CNWRA PROGRAM MANAGER'S PERIODIC REPORT ON ACTIVITIES OF THE CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

For the Fiscal Reporting Period

July 5, 1997 – August 1, 1997

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TABLES

ABBREVIATIONS

1D	one-dimensional
2D	two-dimensional
3D	three-dimensional
AA	Atomic Absorption
AAI	Average Annual Infiltration
ACD	Advanced Conceptual Design
ACF	Alumina (in excess of alkali feldspar), Calcium Oxide, Ferromagnesian Oxide
ACNW	Advisory Committee on Nuclear Waste
ACRS	Advanced Computer Review System
AECL	Atomic Energy of Canada Limited
AES	Atomic Emission Spectrometry
AGU	American Geophysical Union
AI	Administrative Item
ALTS	Apache Leap Test Site
AML	Areal Mass Loading
ANS	American Nuclear Society
ANSI	American National Standards Institute
AO	Annotated Outline
AP	Administrative Procedure
APB	Acid-Producing Bacteria
ARDES	Activities Related to Development of the U.S. Environmental Protection Agency Yucca Mountain Standard
ASCE	American Society of Civil Engineers
ASCII	American Standard Code for Information Interchange
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ASU	Arizona State University
ATDTS	Automated Technical Data Tracking System
BEG	Bureau of Economic Geology
BFD	Basis for Design
BM	Bare Mountain
BMF	Bare Mountain Fault
BTP	Branch Technical Position
CAI	Color Alteration Index
CAR	Corrective Action Request
CCDF	Complementary Cumulative Distribution Function
CCL	Commitment Control Log
CCM	Constant Capacitance Model
CD-R	CDROM Recordable
CDF	Cumulative Distribution Function
CDM	Compliance Determination Method
CDOCS	Consolidated DOCument Management System
CDROM	Compact Disk Read Only Memory
CDS	Compliance Determination Strategy
CDTS	Commission Decision Tracking System
CEB	Center for Environmental Biotechnology
CEC	Commission of the European Communities
CFD	Computational Fluid Dynamics
CFR	Code of Federal Regulation
CIAC	Computer Incident Advisory Capability
CLST	Container Life and Source Term
CM	Configuration Management
CNWRA	Center for Nuclear Waste Regulatory Analyses
COI	Conflict of Interest
COPS	CNWRA Operations
CPP	Cyclic Potentiodynamic Polarization
CQAM	CNWRA Quality Assurance Manual
CRG	Center Review Group
CRWMS	Civilian Radioactive Waste Management System
CSCS	Constrained Stochastic Climate Simulator
CSH	Calcium Sulfate Hydrate
DAS	Data Acquisition System
DBE	Design Basis Event
DC	Division of Contracts
DCAA	Defense Contract Audit Agency
DCF	Dose Conversion Factor
DECOVALEX	DEvelopment of COupled Models and Their VALidation Against EXperiments in Nuclear Waste Isolation
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
DF	Dilution Factor
DFCSS	Division of Fuel Cycle Safety and Safeguards
DIE	Determination of Importance Evaluation
DIMNS	Division of Industrial and Medical Nuclear Safety
DLG	Digital Line Graph
DLM	Diffuse Layer Model
DNAG	Decade of North American Geology
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOE-DP	DOE Defense Program
DRA	Division of Regulatory Applications
DST	Drift Scale Test
DTED	Digital Terrain Elevation Data
DWM	Division of Waste Management
EBS	Engineered Barrier System
EBSER	Engineered Barrier System Experimental Research
EBSPAC	Engineered Barrier System Performance Assessment Code
ECM	Equivalent Continuum Model
EDO	Office of the Executive Director for Operations
EDX	Energy-Dispersive X-Ray Spectroscopy

ABBREVIATIONS (cont'd)

