAGRs for 8.3.1.2.2.4 and 8.3.1.2.2.8. Concerns were raised about the applicability of Graded QA in the absence of an approved QMP 3.15 for Graded QA.

C. Boughton, E. Kwicklis, and C. Mallon completed reading assignments and replaced pages in controlled documents as required. YMP-USGS Controlled Document Configuration Reports were also checked against actual controlled documents in possession.

QA reading assignments were completed by various personnel.

Operations
C. Boughton has continued to maintain contact with D. Keen, who was assigned by L. Hayes, to follow up on the issue of staff exposure to fumes of unknown origin and composition emanating from the floor drains in the fractured rock hydrology on October 17.

C. Boughton received training to become an authorized BPA buyer. Issues are yet unresolved concerning tracking responsibilities for BPA purchases, so BPA purchasing has not yet been initiated on behalf of the UZ fractured rock hydrology staff.

Communication with LBL regarding ongoing activities was maintained. C. Boughton and E. Kwicklis participated in the UZ Section meeting held on January 30, 1991, in which the framework of the site-scale model was the focus of the discussion.

C. Boughton has had ongoing contact with the Administrative Section regarding submission of an order for Nashua diskettes. Justification has been given for requiring these diskettes for project work; however, procurement has continued to block their purchase which is causing delays in data acquisition.

Budgetary uncertainty continues to effect the progress of the project. The workscope was modified because LBL funding was lower than anticipated.

WBS 1.2.3.3.1.2.9 Site Unsaturated Zone Modeling and Synthesis
Principal Investigator - B. Lewis
LBL Principal Investigator - G. Bodvarsson

OBJECTIVE
To develop conceptual and numerical models for the site unsaturated zone hydrogeologic system; to apply the models to predict the system response to changing external and internal conditions; to evaluate the accuracy of the models using stochastic modeling, conventional statistical analyses, and sensitivity analyses; and to integrate data and analyses to synthesize a comprehensive qualitative and quantitative description of the site unsaturated-zone hydrogeologic system under present as well as probable, or possible, future conditions. (SCP Study 8.3.1.2.2.9)

SCP 8.3.1.2.2.9.1 Conceptualization of the unsaturated-zone hydrogeologic system

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
The Sample Overview Committee meeting was held at the Sample Management Facility on January 15, with R. Craig representing HIP PIs. The major work task was that of reviewing Lawrence Livermore National Laboratory's request for samples. No requests for samples were made by HIP investigators.

Planning Documents
S. Keller recompiled Study Plan 8.3.1.2.2.9 (Site unsaturated-zone modeling and synthesis) to incorporate author/reviewer concurrence for the USGS technical review comments, transmitted it for HIP QA review, incorporated HIP QA review results, and produced the document. The study plan was transmitted to the Project Office January 25.

Quality Assurance
Reading assignments and revisions to QMPs were distributed to UZ investigators for reading.

Operations
On January 8, B. Lewis attended a Calico Hills Risk Benefit/Analysis meeting in Las Vegas, to formulate a final draft of recommendations and conclusions reached by the Task Force.

On January 28 and 29 the General Employment Training Course for Unescorted Access to the Yucca Mountain area was given at the A&E building in Area 25 and was attended by the following HIP personnel: J. Rousseau, M. Kurzmack, E. Kwicklis, K. Thomas, C. Boughton, M. Chornack, J. Kume, C. Loskot, and M. Whitfield. Attendees from the USBR included T. Lippert, M. McKeown, T. Strauss and J. Darnell.

B. Lewis attended a DOE/NRC technical exchange meeting in Bethesda, Maryland, from January 28-31, concerning results of the Calico Hills Risk/Benefit analysis and ESF alternatives studies.

SCP 8.3.1.2.2.9.2 Selection, development, and testing of hydrologic-modeling computer codes

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Various information and reports on Yucca Mountain data and analysis were reviewed.

G. Bodvarsson met with UZ principal investigators on January 30 at NTS to start the development of a site-scale model.

Planning Documents

Quality Assurance
QA reading assignments were completed by various personnel.

Operations

WBS 1.2.3.3.1.2.10 Prototype Hydrologic Tests that Support Multiple Site Characterization Activities
Principal Investigator - B. Lewis

OBJECTIVE
To perform prototype hydrologic tests to minimize costly stand-by times; to develop QA procedures; to determine feasibility of the proposed tests; to train new personnel; to help increase likelihood of success of the tests; and to test new instruments, equipment, and procedures.

Prototype Tracer Testing

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
The aqueous-phase tracer contract work to New Mexico Institute of Mining and Technology, under contract No. 14-08-0001-2637, was completed in mid January, 1991. The conservative tracers which can be used at the Yucca Mountain include bromide, iodide, borate, etc.

Planning Documents

Quality Assurance

Operations
The project member A. Lewis-Russ, who was working on the tracer project, graduated from the Colorado School of Mines (Ph.D) in December, 1990, and left the USGS. Currently no work is being conducted until a replacement is hired.

Prototype Optimal Rubble Size

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Work continued on the report discussing G-tunnel operation.

Water and gas samples were extracted from six cores.

Planning Documents

Quality Assurance
All staff members completed their Quality Assurance reading assignments.

The calibration of the pH and SC meters was completed.

Operations
The coring, cutting and squeezing priorities for FY91 have been outlined.

The forms used for coring and squeezing have been organized.

The USGS worked with the USBR to facilitate the hiring of a Colorado School of Mines student.

Prototype Dry Coring of Rubble

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Two cores were cut from uniaxial compression.

Statistical analysis of the USBR and H&N coring work continued.

Planning Documents

Quality Assurance
All staff members completed their Quality Assurance reading assignments.

Operations
The coring, cutting and squeezing priorities for FY91 have been outlined.

The USGS worked with the USBR to facilitate the hiring of a Colorado School of Mines student.

Prototype Pore-Water Extraction

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
J. Higgins advised M. Beasley on one-dimensional pore-water extraction testing procedures.

Water and gas were extracted from six cores.

Planning Documents

Quality Assurance
J. Higgins began editing and modifying draft of the HP for one-dimensional compression method of pore-water extraction.

Operations
J. Higgins participated in one Hydrochemistry project coordination meeting.

J. Higgins and C. Peters met with J. Prizio (USBR) weekly to coordinate project activities, safety shield construction, supercell construction, and formation of a student coop position through the USBR specifically for the project.

J. Higgins transferred project working files between hard disks from an old PC-XT to an up-dated Compaq 286 machine.

J. Higgins and C. Peters prioritized core to be prepared and tested for the period of January through September 1991.

WBS 1.2.3.3.1.3 Saturated Zone Hydrology

OBJECTIVE
To develop a model of the saturated zone hydrologic system of Yucca Mountain that will assist in assessing the suitability of the site to contain and isolate waste. (SCP Investigation 8.3.1.2.3)

WBS 1.2.3.3.1.3.1 Site Saturated Zone Ground-Water Flow System
Principal Investigator - R. Luckey

OBJECTIVE
To determine the hydrogeologic nature of the Solitario Canyon fault in the saturated zone; to determine the time and spatial variation of the potentiometric surface; to determine the character, magnitude, and causes of water-level fluctuations; to estimate elastic and hydraulic properties; to determine transport properties of the saturated zone; to evaluate the relation between hydraulic properties and fracture characteristics; to characterize chemical and physical properties of the saturated zone that affect radionuclide retardation; and to conduct single-and-multiple well tracer tests using conservative and reactive tracers to determine hydrologic, chemical, and physical properties in the saturated zone. (SCP Study 8.3.1.2.3.1)

SCP 8.3.1.2.3.1.2 Site potentiometric-level evaluation

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities

R. Spaulding dumped data loggers on the continuous water-level network and processed data twice this month. Transducers were calibrated at the following wells by G. O'Brien, R. Spaulding, and D. Baldwin: USW WT-2, UE-25 WT#6, UE-25 WT#13, UE-25 WT#16 UE-25b #1 (lower), UE-25p #1, USW H-1 (all four tubes), and USW H-6 (both zones). Most of the calibrations were done because a new program was installed in the Campbell Scientific 21X data logger. The new program, designed by G. O'Brien, should improve accuracy of voltage measurements and decrease background noise. Operational checks were done on six barometers in use in the network and all were found to be functioning correctly. All instrument calibrations are up to date.

R. Spaulding made periodic measurements once this month on the periodic water-level network. Well USW H-3 will remain in the periodic network until the water level appears to have stabilized following a change in the packer at the well.

Data-collection platforms at USW G-3, USW H-4, USW H-5 and USW WT-11 are operating well. D. Baldwin collected backup data from the platforms and transmitted it directly to the Prime computer. M. Boucher spot checked the backup data against the data coming through the satellite to verify that the transmission system was operating properly. Editing of data files for transmission problems and field-induced changes was begun by Boucher.

Multiconductor cable unit was calibrated without its usual weight on December 5-6. The calculated correction factor was somewhat different than had been observed in the past. The unit was checked with the weight and seems to have some operational problems. It will continue to be checked until the nature of the problem can be determined.

A backup computer that can be used to service data collection platforms has been tested and works fine. This computer was borrowed from another activity; a permanent backup is being procured through normal USGS channels.

The draft report "Water levels in continuously monitored wells in the Yucca Mountain area, Nevada, 1985-88" by R. Luckey, D. Lobmeyer, and D. Burkhardt continued to be revised following editorial review. The process should be completed next month.

The draft report "Water Levels in periodically measured wells in the Yucca Mountain area, Nevada, 1989" by G. O'Brien was revised following editorial review and has been submitted for USGS Director's approval and DOE concurrence.

D. Lobmeyer continued preparation of text for draft report "Water levels in continuously monitored wells in the Yucca Mountain area, Nevada, 1989." All appropriate transducer output for 1989 has been converted to water levels. The text is now approximately 75 percent complete.

G. O'Brien completed processing of periodic water-level data for 1990 into water-level altitudes. Quality Assurance checking of the processing has not yet begun.

D. Burkhardt prepared transducer output data for 1985-88 for input to the USGS National Water Information System ADAPS Unit Values file. The data will be released to the public files following approval of the report "Water levels in continuously monitored wells in the Yucca Mountain area, 1985-88."

R. Luckey attended a meeting of the Testing Prioritization Task Force in Las Vegas January 17 to give information about the saturated-zone flow system.

All packers used to isolate water-level monitoring wells into separate zones will be tested. The test will initially determine if the plug was removed when the packer was installed. Conclusive testing will include removing, inspecting, rebuilding, and replacing all packers. A criteria letter to initiate the testing will be prepared soon.

Planning Documents

Study Plan 8.3.1.2.3.1.1-.6, R0, Characterization of the Site Saturated-Zone Ground Water Flow System, was resubmitted to YMPO on May 18. To date, it has not yet been formally approved by DOE. The Quality Assurance Grading Report for the Study Plan was transmitted to YMPO this month.

Quality Assurance

NCR 91-03, issued in November for using a barometer that had been calibrated by a non-certified calibration facility, was closed following certification of the facility.

NCR 91-07, also issued in November for using a barometer that had been calibrated by a non-certified calibration facility, was amended twice this month and the second amendment was accepted by the QA Office. Documents called for in the response are being prepared.

NCR 91-12 was issued against the activity for using existing software prior to completion of required QA documents. A response to the NCR is being researched.

M. Boucher continued to participate in revision and implementation of QMP-2.07 and QMP-2.08.

R. Luckey continued to participate in revision and implementation of QMP-2.02. The document has been revised and guidance for implementation is nearly complete.

R. Luckey discussed qualification of old water-level data from well J-13 with staff of the QA Office. He asked that YMPO again be requested to qualify the data at this time so that it may be used in synthesis and modeling activities. The QA Office agreed to again bring the matter to YMPO's attention.