EIS	Environmental Impact Statement
EM	Element Manager
EMPA	Electron MicroProbe Analysis
ENFE	Evolution of the Near-Field Environment
ENGB	ENgineering and Geosciences Branch
EnPA	Energy Policy Act of 1992
ENS	European Nuclear Society
EPA	U.S. Environmental Protection Agency
EPR	Electrochemical Potentiokinetic Reactivation
EPRI	Electric Power Research Institute
EQA	External Quality Assurance
EROS	Earth Resource Observation System
ESP	Environmental Simulation Program
ESF	Exploratory Studies Facility
EXAFS	Extended X-Ray Absorption Fine Structure
FAC	FAvorable Condition
FCRG	Format and Content Regulatory Guide
FDSHA	Fault Displacement and Seismic Hazard Analysis
FEHM	Finite Element Heat and Mass Transfer
FEM	Finite Element Method
FEP	Features, Events, and Processes
FFRDC	Federally Funded Research and Development Center
FFT	Fast Fourier Transform
FTE	Full-Time Equivalent
FTP	File Transfer Protocol
FY	Fiscal Year
FYTD	Fiscal Year-to-Date
GDF	Ghost Dance Fault
GEM	General Electrochemical Migration
GEOTRAP	GEOlogic Transport of RAdionuclides Predictions
GERT	General Employee Radiological Training
GET	General Employee Training
GFM	Geological Framework Model
GHGC	GeoHydrology and GeoChemistry
GIS	Geographic Information System
GLGP	GeoLogy and GeoPhysics
GPS	Global Positioning Satellite
GROA	Geologic Repository Operations Area
GS	Geologic Setting
GSA	Geologic Society of America
GTFE	Great Tolbachik Fissure Eruption
GUI	Graphics User Interface
GWSI	GroundWater System Integration
GWTT	GroundWater Travel Time
HLUR	High-Level Waste and Uranium Recovery Projects Branch
HLW	High-Level Waste
HRTEM	High-Resolution Transmission Electron Microscopy
IA	Igneous Activity
IBM	International Business Machines
ICP	Inductively Coupled Plasma
ICPP	Idaho Chemical Processing Plant
IDLH	Immediately Dangerous to Life and Health
IHLRWM	International High-Level Radioactive Waste Management Conference and Exposition
IM	Intermediate Milestone
IME	Industrial Mobilization Exemption
IMS	Information Management Systems
INEEL	Idaho National Engineering and Environmental Laboratory
INETER	Instituto Nicaraguense de Estudios TERritoriales
INTRAVAL	International Code Validation
I/O	Input/Output
IPA	Iterative Performance Assessment
IR&D	Internal Research & Development
IRIS	Interim Records Information System
IRM	Office of Information Resources Management
IRSR	Issue Resolution Status Report
ISFSI	Independent Spent Fuel Storage Installation
ISM	Integrated Site Model
IVM	Interactive Volume Modeling
IWPE	Integrated Waste Package Experiments
JC	Job Code
JPL	Jet Propulsion Laboratory
JRC	Joint Roughness Coefficient
KTI	Key Technical Issue
KTU	Key Technical Uncertainty
LAAO	License Application Annotated Outline
LAN	Local Area Network
LANL	Los Alamos National Laboratories
LARP	License Application Review Plan
LAW	Low-Activity Waste
LBL	Lawrence Berkeley Laboratory
LHS	Latin Hypercube Sampling
LITC	Lockheed Information Technology Company
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level Waste
LMAES	Lockheed Martin Advanced Environmental Systems
LSS	Licensing Support System
LSSPP	Licensing Support System Pilot Project
LSSTB	Licensing Support System Test Bed
LWR	Light Water Reactor

ABBREVIATIONS (cont'd)

Ma	Million Years Ago
MC	Monte Carlo
METRA	Mass and Energy TRAnsport
MGDS	Mined Geologic Disposal System
MH	Mechanical-Hydrological
MIC	Microbially Influenced Corrosion
MINC	Multiple Interacting Continua
MIT	Massachusetts Institute of Technology
MM	Major Milestone
MO	Management and Operations
MOU	Memorandum of Understanding
MPC	Multi-Purpose Canister
MRS	Monitored Retrievable Storage
MSS	MultiSpectral Scanner
MTU	Metric Ton of Uranium
NAS	National Academy of Sciences
NAWG	Natural Analogue Working Group
NCR	NonConformance Report
NEA	Nuclear Energy Agency
NFS	Network File Server
NIOSH	National Institutes of Safety and Health
NIR	Near-InfraRed
NIST	National Institute of Standards and Technology
NMSS	Office of Nuclear Material Safety and Safeguards
NNE	North-Northeast
NNW	North-Northwest
NOAA	National Oceanographic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NSRRC	Nuclear Safety Research Review Committee
NTS	Nevada Test Site
NUREG	NRC Technical Report Designation
NWPA	Nuclear Waste Policy Act, as amended
NWTRB	Nuclear Waste Technical Review Board
OBES	Office of Basic Energy Sciences
OCRWM	Office of Civilian Radioactive Waste Management
OGC	Office of General Counsel
OITS	Open-Item Tracking System
OMB	Office of Management and Budget
OPS	Operations Plans
ORR	Operations Readiness Review
ORS	Overall Review Strategy
OWFN	One White Flint North
PA	Performance Assessment
PAAG	Performance Assessment Advisory Group
PAC	Potentially Adverse Condition
PAHT	Performance Assessment and Hydrologic Transport
PASP	Performance Assessment Strategic Plan
PC	Personal Computer
PC/TCP	Personal Computer/Transmission Control Protocol
PDR	Public Document Room
PEL	Permissible Exposure Limit
PEM	Program Element Manager
PER	Prelicensing Evaluation Report
PFD	Probabilistic Fault Displacement
PFDHA	Probabilistic Fault Displacement HAzard
PI	Principal Investigator
PDF	Probability Distribution Function
PMDA	Program Management, Policy Development and Analysis Staff
PMPR	Program Manager's Periodic Report
PMT	Photo-Multiplier Tube
PNNL	Pacific Northwest National Laboratory
PO	Project Officer
PPA	Proposed Program Approach
PPE	Prepassivated Platinum Electrode
PRA	Probabilistic Risk Assessment
PRT	Peer Review Team
PSAG	Probabilistic System Assessment Group
PSHA	Probabilistic Seismic Hazard Analysis
PTFE	PolyTetraFluoroEthylene
PTn	Paintbrush Nonwelded Tuff
PVHA	Probabilistic Volcanic Hazards Assessment
PVHVIEW	Probability of Volcanic Hazards VIEW
PVM	Parallel Virtual Machine
PWR	Pressurized Water Reactor
QA	Quality Assurance
QAP	Quality Assurance Procedure
QRAM	Quality Requirements Application Matrix
RASA	Regional Aquifer System Analysis
RDCO	Repository Design, Construction, and Operations
RDTME	Repository Design and Thermal-Mechanical Effects
REE	Rare Earth Element
REECO	Reynolds Electrical and Engineering Company, Inc.
RES	Office of Nuclear Regulatory Research
RFP	Request for Proposal
RH	Relative Humidity
RIP	Repository Integration Program
ROC	Repository Operations Criteria
RPD	Regulatory Program Database
RRT	Regulatory Requirement Topic
RSRG	Real Space Renormalization Group
RT	Radionuclide Transport
RTS	Radwaste Treatment System
SAP	Safety Assessment Package
SAR	Safety Analysis Report

ABBREVIATIONS (cont'd)

SCA	Site Characterization Analysis
SCC	Substantially Complete Containment
SCCEX	Substantially Complete Containment EXample
SCM	Surface Complexation Models
SCP	Site Characterization Plan
SDMP	Site Decommissioning Management Plan
SDS	Structural Deformation and Seismicity
SECY	Secretary of the Commission, Office of the (NRC)
SELM	Spectral ELement Method
SEM	Scanning Electron Microscopy
SER	Safety Evaluation Report
SF	Spent Fuel
SFPO	Spent Fuel Project Office
SFVF	San Francisco Volcanic Field
SGML	Standard Generalized Markup Language
SHE	Standard Hydrogen Electrodes
SIP	Scientific Investigation Plan
SKI	Swedish Nuclear Power Inspectorate
SLAR	Side Looking Airborne Radar
SNL	Sandia National Laboratories
SOTEC	SOurce TErm Code
SOW	Statement of Work
SPCR	Software Problem Correction Report
SRA	Systematic Regulatory Analysis
SRB	Sulfate-Reducing Bacteria
SRBS	Shafts, Ramps, Boreholes, and Their Seals
SRD	Software Requirements Description
SRESNR	Support Revision of the EPA Standard and NRC Rule
SS	Stainless Steel
STEM	Scanning Transmission Electron Microscopy
STP	Staff Technical Position
SUFLAT	Stochastic Analyses of Unsaturated FLow And Transport
SVF	Springerville Volcanic Field
SwRI	Southwest Research Institute
TA	Technical Assistance
TBD	To Be Determined
TBM	Tunnel Boring Machine
TCP/IP	Transmission Control Protocol/Internet Protocol
TDI	Technical Document Index
TDOCS	Technical DOCument Reference Database System
TEF	Thermal Effects on Flow
TEM	Transmission Electron Microscopy
THMC	Thermal-Hydrologic-Mechanical-Chemical
TLM	Triple-Layer Model
TM	Thermal-Mechanical
TMH	Thermal-Mechanical-Hydrologic
TMI-2	Three Mile Island Unit 2
TMS	The Minerals, Metals, and Materials Society
TOP	Technical Operating Procedure
TP	Technical Position
TPA	Total Performance Assessment
TPI	Time Period of Regulatory Interest
TR2	DOE Seismic Topical Report No. 2
TRG	Technical Review Group
TSPA	Total System Performance Assessment
TSPAI	Total System Performance Assessment and Integration
TSw-Chnv	Topopah Spring Welded-Calico Hills Nonvitric
TVD	Total Variation Diminishing
TWFN	Two White Flint North
TWINS	Tank Waste Information Network System
TWRS	Tank Waste Remediation System
UA	University of Arizona
UACH	Universidad Autónoma de Chihuahua
UCLA	University of California-Los Angeles
UDEC	Universal Distinct Element Code
UK	United Kingdom
UNM	University of New Mexico
UR	Uranium Recovery
U.S.	United States
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey
UTM	Universal Transverse Mercator
USFIC	Unsaturated and Saturated Flow under Isothermal Conditions
UZ	Unsaturated Zone
VA	Viability Assessment
VCS	Version Control System
VF	Vitrification Facility
VSIP	Vertical Slice Implementation Plan
WAN	Wide Area Network
WAPDEG	WAste Package DEGradation
WBS	Work Breakdown Structure
WCIS	Waste Containment and Isolation Strategy
WFO	Work for Others
WGB	Western Great Basin
WIPP	Waste Isolation Pilot Plant
WMB	Waste Management Branch
WNYNSC	Western New York Nuclear Service Center
WOL	Wedge-Opening Loading
WP	Waste Package
WSEI	Waste Systems Engineering and integration
WSS	Waste Solidification Systems

ABBREVIATIONS (cont'd)

WTSO	Washington Technical Support Office
WVDP	West Valley Demonstration Project
WVNS	West Valley Nuclear Services
WWW	World Wide Web
XPS	X-ray Photoelectron Spectroscopy
XRD	X-ray Diffractometry
YM	Yucca Mountain
YMP	Yucca Mountain Project
YMSCO	Yucca Mountain Site Characterization Office
YMR	Yucca Mountain Region
YTD	Year-to-Date

EXECUTIVE SUMMARY—PERIOD 11

In the Division of Waste Management (WP) Job Code (JC), the following items highlight the Center for Nuclear Waste Regulatory Analyses (CNWRA) key activities and accomplishments:

- FY97 CNWRA Quality Assurance Audit—Letter Report was conveyed.
- 1995 Eruptions of Cerro Negro Volcano, Nicaragua, and Risk Assessment for Future Eruptions—Journal Article was transmitted.
- Geometric, Thermal, and Temporal Constraints on the Tectonic Evolution of Bare Mountain—Journal Article was sent.
- Evaluation of Cement-Water Interactions—Letter Report was delivered.
- Infiltration—Journal Paper documenting field and modeling work studying hydrologic processes in the Tiva Canyon caprock was conveyed.