All 1990 logbooks were removed from the field and are being prepared for transmittal to the USGS local records center as required in AP-5.1Q.

Operations

D. Baldwin continued to work on an internal training course on use of data collection platforms to collect water-level data. The course will be given at NTS starting February 6.

R. Luckey worked on the FY91 budget and prepared final figures and plans.

R. Martin obtained a used van from the NTS Motor Pool for use by the activity. This van will be used as a replacement for a non-DOE vehicle.

WBS 1.2.3.3.1.3.2 Saturated Zone Hydrochemistry
Principal Investigator - W. Steinkampf

OBJECTIVE
To describe spatial variations in chemical composition of ground-water; to identify chemical and physical processes that influence ground-water chemistry; to use hydrochemical data to aid in the identification and/or quantification of ground-water travel times; flow paths; fluxes to, from, and within the saturated zone; and climatic conditions during past periods of recharge. (SCP Study 8.3.1.2.3.2)

SCP 8.3.1.2.3.2.1 Assessment of saturated-zone hydrochemical data availability and needs

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
W. Steinkampf spoke with investigative and analytical staff at the USEPA Environmental Monitoring Systems Laboratory (LV), LANL and EG&G (INEL) regarding the feasibility of using ^{85}Kr as a drilling fluid tracer at the NTS. R. Holloway (EPA) indicated a willingness to perform several scoping analyses on gas samples when sample collection begins. It is likely that some sort of prototype work will have to be done for this aspect of the study. EG&G has designed an air-sampling system that is potentially applicable for sampling subsurface gases at Yucca Mountain. This item will be further investigated. Both Holloway and J. Thompson (LANL) suggested that dissolved ^{85}Kr would be less feasible. Subsequent discussion with J. Poths (LAPNL) lead to the conclusion that stable isotopic ratios will be the initial focus of dissolved Kr investigations, and that ^{85}Kr will be addressed if ^{3}H and stable Kr data suggest that this is warranted.

Planning Documents
W. Steinkampf continued consideration of Project and DOE/HQ review comments on SP-8.3.1.2.3.2, R0.

Quality Assurance
W. Steinkampf attended a DOE QA workshop to present initial drafts of charters for technical working groups at participant and Project levels for comment by workshop attendees. The Project-level charter was subsequently integrated into a draft prepared by other participants and submitted to DOE and the entire workshop roster for review. The participant-level charter was also submitted as an example for each of the participant organizations to consider.

Operations
W. Steinkampf participated in a briefing of A. Robinson (DOE) on HIP activities; began technical review of a draft quality assurance plan for support work to be done by the Environmental Research Center at the University of Nevada, Las Vegas, which will be completed and sent to the Project office in the first week of February; and received a draft MOU from M. Ebinger (LAPNL) for comments and input.

WBS 1.2.3.3.1.3.3 Saturated Zone Hydrologic System Synthesis and Modeling
Principal Investigator - R. Luckey
LBL Principal Investigator - K. Karasaki

OBJECTIVE
To synthesize available data to develop a conceptual model; to make a qualitative analysis of how the system is functioning; to develop and evaluate porous-media and fracture-network methods for simulating ground-water flow and solute transport; and to estimate ground-water flow direction and magnitude for input to ground-water travel time calculations. (SCP Study 8.3.1.2.3.3)

SCP 8.3.1.2.3.3.1 Conceptualization of saturated zone flow models within the boundaries of the accessible environment

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
E. Ervin continued to work on the Golder Associates, Inc. MAFIC flow and transport code. The code was compiled successfully on the HIP Sun workstation, although several minor problems still remain that are causing runtime errors. Once these errors are resolved, plans are to run all test cases provided by Golder. Ervin also requested the latest version and documentation of the FRACMAN code from W. Dershowitz of Golder Associates, Inc.

E. Ervin and M. Chornack completed approximately 400 miles of geologic road log from Las Vegas to Pahute Mesa, Yucca Mountain and Death Valley for the 1991 Geological Society of America field trip of the regional flow system in the vicinity of Yucca Mountain to be held in October.

E. Ervin delivered to D. Baldwin and setup a COMPAQ 386 laptop computer for the purpose of downloading data from the Data Collection Platforms and communicating with the PRIME.

Planning Documents
E. Ervin signed off on colleague review comments for Study Plan 8.3.1.5.2.2, Characterization of the Future Regional Hydrology Due to Climate Changes.

Quality Assurance

Operations

SCP 8.3.1.2.3.3.2 Development of fracture network model

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
An abstract entitled "Prematurely Terminated Slug Tests," by K. Karasaki was submitted to and has been accepted for the 1991 International Symposium on Ground Water sponsored by American Society of Civil Engineers, Hydraulics Divisions.

Another minor bug was discovered and was fixed during verification runs of the transport option of TRINET on 3-dimensional fracture networks.

Planning Documents

Quality Assurance
QA reading assignments were completed by various personnel.

Operations
The workscope was modified because LBL funding was lower than anticipated.

WBS 1.2.3.3.2 Preclosure Hydrology

OBJECTIVE
To examine hydrologic conditions, including flooding, availability of water supply, and characteristics within and above the repository horizon; and to determine whether engineering measures that require excessive cost, or technology beyond that which is reasonably available, will be needed during construction or operation of the repository. (SCP Section 8.3.1.16)

WBS 1.2.3.3.2.1 Flood Recurrence Intervals and Levels at Potential Locations of Surface Facilities
Principal Investigator - P. Glancy

OBJECTIVE
To assess the flood and debris hazards at and near the potential repository surface facilities locations to allow adequate design of facilities to prevent or reduce hazards to an acceptable level. (SCP Study 8.3.1.16.1.1)

SCP 8.3.1.16.1.1.1 Site flood and debris hazards studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
Vigilance for rainfall and runoff was maintained during the month.

The processing of data from numerous 1990 floods dominated technical work.

Current literature on flooding and related hazards was scanned and appropriate articles were duplicated for addition to the library.