The APRIC JC year-to-date (YTD) cost variance was 1.9 percent. This variance reflects spending estimates from the CNWRA Operations Plans Revision 9 Change 3.

In the Waste Solidification Systems (WSS) JC, the CNWRA staff engaged in limited administrative activities. This project will be restructured later this fiscal year. The YTD cost variance to this JC was 68.0 percent. This variance is based on spending estimates from the Operations Plan for WSS Revision 6 Change 2.

In the Tank Waste Remediation System (TWRS) JC, the CNWRA staff delivered the Consolidated Hanford Tank Waste Familiarization Report—Final Report (retitled Hanford Tank Waste Remediation System Familiarization Report) and it has been accepted. The CNWRA staff visited the U.S. Department of Energy (DOE) Regulatory Unit in Richland, Washington, to participate in a training workshop on review of the Safety Assessment Package from the privatization contractor. The YTD cost variance was −4.4 percent. This variance reflects spending estimates from the Operations Plan for Technical Assistance to TWRS Licensing Revision 0 Change 2.

In the Three Mile Island Unit 2 Independent Spent Fuel Storage Installation (TMI-2 ISFSI) JC, four CNWRA staff along with NRC management and staff visited the INEEL ISFSI site to obtain firsthand information on the DOE collection and interpretation of seismic data, various components of the TMI-2 fuel debris and dry storage system, and the proposed facility and related equipment, and to discuss with the DOE various issues relevant to review of the DOE Safety Analysis Report. The YTD cost variance was 14.0 percent. This variance reflects spending estimates from the Operations Plan for Safety Review of an Application to Store the Three Mile Island Unit 2 Fuel Debris in an Independent Spent Fuel Storage Installation Revision 0 Change 0.

CNWRA PROGRAM MANAGER'S PERIODIC REPORT ON ACTIVITIES OF THE CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TITLE: Center for Nuclear Waste Regulatory Analyses (CNWRA)

CONTRACTOR: Southwest Research Institute (SwRI)
6220 Culebra Road, San Antonio, Texas 78238-5166

CONTRACT NO: NRC-02-93-005

JOB CODES: D1035, L1793, J5164, J5186

NRC CNWRA PROGRAM MANAGER: John J. Linehan, (301) 415-7780

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ESTIMATED BUDGET: $89,898,141

PERIOD OF PERFORMANCE: 10/15/92-09/26/97

PERIOD OF THIS REPORT: 07/05/97-08/01/97

1 TECHNICAL

1.1 CNWRA Operations (COPS)

In addition to a wide range of day-to-day activities, activities in COPS included (i) taking part in the NRC CRG meeting on the mid-year evaluation of the CNWRA and an NRC/CNWRA management meeting; (ii) continuing development of the Five-Year Renewal Cost Proposal; (iii) participating in weekly HLW Management Board meetings; (iv) responding to the two CNWRA annual QA audit CARs by appropriate CNWRA staff; (v) scheduling QA surveillances, participating in the CNWRA Technical/QA staff meetings on software QA and COI activities and updating Professional Personnel Qualification forms as required; (vi) delivering the FY97 QA Audit—Letter Report (IM 5708-159-720); (vii) preparing CNWRA Computer Certification—Letter Report (IM 5708-158-730) along with sustained implementation of the NRC-approved and CIAC-recommended changes to the CNWRA Computer Security System; and (viii) participating in the monthly NRC/CNWRA Computer Coordination Meeting and maintaining LAN operations.

Status of the CNWRA staffing is indicated in table 1. Recruitment efforts and interviews for the listed open positions have been suspended until the NRC establishes FY98 funding for the CNWRA.

In the next period, the CNWRA staff expects to (i) deliver the Five-Year Renewal Cost Proposal; (ii) conduct scheduled surveillances, review RFPs received by SwRI for potential COI, continue entering the CNWRA internal and product documents into QA records, and track responses to the remaining CAR; (iii) submit the CNWRA Computer Certification—Letter Report (IM 5708-158-730); (iv) progress with execution of the NRC-approved and CIAC-recommended modifications to the CNWRA Computer Security System; (v) pursue preparation of the FY97 CNWRA Computer Security Plan Update—Letter Report (IM 5708-158-750) after receipt of NRC guidance; and (vi) provide CNWRA LAN operation and maintenance support.

1.2 Igneous Activity (IA)

During this period, IA staff focused on development of the Input to Issue Resolution Status Report Including Acceptance Criteria on Probability of Future Igneous Activity (IM 5708-461-700). Currently, the CNWRA staff are developing technical bases for each of the Acceptance Criteria in the IRSR. These technical bases are developed for acceptance criteria related to (i) sufficiency of data used to estimate the probability of volcanic disruption, (ii) definition of volcanic events, (iii) bounds on parameters used to estimate probability, (iv) calibration and testing of probability models, (v) integration with tectonic models, (vi) conservatism of probability models, and (vii) use of expert elicitation in volcanic hazards assessment.

Work on the technical bases for these criteria included development and revision of the database on volcano locations and ages, including the addition of magnetic anomalies in the site region produced (it may be interpreted) by buried basaltic rocks. In addition, included was a discussion on the formal definition of volcanic events and how these definitions must be propagated through the volcanic hazard assessment. A technical basis for the correlation between change in lithostatic pressure across the YMR and distribution of basaltic volcanism was also developed. This model directly links volcano probability studies, geophysical data sets, and structural models for the YMR to produce volcano probability models with a basis in tectonic setting.

A journal article 1995 Eruptions of Cerro Negro Volcano, Nicaragua, and Risk Assessment for Future Eruptions (IM 5708-461-760), was transmitted to the NRC and to the *Geological Society of America Bulletin*. In addition, an abstract, Tephra-Fall Risk Assessments for Basaltic Cinder Cones: An Example From the 1995 Eruption of Cerro Negro Volcano, Nicaragua, was submitted for the NRC approval.

IA staff continued processing ground magnetic data sets collected in the YMR during the last period. Data processing is now complete for all of the surveyed areas in the region. Because of the interest in early release of these data to the NRC and the DOE, an IM has been planned for distributing these data. With concurrence of the NRC PEM and Contracting Officer, this IM will be added to the list of deliverables for next FY. The IM will include a CD ROM disk containing ARC/INFO coverages of the geophysical data collected at all survey sites, maps, and an explanation of the data processing. It is now anticipated this IM will be delivered in October.

During this period, methods to overlay probability maps directly on digital elevation models of the site region were developed using PVHVIEW. Further additions to the PVHVIEW code are map annotation routines.

Next period, the staff will focus on completion of Input to Issue Resolution Status Report Including Acceptance Criteria on Probability of Future Igneous Activity (IM 5708-461-700). A journal article entitled Recurrence Rate of Basaltic Volcanism in the SP Cluster, San Francisco Volcanic Field, Arizona, Probability Model Parameters and Sensitivities (IM 5708-461-730) will be submitted to *Geology* and also delivered to the NRC. This article summarizes the application and use of volcanic hazard probability models in an active basaltic volcanic field. Other tasks will proceed at a lower priority during the next period.

1.3 Structural Deformation and Seismicity (SDS)

The SDS staff and their consultants collected gravity data profiles during field investigations on July 23-31, 1997. Three profiles along the west flank of Bare Mountain and Amargosa Desert were designed to test for the presence of proposed, but unmapped faults. Single profiles were completed in Crater Flat and Forty-Mile Wash. Field data on the nature and distribution of fractures and faults at and around YM were also collected. Important structural relationships at the southern end of Crater Flat were resolved.

The staff pursued development of a suite of seismic hazard curves that will be used in upcoming TSPA sensitivity studies. Work also continued on tests of the FAULTO module of the TPA Version 3.1. These tests will help SDS staff determine the most appropriate abstraction of faulting recurrence within the repository boundary.

CNWRA staff participated in a DOE/NRC Appendix 7 meeting on 3D framework models. The CNWRA staff reviewed the DOE document, IMS2.0: A 3D Geologic Framework and Integrated Site Model of Yucca Mountain, prior to attending the meeting. An overview of the CNWRA 3D Geologic Framework model was also presented. The meeting clarified many issues regarding construction and operation of the models, as well as application to structural geologic and hydrologic investigations.

Preparation continued on the following reports: Geologic Input for TPA Version 3.1 Code—Letter Report (IM 5708-471-711), Input to Issue Resolution Status Report Including Acceptance Criteria on Type 1 Faults (IM 5708-471-745), and Input to Issue Resolution Status Report Including Acceptance Criteria on Tectonic Models (IM 5708-471-700). A manuscript entitled Geometric, Thermal, and Temporal Constraints on the Tectonic Evolution of Bare Mountain—Journal Article (IM 5708-471-731) was sent.

In the next period, three IM reports will be submitted: Geologic Input for TPA Version 3.1 Code—Letter Report (IM 5708-471-711), Input to Issue Resolution Status Report Including Acceptance Criteria on Type 1 Faults (IM 5708-471-745), and Input to Issue Resolution Status Report Including Acceptance Criteria on Tectonic Models (IM 5708-471-700). Progress will continue on sensitivity studies using the TPA Version 3.1. Gravity data will be reduced and analyzed. The fracture and fault data will be interpreted and incorporated into SDS tectonic models.

1.4 Evolution of the Near-Field Environment (ENFE)

Staff pursued development of Input to Issue Resolution Status Report Including Acceptance Criteria on Near-Field Chemistry (IM 5708-561-700) and Input to Issue Resolution Status Report Including Acceptance Criteria on Mineralogy, Petrology, and Rock Chemistry (IM 5708-561-735). As stated last period, these deliverables will support a single IRSR identified as Effects of Coupled Processes.

Preliminary results were obtained for a drift-scale calculation of gas and liquid flow coupled with gas-water-rock reactions using MULTIFLO. Maximum chloride concentrations of about 0.3 molal occurred approximately 5 m above the drift at an elapsed time of 100 yr for an 83 MTU/acre heat load. These results are expected to change as better representations of the drift are employed in the model.

A discrepancy was found between the operator splitting algorithm and the fully implicit algorithm used in MULTIFLO for combined gas and liquid flow. For a fully saturated system, the two methods agree. The operator splitting form is expected to be useful for 2D and 3D calculations of the near-field environment at YM. All calculations completed and reported so far have used the implicit algorithm, which is still considered correct. Investigation continues on resolution of this discrepancy.

Evaluation of Cement-Water Interactions—Letter Report (IM 5708-561-750) was submitted. Results presented in this report are based on MULTIFLO simulations of alkaline plume migration and indicate that strong alteration of the tuff host rock and cement could result from interaction of cement and tuff pore waters and the respective minerals. A sharp reduction in porosity in the tuff was caused by precipitation of tobermorite, and calcification of cement was also predicted—more pronounced in the case of a partially saturated system compared to a fully saturated case. The results will be presented in a poster session at the upcoming 1997 Materials Research Society Symposium on the Scientific Basis for Nuclear Waste Management to be held in Davos, Switzerland. The staff is preparing a paper for publication in the symposium proceedings.