Data compilations and analysis for recent regional flooding will continue during the foreseeable future.

Planning Documents
All study plans are undergoing some stage of review.

Quality Assurance
Revisions were made to the QA Grading Report for this activity.

Much technical work will be delayed in February to allow time to prepare for and undergo an internal QA audit.

Operations
A substantial amount of time was spent revising the PACS input to coincide with funding changes.

R. Carman and P. Glancy attended health and safety training at the YMP training facility at NTS.

WBS 1.2.3.6 Climatology and Meteorology

OBJECTIVE
To collect and analyze climatic, paleoclimatic, future climatic, and Quaternary hydrologic data to evaluate the suitability of the site.

WBS 1.2.3.6.2 Climatology

OBJECTIVE
To characterize the present, paleo-regional, local climate, and hydrologic conditions at Yucca Mountain, and to determine the magnitude and likely effects that future changes in climate will have on repository performance.

WBS 1.2.3.6.2.2 Effects of Future Climatic Conditions on Hydrologic Characteristics

OBJECTIVE
To determine the relations between climatic conditions and hydrologic characteristics in the vicinity of Yucca Mountain during and since the Quaternary; and to predict future hydrologic response to possible future climatic conditions. (SCP Investigation 8.3.1.5.2)

WBS 1.2.3.6.2.2.1 Quaternary Regional Hydrology
Principal Investigator - J. Stuckless

OBJECTIVE
To investigate the hydraulic characteristics of paleoflood events and to compare them with modern flooding and related geomorphic processes; to determine past infiltration and percolation history at Yucca Mountain through isotopic and chemical analysis of water from the unsaturated zone; to determine past hydrologic conditions in the regional discharge area; to estimate the conditions and rates of infiltration and ground-water recharge during the Quaternary; and to determine the ages, distribution, origin, and paleohydrologic significance of calcite and opaline silica deposits along faults and fractures.

SCP 8.3.1.5.2.1.1 Regional paleoflood evaluation

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
The available newly published literature was scanned to stay abreast with changing technology in paleoflooding. Important and useful articles were copied and included in the YMP library.

Documentation and processing of data from numerous 1990 floods dominated technical work.

Data accumulation and analysis for recent regional flooding will continue during the foreseeable future.

Planning Documents
The study plan for this activity is still undergoing DOE review.

Quality Assurance
Much technical work will be delayed in February to allow time to prepare and undergo an internal QA audit.

Operations
A substantial amount of time was spent revising the PACS input to coincide with budget changes.

R. Carman and P. Glancy both attended health and safety training at the YMP training facility at NTS.

SCP 8.3.1.5.2.1.3 Evaluation of past discharge areas

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
E. Gutentag, D. Malmgrem, and L. Wilson (GD) were in the field January 3-11 to collect 44 samples from 22 dry playas visited in New Mexico, Nevada, and California. The dry playas in Arizona were flooded due to recent rains. The collected samples will be analyzed for faunal content.

E. Gutentag collected 20 samples from 10 additional dry playas (Jan. 23-27) in California and Nevada. The collected samples will also be analyzed for faunal content.

E. Gutentag attended the ASTM meeting to write standards of hydrogeologic properties. These procedures are done by ASTM committees with input from the USGS, EPA, and Navy.

F. D'Agnese developed a method of data conversion for slope, aspect, and contour mapping.

F. D'Agnese and C. Faunt delineated the study area that will be covered by GSIS data base and developed a hierarchy for data base coverage of the study area including regional, subregional, and local scale.

K. Kolm reported that three reports have been submitted to the director's office for approval to publish and 10 additional reports are in the review process as products of the Past Discharge Activity.

Director's approval has been received for the following:

> Schmidt, M.R., Kolm, K.E., and Flint, A., USGS-Director approved, in journal review, "Use of statistically distinct genesis-lithology-qualifier map units for classifying upland soils at Yucca Mountain, Nevada, by geomorphology and physical properties affecting infiltration": Bulletin of the Association of Engineering Geologists.
>
> Weeks, J.B., Gutentag, E.D., and Kolm, K.E., USGS-Director approved, in journal review, "Evaluating vertical and areal variability of transmissivity and storage depth in fluvial deposits": Am. Institute of Hydrology Journal.
>
> M. Salamon completed processing HP-199T which is a scientific notebook for the collection of aquatic faunas.

Planning Documents
M. Salamon wrote responses for AFRS USGS-AFR-9101-02-03-04, -06, and USGS-9101-OBS3 and submitted them to the QA office for approval.

M. Salamon acquired lists of software for TCs within the Paleohydrology project for determination of further software QA action.

Quality Assurance

Operations

SCP 8.3.1.5.2.1.4 Analog recharge studies

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
P. McKinley discussed a job package for ongoing activities with J. Davis (SAIC/LV).

P. McKinley and J. Emerick discussed plans for summer field activities and prep-work for those activities.

B. Kerans and P. McKinley solved new challenges on entering data into ADAPS. P. McKinley was then able to complete input into ADAPS of temperature data for the Veg Spring site.

C. Mallon completed the first phase of the statistical comparisons of air temperature at Kawich with surrounding weather stations. P. McKinley discussed with K. Turner current statistical efforts to estimate missing data and other statistical methods that could be used to estimate data.

T. Oliver completed preparation of an information package on "Chemical analysis of water from selected wells and springs in the Yucca Mountain area, Nevada and southern California" for the Local Records Center.

T. Oliver completed preparation for the winter field trip to the Analog Sites. P. McKinley completed the winter field trip to the Analog Sites.

Planning Documents

Quality Assurance
M. Salamon completed a review of the equipment calibrations and compliance with QA requirements.

P. McKinley completed negotiations and received calibrated thermometers from Ball Corp.

A follow-up on Li-Cor as a calibration vendor was discussed with J. Woolverton.

M. Salamon and T. Oliver, under the guidance of J. Emerick, have started investigating the necessary calibration requirements and locating vendors that can perform the calibrations for the evapotranspiration equipment.