Sustained corrosion tests continued for 1,124 days to confirm the applicability of repassivation and corrosion potentials as predictive parameters of the long-term localized corrosion of Alloy 825 in chloride-containing solutions. No initiation of localized corrosion was observed on specimens continuously maintained below the repassivation potential. A long-term test with a creviced Alloy 825 specimen in an air-saturated 1,000 ppm chloride solution at 95 °C has been in progress for 713 days at the open-circuit potential. Corrosion potential of this specimen varied between 150 mV above to 50 mV below the repassivation potential in the last month of testing. Crevice corrosion began each time the corrosion potential exceeded the repassivation potential.

Galvanic corrosion tests with coupled specimens of Alloy 825 and A516 carbon steel were interrupted for two weeks due to the failure of a data acquisition computer. Tests are being re-initiated in chloride-containing solutions under both air saturated and deaerated conditions.

Modeling the electrochemical impedance spectra continued to characterize the interface between A516 carbon steel and Alloy 825. The impedance characteristic of the interface

between the two materials under a variety of conditions will be used to verify estimates of the galvanic coupling efficiency evaluated as part of the TSPAI KTI. Data from both the electrochemical impedance tests and the galvanic corrosion tests will be incorporated in a paper to be submitted for the CORROSION/98 conference.

Effects of Microbes on Near-Field Environment—Journal Paper (IM 5708-561-760) is near completion, however delivery has been delayed because of other work commitments.

In the next period, the staff will complete Input to Issue Resolution Status Report Including Acceptance Criteria on Near-Field Chemistry (IM 5708-561-700) and Input to Issue Resolution Status Report Including Acceptance Criteria on Mineralogy, Petrology, and Rock Chemistry (IM 5708-561-735) and a combined report will be submitted for review. A paper entitled Reaction-Induced Porosity Reduction Resulting from Infiltration of a Hyperalkaline Fluid Along a Fracture and Interaction with the Rock Matrix will be completed for presentation at the Scientific Basis for Nuclear Waste Management Symposium and publication in the proceedings. MULTIFLO will be used to obtain model results for the near-field environment at the drift scale. Long-term corrosion tests of Alloy 825 will continue. Additional galvanic corrosion tests are planned to evaluate the effect of other environmental parameters such as chloride concentration. Characterization of the interface between A516 carbon steel and Alloy 825 will be completed. Preparation of Effects of Microbes on Near-Field Environment—Journal Paper (IM 5708-561-760) will continue.

1.5 Thermal Effects on Flow (TEF)

The TEF KTI team participated in the NRC/DOE technical exchange held to discuss TSPAs for YM. Although thermal effects on flow were not directly discussed, the importance of coupled thermal-hydrologic effects to total system performance resulted in TEF staff involvement in many discussions during the technical exchange. Participants at this NRC/DOE technical exchange and the subsequent ACNW meeting toured the TEF laboratory experiments.

Staff continued work on the IRSR. This report, a team effort between the NRC and CNWRA staffs, will be delivered as Input to Issue Resolution Status Report Including Acceptance Criteria on Gravity Driven Refluxing (IM 5708-661-700) in August 1997. A detailed outline has been prepared by the NRC staff. Current CNWRA staff efforts include preparation of sections to be included in the IRSR.

A draft report on potential causative mechanisms leading to formation of perched water bodies near the proposed repository area under nonisothermal conditions was completed. The report is currently undergoing internal CNWRA reviews. The document will be delivered to the NRC as Evolution of Perched Water Bodies at YM—Journal Paper (IM 5708-661-760) in August 1997.

Development progressed on implementing an analytical model to describe heat conduction, two-phase flow, and gravity-driven fracture film flow. The model will be used to assess the refluxing phenomenon.

Sensitivity-to-dose analyses to determine the importance of thermal effects on flow are moving forward. Numerical characterization of the air space in the emplacement drift has been modified to provide more accurate representation of heat and mass transfer. The modified air representation will be implemented in the 3D basecase model. Preliminary sensitivity analyses will begin with the availability of the TPA Version 3.1 code.

Preliminary results of numerical assessment of the 1988–89 LLNL G-Tunnel heater experiment have been completed and results are being reviewed.

Two laboratory-scale experiments to support analysis efforts in the TEF KTI progressed. One quantifies the rate of moisture removed from a volume of saturated porous material by ventilation and the other assesses depression of the boiling isotherm by infiltration or refluxing water. Construction of the laboratory-scale heater test has been completed. Numerical analyses continue to predict the performance of the laboratory-scale heater test and assist in design of the experiments. Results from the heater test experiment will be used to evaluate gravity driven refluxing analysis conducted in the TEF KTI.

With the concurrence of the NRC PEM, the milestone identified as Ventilation Effects on Repository—Journal Paper (IM 5708-661-740) has been eliminated. The effects of ventilation on repository cooling and drying will be discussed with the results of the laboratory-scale ventilation experiment.

In the next period, TEF KTI staff plans to (i) conduct two laboratory-scale experiments, (ii) perform sensitivity-to-dose analyses, (iii) pursue evaluation of conceptual models of refluxing, (iv) continue preparation of the IRSR, and (v) if possible, visit Alcove 5 of the ESF to observe final preparations of the drift-scale heater test.

1.6 Total System Performance Assessment and Integration (TSPAI)

In addition to general testing of the new TPA Version 3.1 code, the TSPAI staff developed plans for specific testing of the major modules with emphasis on checking the intermediate PA calculations written to the final output files. The joint efforts between the NRC and CNWRA staffs on general testing identified a number of code bugs in the EXEC, UZFLOW, and NEFTRAN modules. These coding bugs were fixed and documented in accordance with QA requirements. As part of the testing, the NRC staff identified ways to significantly improve the computational speed of the EBSFAIL and EBSREL modules. Updated copies of the current beta version TPA Version 3.1 code have been sent to the NRC every 2 weeks in accordance with agreements between the NRC and CNWRA managements.

The CNWRA assisted the NRC with the DOE/NRC Technical Exchange on TSPA, briefings to the ACNW on TSPA, and the ACNW Topical Meeting on PRA and PA. All three meetings were held at the CNWRA in San Antonio, Texas, and were videoconferenced to Las Vegas, Nevada, and Rockville, Maryland. This technical exchange provided the opportunity for the NRC/CNWRA staffs to highlight the current status of the TPA Version 3.1 code and gain insight to the DOE TSPA activities for the TSPA-VA. One important accomplishment was the agreement between the DOE and the NRC to exchange input data sets for the TSPA-VA in January 1998. Briefings to the ACNW offered a complete picture of the NRC progress on developing the TSPA capability since the IPA Phase 2 work.

Staff pursued preparation of the Issue Resolution Status Report Including Acceptance Criteria on Model Abstraction (IM 5708-761-745). Draft text was developed for selected sections and transmitted for review and comment. In addition, teleconferences between the NRC and CNWRA were held to further refine this draft text.

The technical report on galvanic coupling auxiliary analysis was completed and placed in the CNWRA internal review process. The report describes the mathematical models and an initial technical basis for estimating the galvanic coupling parameter in the EBSPAC code. An estimate of the galvanic coupling efficiency was made based on the expected impedance of the interface between the two barrier layers. The letter report, Auxiliary Analysis on Galvanic Coupling (IM 5708-761-730), will be transmitted in the next reporting period.

Revisions were made to the previously issued letter report Detailed Review of Selected Aspects of Total System Performance Assessment—1995. The executive summary and the chapter on Container Life and Source Term were revised as requested by the NRC staff. The revised report will be transmitted during the next reporting period to fulfill an AI.

Next period, testing and modification of the TPA Version 3.1 code will continue as will preparation of the IRSR on model abstraction.

1.7 Activities Related to Development of the U.S. Environmental Protection Agency Yucca Mountain Standard (ARDES)

The report entitled Summary of Information Relevant to the Specification of the Critical Group and Reference Biosphere—CNWRA Report (IM 5708-771-720) was placed into the CNWRA internal review process. The report documents the following issues: (i) updated DCFs for both the current biosphere and a pluvial biosphere to be used in the TPA code, (ii) results of an importance analysis that identifies the parameters most influential in the dose calculations, and (iii) technical bases for the values and statistical distributions of environmental pathway parameters used in calculating the updated DCFs. The report will be completed and transmitted in period 12.

Staff progressed on preparation of Detailed Dilution Analysis Related to Exposure Scenarios Involving Water Wells—Letter Report (IM 5708-771-760). A range of water pumping rates was analyzed relative to its magnitude and spatial distribution. Modeling of potential well water pumping scenarios was performed using a 3D analytic element model for groundwater flow. The simulations examined capture zone delineation as a function of pumping rate, well screen location and length, and strength of the regional flow field. The capture zone information, when combined with potential plume configuration and concentration, is used to determine dilution factors resulting from pumping in the Amargosa Farms area. Progress was made on bounding the shape of a plume traveling to the Amargosa Farms area. This effort is meant to complement work done in the EPRI 1995 TSPA and the TRW 1993 TSPA on the plume configuration at 25 and 30 kilometers. Assistance in obtaining well driller logs and water use estimates will be obtained from personnel at the NRC Las Vegas office. Because of higher priority of TPA code testing, however, further work on this study has been deferred until September (see table 2).

In the next period, the ARDES staff will complete the report entitled Summary of Information Relevant to the Specification of the Critical Group and Reference Biosphere—CNWRA Report (IM 5708-771-720).

1.8 Unsaturated and Saturated Flow under Isothermal Conditions (USFIC)

Infiltration—Journal Paper (IM 5708-861-730), which documents field and modeling work studying hydrologic processes in the Tiva Canyon caprock, was transmitted on July 29, 1997. Particular emphasis was placed on examining the interaction of vegetation and infiltrating water within soil-filled caprock fissures. Based on the modeling results, it appears the caprock environment is likely to exhibit significant infiltration primarily during the winter when perennial vegetation is dormant, evaporation is low, and extended periods of rainfall sometimes occur.

Staff review of Cl-36 studies in the ESF led to the observation that the data set may be interpreted to indicate that 20 to 25 percent of the samples show evidence of bomb pulse contamination. A paper entitled Commentary on Studies of ^{36}Cl in the Exploratory Studies Facility at Yucca Mountain, Nevada was prepared and has undergone CNWRA internal programmatic review. This paper will be conveyed to fulfill a new IM, Cl-36 Data from the ESF—Journal Paper (IM 5708-861-748), with a proposed completion date of September 26, 1997.