Operations
P. McKinley submitted remaining 1991 purposed field work to the Acting HIP chief for budget development consideration.

The revised 1991 budget for the Analog Recharge Project was reviewed.

SCP 8.3.1.5.2.1.5 Studies of calcite and opaline silica vein deposits

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
J. Wilson participated in a field trip to collect surface sediments from wet and dry playas in New Mexico, Arizona, Nevada, and California. Data will be used to calibrate ostracode response to playas supported by ground-water discharge versus those supported by only runoff.

Planning Documents

Quality Assurance

Operations
C. Carter's open-file received branch approval. It is now being readied for DOE approval.

WBS 1.2.3.6.2.2.2 Future Regional Hydrology due to Climate Changes
Principal Investigator - J. Stuckless

OBJECTIVE
To characterize the impacts of potential future climate changes on the regional and site surface-water system, the site unsaturated zone hydrology, and the regional and site saturated zone hydrology. (SCP Study 8.3.1.5.2.2)

SCP 8.3.1.5.2.2.3 Synthesis of effects of possible future recharge due to climate changes on hydrologic characteristics of the Yucca Mountain saturated zone

ACTIVITIES AND ACCOMPLISHMENTS

Technical Activities
J. Downey continued development of Isotope Model SNODIF2, adding new concepts of isotope movement through a snow pack. SNODIF is a required program to evaluate isotope data from discharge area of ground-water flow system.

Planning Documents
S. Keller finalized recompilation of Study Plan 8.3.1.5.2.2 (Effects of future climate on hydrology) to incorporate author/reviewer concurrence for the USGS technical review comments, transmitted it for HIP QA review, incorporated HIP QA review results, and produced the document. The study plan was transmitted to the Project Office January 16.

Quality Assurance
All software that will be used by project was QA'd and programs not requiring QA treatment were removed.

Operations
A field trip is planned to the northern part of ground-water flow system.

1.2.5 REGULATORY AND INSTITUTIONAL

OBJECTIVE
To support the Department of Energy (DOE)/HQ in the development of the site-related aspects of compliance with Nuclear Regulatory commission agreements, requirements, and policies, environmental and permitting requirements, and related DOE orders, and the development of site-related regulatory documentation; to plan and conduct environmental field investigations and transportation studies related to environmental compliance, permitting and repository design; to plan and conduct socioeconomics studies to assess the regional socioeconomic action studies; to coordinate Project activities with the community and state and local governments; and to plan and implement a public communication plan.

WBS 1.2.5.2 Licensing

OBJECTIVE
To support DOE by providing Project coordination and support of NRC interactions by providing input related to site aspects of proposed NRC regulation changes, and evaluate the impact of the regulation changes on the site activities, strategies, and plans; to support DOE/HQ in the development of site technical position papers by synthesizing site and site performance assessment technical information into Project positions; to develop draft position papers which support these positions; to perform technical evaluation of site data and related reports, technical reports, and conclusions, and draft position papers; to coordinate study plan review; to support the preparation of the semi-annual progress report for site investigations and assessments; and to coordinate and perform technical reviews of the site characterization program.

WBS 1.2.5.2.5 Study Plan Coordination
Principal Investigator - L. Hayes

OBJECTIVE
To coordinate the preparation review and revision of SCP Study Plans.

ACTIVITIES AND ACCOMPLISHMENTS
F. Singer compiled study plan status material and report for W. Langer (GD).

S. Keller recompiled Study Plan 8.3.1.2.1.1 (Meteorology for regional hydrology) to incorporate the completed author responses to DOE review comments, transmitted it for HIP QA review, and incorporated HIP QA review comments in final preparation for production and Project Office transmittal.

S. Keller provided the Project Office with minor revisions to reflect the deletion of discussion of QALAs from the text for Study Plan 8.3.1.2.1.3 (Regional ground-water flow system) and Study Plan 8.3.1.2.2.1 (Unsaturated-zone infiltration). DOE approved the study plans on January 18.

S. Keller provided the Project Office with minor revisions to reflect the deletion of discussion of QALAs from the text for Study Plan 8.3.1.2.3.1 (Site saturated-zone ground-water flow system).

F. Singer prepared proposed dispositions in response to YMP/OCRWM comments in preparation for a comment resolution workshop for Study Plan 8.3.1.9.2.1 (Natural resource assessment).

F. Singer incorporated revisions to figures and tables in response to a request made by T. Grant (SAIC/LV) for Study Plan 8.3.1.17.4.1 (Historical and current seismicity).

WBS 1.2.5.4 Environment

OBJECTIVE
To identify data requirements; to collect required environmental field data; and to prepare topical data reports.

WBS 1.2.5.4.8 Water Resources
Principal Investigator - R. LaCamera

OBJECTIVE
To provide water resources environmental field activity planning documents, field data and analyses, and topical reports describing the results of field data analyses.

ACTIVITIES AND ACCOMPLISHMENTS
A status report for the water-resources monitoring program was prepared for DOE. The report summarized activities for the period December 4 to December 28, 1990.

An initial and revised budget for FY 1991 were prepared for the Nevada District and YMPB. PACS information was also updated. A revised budget was required to reflect a funding reduction from $375,000 to $275,000.

W. Carswell, W. Scott, D. Beck, D. Wood, and R. La Camera (USGS, Nevada District) met with D. Appel, A. Handy, T. Chaney, and R. Luckey (USGS, YMPB) in Las Vegas on January 15. The purpose of the meeting was to discuss receipt and transfer of ground-water level data collected as part of the site-characterization studies to the Nevada District and the National Park Service. Most of that data will become available on a quarterly basis, and will be obtained through DOE's record center.

D. Beck and R. La Camera (USGS, Nevada District) met with L. Hayes, R. Ritchey, D. Appel, A. Handy, and T. Chaney (USGS, YMPB) and G. Fasano and E. McCann (SAIC/LV) in Las Vegas on January 16. The purpose of the meeting was to discuss integration and communications between the three organizations. La Camera, Beck, and Fasano will be drafting a possible memorandum of understanding between the USGS and SAIC.

D. Beck, R. La Camera, and G. Fasano met in Las Vegas on January 31 to consider current and future interactions between DOE, USGS-YMPB, USGS-Nevada District, and SAIC as they relate to the water-resources monitoring program. La Camera will prepare a draft memorandum of understanding for comment.

A brief history, status, and staffing needs of the water-resource monitoring program were discussed with D. Beck, who will be overseeing all USGS, Nevada District activities related to the Yucca Mountain Project.

Still further negotiations with NPS concerning the monitoring network appear to be necessary. At the last meeting with NPS, the plan was preliminarily approved, dependent primarily on issues related to data transfer and subsequent modifications to the network (should they be necessary).

1.2.9 PROJECT MANAGEMENT

OBJECTIVE
To provide overall management of the Yucca Mountain Project including: project control, quality assurance, technical integration, and interaction with other OCRWM Program demands on Project management activities.

WBS 1.2.9.1 Management and Integration

OBJECTIVE
To provide overall management of the Yucca Mountain Project including: technical integration and interaction with other OCRWM Program elements.

WBS 1.2.9.1.1 Management
Principal Investigator - L. Hayes

OBJECTIVE
To provide overall management of the Yucca Mountain Project including budgeting and financial analysis, progress reporting, support to HQ management activities, training, and overall Project integration.

ACTIVITIES AND ACCOMPLISHMENTS
A request to YMP-USGS Management was sent for their instructional assignments for the following QMPs:

QMP-3.04, R4	Technical Review, Approval, and Distribution of YMP-USGS Publications
QMP-5.03, R6	Development and Maintenance of Quality Management Procedures

Reading Assignments were distributed to assigned TPO and QA personnel for the following QMP modifications and Administrative Procedure revision:

QMP-8.03,R3-M1	Identification, Control, and Transmittal of Technical Data
QMP-15.01,R4-M1	Control of Nonconforming Items
QMP-18.01,R5-M2	Audits
AP-3.3Q, R3	Change Control Process

Starting in January, an updated version of the Overdue Reading Assignments Reminder Notice system was put into place. Second Reminder Notices were distributed to participants who were late in submitting completed reading assignment forms for QMP-4.02, R2; QMP-12.01, R5; and AP-5.1Q, R1. First Reminder Notices were distributed to participants who were late in submitting reading assignment forms for AP-1.10Q, R2 and QMP-17.01, R4. Overdue reading assignment information was also provided to the TPO QA Advisor for distribution during Action Items meetings. This information was provided in a revised format according to the recipients' requests.

Orientation video tapes, Environmental Training Requirements Program video tapes, and reading assignments were distributed to personnel according to management's requests. The Environment Requirements Training Program was presented twice to GD personnel.

Information was requested from management regarding those participants requiring the mandatory DOE NTS Orientation and Health and Safety Training. Participants working at the NTS in January and February were scheduled for training through coordination with T&MSS. A tracking system is in place to ensure that all YMP-USGS participants will complete the required training.

The YMP-USGS training database was updated to reflect all instruction completions in January.

The Training Coordinator worked with M. Boucher, Foothills, and J. Whitney, USGS, to make changes to the QMP-2.07, R1 December preliminary draft for presentation to T. Chaney, USGS. Subsequently, a draft revision was presented for Division review.

Personnel database changes were input; and computer generated listings of the database information were printed and distributed to each management group along with a request to update the information by the end of March.

The Training Coordinator worked with B. Langsteiner, SAIC/Golden, to ensure the success of a training course entitled "Responding to Deficiency Documents" which was presented on 1/21/91 to selected QA Specialists, Software, and Records Center support personnel.

The Training Coordinator represented the USGS at a DOE/YMP Training Coordinators' Meeting held in Las Vegas, January 23 and 24. This meeting was to observe a training meeting held in Las Vegas between a QA committee appointed to investigate the effectiveness of YMP training and DOE/T&MSS training staff representatives. At the YMP-USGS TPO's request, she agreed to meet with H. Nunez, LANL, in February to familiarize him with the USGS instruction program and to assist him in designing a questionnaire for his use when interviewing YMP participants regarding the effectiveness of the training program.

Information necessary to finalize a response to indoctrination and orientation issues raised by Audit Findings 01 and 02 from Audit 90-1 was provided to the TPO Office.

The Open Items Committee continues to learn of open instruction assignments from the TPO's Training Coordinator. Emphasis is placed on the overdue or nearly overdue assignments to bring them to closure or to escalate the items for management attention.

The QA Advisor to the TPO worked with the Training Coordinator to complete the investigation for and provide additional information required by Audit Finding Report 9013-02 (QMP-2.07 requirements for orientation, training, and indoctrination).

WBS 1.2.9.1.4 Records Management
Principal Investigator - L. Hayes

OBJECTIVE
To provide a Yucca Mountain Project Records Management System that will meet the requirements of: DOE-NNWSI, Quality Assurance Plan, DOE-NNWSI/88-9; DOE-OCRWM Records Management Policies and Requirements, DOE/RW-0194; and the Licensing Support System (LSS); and to establish and operate all local records centers.

ACTIVITIES AND ACCOMPLISHMENTS
Thirteen QA record packages (4,007 pages), six cited reference packages (2,644 pages), and four published report packages (Map I-1972, OFR88-436, OFR 88-664 and OFR 89-3 totalling 5,581 pages) were submitted to the CRF with a total of 12,232 pages.

The following items were picked up from the Earthquake Center for storage by the LRC: 48 rolls of Develocorder film, 106 magnetic tapes, and two boxes of PT plots.

Three new published report packages were received in the LRC.

QMP-3.07 reviews were conducted for Records Management requirements on:

QMP-3.14, R4	Software Configuration Management System
QMP-2.08, R1	Contractor Personnel Qualification and Training
QMP-5.03, R6	Development and Maintenance of Quality Management Procedures

A preliminary draft of records management requirements Para. 6 for QMP-2.07, R0 (Training Development and Documentation) was prepared for the Training Coordinator.

An amended response was prepared for USGS-NCR-91-01.

A new NRC 91-19 was initiated to identify improper protection/storage of aerial photographs within the Geologic Division.

Two instruction sessions were conducted in records management to review requirements of record preparation and indexing as well as specific record package preparation and submittal requirements. Specific package responsibility areas were: training, audits, surveillances, document control, and procedures.

A meeting was held to review and discuss USGS strategy related to the Project Office proposed Nevada Test Site Document and Records Center. Recommendations were provided to the TPO.

Two teams of individuals representing the NRC and the Project Office visited the LRC regarding selection criteria for Licensing Support System (LSS) records and to develop an understanding of how technical data records are processed in the LRC and the media on which they are captured.

A telecommunication meeting was attended to review and discuss the plans and needed funding to connect the Branch Office, QA Office, and LRC to the Project wide system.

Meetings were attended with the LRC Staff, the Records Coordinator, and T. Lanier regarding the status and implementation of previously identified Improvement/Enhancements to the Records Database System. Programming and testing of most of these improvements have been completed. Implementation and additional testing is ongoing. Limited orientation and training has been provided to users regarding the search capabilities and keyword requirements of the enhanced system. Database maintenance activities have been completed.

The following approved modifications to Quality Management Procedures were distributed:

QMP-8.03,R3-M1	Identification, Control, and Transmittal of Technical Data
QMP-15.01,R4-M1	Control of Nonconforming Items
QMP-18.01,R5-M2	Audits

The following approved technical procedures were distributed:

GP-10, R1	Borehole Video Fracture Logging
GPP-01, R2	Gravity Methods
GPP-18, R1	Magnetotelluric Measurements
HP-91, R2	Collection and Field Analysis of Surface-Water Samples
HP-199T, R0	Collection of Aquatic Micro-organisms

Technical procedure GPP-18, R0, Volcanic Stratigraphic Studies was rescinded.

Numerous routine document control functions were performed including distributing replacement documents to 28 document holders, issuing new copy holders to four participants, transferring two sets of controlled documents, sending out follow-up DTNs for seven transmittals, and transmitting completed DTN record packages to the YMP-USGS Local Records Center.

A follow-up letter was transmitted for the 1990 annual Controlled Documents Configuration Report. The current percentage of completion for the configuration report is 70%.

The YMP-USBR Quality Management Procedure QMP-1.01, R1, Organization Description, was distributed. YMP-USBR-QMP-17.02, R0, Acceptance of Data Not Developed Under the NNWSI QA Plan, was deleted.

WBS 1.2.9.2 Project Control
Principal Investigator - L. Hayes

OBJECTIVE
To provide Project management support in the areas of cost and schedule planning and control; to develop and maintain an integrated project management system; to implement performance measurement; to support the change control system; and to establish WBS.

ACTIVITIES AND ACCOMPLISHMENTS
The SAIC/Golden actual cost distribution, estimated cost distribution, FTE report, and the USGS cost report for December were compiled. The December actual costs for the USGS were sent to Las Vegas for input into the PACS system. The compilation of the USGS monthly status report for December was completed and the report was edited and submitted to DOE.

All revision and modification have been made to schedules for the PACS input and sent to Las Vegas for re-entry into the APECS system. With close correlation with the personnel of the Las Vegas office, all interfaces related to the USGS-YM schedules from and to the other contractors have been installed in the system and is now awaiting Las Vegas to baseline the milestones.

New printouts of all schedules have been incorporated into books for reference and given to the PI for their use.

WBS 1.2.9.3 Quality Assurance

OBJECTIVE
To establish and implement a Yucca Mountain quality assurance program.

WBS 1.2.9.3.1 Quality Assurance Program Development
Principal Investigator - D. Appel

OBJECTIVE
To establish and maintain the QA program descriptions.

ACTIVITIES AND ACCOMPLISHMENTS
QMP-2.02, R5 is approved and awaiting distribution pending the development of Guidelines for its use.

A request for the rescission of QMP-3.10, R2 was submitted and approved.

Comments have been received from both Divisions for the revisions to QMPs -18.01 and -18.02; however, QMP-18.01 is being revised further to incorporate the new modification and will be resubmitted for Division Review.

Comments on the modification to QMP-3.14, R4 were received as a result of Division Review. There were no comments specific to the modification; however, comments were received under separate cover from the Records Coordinator and these were forwarded to the author M. Wallendorf for consideration in the next revision.

QMPs- 303, R3, -3.07, R4, -4.01, R4, and -7.01, R4 are still in comment resolution. QMPs -2.08, R2 and -5.03, R6 were prepared and submitted for Division Review with comments being received and are being returned to the author for resolution. QMP-2.07, R1, YMP-USGS Instruction was prepared and submitted for Division Review at month's end.

A modification was prepared, approved and distributed for QMP-8.03, R3. Modifications are being prepared for QMP-18.01, R5 and QMP-15.01, R4.

An Interim Change Notice to the YMP-USGS-QAPP-01, R5 was approved and has been forwarded to Document Control.

WBS 1.2.9.3.2 Quality Assurance - Audits and Surveillances
Principal Investigator - D. Appel

OBJECTIVE
To verify the QA program through periodic audits and surveillance of Project activities.

ACTIVITIES AND ACCOMPLISHMENTS
Audit Plans for USGS-91-03 for annual vendor requalification of Fluid Data Systems, Inc., and USGS-91-04 for the USGS National Mapping Division, Branch of Geometronics, a potential supplier of calibration services for level rods were submitted and the audits were performed.

The report for Audit USGS-91-01 on the implementation of select YMP-USGS QMPs and APQs for two HIP activities was written. Six Audit Findings and three Audit Observations resulted from this audit. Additionally, two Nonconformance Reports were verified and closed as a result of the Audit.

The amended and supplemental responses to Audit Findings and Observations from internal Audit USGS-90-13 were accepted.

Scoping and other preparations for internal Audit USGS-91-05 on four HIP activities in Nevada were conducted.

Assistance with the responses to Audit Findings from Audit USGS-91-01, and with responses to Nonconformance Reports from Surveillance USGS-91-S04 was conducted.

Surveillances USGS-91-S10, U.S. Bureau of Reclamation; USGS-91-S08, Geodetic Leveling for the Relevel Base Station activity; USGS-91-S09, installation of piezometers for the Regional Potentiometric Level Study, were planned and conducted.

A Surveillance Plan for USGS-91-S12 was submitted on 01/28/91. This surveillance will be conducted next month.

The response to Surveillance USGS-91-S05, Observation No. 2, was received and accepted. The Surveillance Report and Observation will remain open until the proposed response actions are completed and can be verified.

An addenda to the Approved Vendor List was submitted. The addenda reflects the addition of one vendor, YSI Incorporated, and the deletion of two vendors, Leupold & Stevens, Inc. and the New Mexico Institute of Mining and Technology.

A report was submitted for Special Investigative Review USGS-AFR-9009-02. Resolutions were verified and the subject deficiency document was closed.

A memorandum was submitted rejecting the response to USGS-NCR-91-08 and recommending an acceptable amended response for a deficiency relating to the calibration of balances used by the New Mexico Institute of Mining and Technology.

The following Special Investigative Reviews were performed:

Review of USGS-NCR-90-27 -	The resolutions were verified and the subject nonconformance document was closed 1/17/91.
Review of USGS-NCR-91-03 -	The resolutions were verified and the subject nonconformance document was closed 1/24/91.
Review of USGS-NCR-91-07 -	The disposition activities were verified and a recommendation for a closeout was transmitted 1/29/91.

A review and update of the USGS Lead Auditor and Surveillance Qualifications Records was completed 1/15/91 in accordance with QMP-2.05, R3.

WBS 1.2.9.3.3 Quality Assurance - Quality Engineering
Principal Investigator - D. Appel

OBJECTIVE
To provide quality engineering support to the project through reviews of documentation and assistance with QA training.

ACTIVITIES AND ACCOMPLISHMENTS
The TPO QA Advisor attended several meetings involving implementation of QMP-2.02, R5, USGS Personnel Qualification. The committee, chaired by the YMP-USGS QA Manager, has been tasked with developing a highlights and guidance document to assist USGS personnel in meeting the requirements of QMP-2.02, and to assure that NQA-1 Criterion 1 "QA Program" requirements for the qualification of personnel will be available for DOE/YMP verification.

Management reviews were completed for QMPs -5.03 (preparing QMPs) and -2.08 (qualification of contract personnel).

Work continued on reviewing procurement records for USGS-NCR-90-09 and DOE/YMP SDR 135. The full resolution of these open items has been a top priority and ensure that the corrective actions are completed without further delays or extensions.

The Open Items Committee continued meeting on a bi-weekly basis with committee members focused on resolving difficult and/or complex open items. Some of the action items worked on during January included: External Items SDR 135 (USGS FY89 and FY90 procurements), SDR 489

(calibration details in technical procedures), SDR 554 (corrections for Study Plan 8.3.1.4.2.2), SDR 557 & 558 (requirements for LRC and Record Sources), SDR 559 (illegible copies of notebooks and aerial photographs), SDR 560 (implementing data requirements from DOE AP-5.1Q); Internal Items AFR 9013-02 (orientation, indoctrination and/or training), AFR 9013-03 (scientific verifications), AFR 9013-08 (data management), AFR EA9001-01 R1 (calibration requirements for sedigraphs); USGS CAR-89-09 (seismic ongoing-monitoring activities compliance with QA program), USGS CAR-90-01 (interface controls), CAR-90-04 (untimely responses or actions for open items), CAR-91-01 (graded QA program), CAR-91-02 (incorporation of QMP modifications), CAR 91-03 (use of unapproved vendors); NCRs 90-09 (procurement), NCR 90-35 (TPO/QA review of publications), NCR 90-37 (calibration requirements), NCR 91-01 (accession numbering on USGS publications), NCR 91-12 and -13 (software QA requirements), NCR 91-14 (qualifications records to support Study Plans), NCR 91-18 (data submittals).

Other miscellaneous actions on behalf of the TPO included coordinating investigation and preparing response for the potential trend from the November 1990 Trend Analysis Report (QMP violations and unclear QMP requirements), coordination and follow-up of instruction assignments with the Training Coordinator, resolving overdue document control notices, and follow-up of potentially overdue calibrations.

Sixty-six items have been received, reviewed, and/or processed by the SCM Librarian in accordance with QMP-3.14. This includes updating the Configuration Status Log, the SCM Document Tracking database, and the Directory of Users. Technical Contacts have been notified upon the receipt of SQA Documentation and upon SCM Baselining of Software Products.

An Agenda and Minutes were prepared and distributed for the 1/25/91 CCC meeting. Eight CCC Reviews were conducted. A CCC Review Plan and Report was completed for each review.

All Technical Contacts were provided with a listing of the status of their SQA documentation as of 12/31/90.

Follow-up notifications were drafted and distributed concerning the change control issues arising out of the December CCC Meeting.

Responses were provided on behalf of the TPO for three SQA related deficiencies: NCR-91-12, NCR-91-13, and 91-S04-OBS2.

A formal review of QMP-3.03, R3 has been completed.

WBS 1.2.9.3.4 Quality Assurance - Quality Overview
Principal Investigator - D. Appel

OBJECTIVE
To provide reviews, analysis, and interpretations of QA requirements and application of QA to technical and scientific disciplines.

ACTIVITIES AND ACCOMPLISHMENTS
The December Open Items and Trend Analysis Report was submitted to the QA Office.

The 1990 Fourth Quarter Quarterly Open Items Status Report was written and distributed.