Results of several 2D UZ flow models that test assumptions of constant infiltration and equivalent continua for the stratigraphy at YM have been evaluated. Indications show the PTn unit attenuates large infiltration pulses so that constant infiltration rate models are reasonable for estimating UZ flow below the PTn, even when continuous fractures penetrate the PTn. Results also note capillary equilibrium between matrix and fractures, indicating that equivalent continuum models are reasonable for both 1 mm/yr and 5 mm/yr infiltration scenarios. An abstract is being prepared for either a poster or oral presentation of these model results at the AGU fall meeting.

Runoff duration statistics were developed for the Solitario Canyon watershed. The span of runoff events that exceeded 0.075 mm/hr was determined for a series of subwatersheds that ranged in size from 1.23 to 10.72 km^2. Although flow duration proved to be an accurate predictor of total channel infiltration for short duration events, the correlation was poor for longer duration events. Using the threshold value of 0.075 mm/hr may have produced duration estimates unduly short and reflective primarily of brief, but intense, summer convective storms. For low-intensity, long-duration winter precipitation events, where non-Hortonian runoff processes predominate, a lower threshold will be used to determine duration statistics. A two-layer soil model will also be used for future simulations of winter precipitation events to effect saturation overland flow.

During initial attempts to calibrate the 30 × 60 km site-scale flow model that was extracted from the USGS MODFLOWP-based (a 3D regional flow model), the CNWRA USFIC staff observed that head residuals in the area of the large hydraulic gradient were too large. It was determined these large head residuals resulted from too coarse a model structure. The site-scale flow model will be refined adopting information from the DOE ISM acquired during an Appendix 7 meeting in Las Vegas, Nevada. Velocity fields obtained from this

refined site-scale model will be used to delineate the boundaries of flow tubes emanating from the repository area and terminating in the Amargosa Farms critical group area. These flow tubes will be applied to define alternative saturated zone transport pathways in the TPA Version 3.1 sensitivity analyses to be reported in the FY97 Annual Report: Section on Isothermal Flow KTI-Joint NRC/CNWRA Report (MM 5708-861-760).

In the next period, USFIC staff will (i) revise the IRSR on shallow infiltration to incorporate new information, (ii) extend investigations of saturated zone subregional-scale mixing processes and particle transport times, and (iii) begin sensitivity analyses using the TPA Version 3.1 code.

1.9 Waste Solidification Systems (WSS)

Limited activities associated with previous tasking occurred and no additional tasking was received.

The CNWRA commenced development of an analysis in response to NRC direction regarding support to decontamination and decommissioning activities in the WSS project. The NRC directed that the work on two activities begin immediately (i.e., August 1, 1997).

1.10 Tank Waste Remediation System (TWRS)

The Consolidated Hanford Tank Waste Familiarization Report—Final Report [retitled Hanford Tank Waste Remediation System Familiarization Report (IM 5709-101-730)] was transmitted to and accepted by NRC staff.

Revisions to the Survey of Solidification Process Technologies—Interim Report (IM 5709-102-710) were initiated after meeting with the NRC staff to discuss their comments. Preparation of the Final Waste Solidification Report [retitled Survey of Solidification Process Technologies—Final Report (IM 5709-102-720)] was deferred to a TBD date, with concurrence from the NRC PO, because of the need to review the TWRS privatization contractor submittals.

Preparation continued on the Preliminary HLW Chemistry Manual (IM 5709-106-705). Internal CNWRA reviews have been completed and a final editorial review is in process. Because of the time needed to complete these reviews and with approval of the NRC PO, submittal of the Preliminary HLW Chemistry Manual (IM 5709-106-705) has been extended to August 8, 1997. To allow sufficient time for the NRC staff review of the report and to accommodate work in task 5 (review of TWRS privatization contractor documents), submittal of the final report, Final HLW Chemistry Manual (IM 5709-106-710), has been rescheduled with a TBD date, with approval of the NRC PO.

CNWRA staff visited the DOE Regulatory Unit in Richland, Washington, to participate in a training workshop on review of the SAP from the privatization contractor. The SAP, received from LMAES, is being reviewed by CNWRA TWRS staff to provide the NRC staff with questions on comments on the submittals. A preliminary list of comments has been sent to the NRC.

In the next period, the Preliminary HLW Chemistry Manual (IM 5709-106-705) will be transmitted. The Review of LMAES Submittals and Input to the Development of Information Needs (IM 5709-105-730) will be delivered.

1.11 Three Mile Island Unit 2 Independent Spent Fuel Storage Installation (TMI-2 ISFSI)

During the reporting period, CNWRA staff along with NRC management and staff visited the INEEL ISFSI site to obtain firsthand information on the DOE collection and interpretation of seismic data, various components of the TMI-2 fuel debris and dry storage system, and the proposed facility and related equipment, and to discuss with the DOE various issues relevant to review of the DOE SAR. During this period, a number of reports and publications referenced in the SAR were acquired from both the DOE and other public sources.

Staff began a literature review to collect information on the TMI-2 fuel debris, core hardware parts, and miscellaneous wastes to be transferred and stored at the proposed ISFSI. These findings will be reported in TMI-2 Fuel Debris Characterization—Draft Letter Report (IM 5711-001-710). Other literature investigation work was also initiated during this period to identify the seismic issues relevant to siting of the TMI-2 storage facility at the ICPP. The DOE reports and relevant information available in the open literature are being reviewed. Results of this review will be reported in Seismic Investigation of Site—Draft Letter Report (IM 5711-002-710).

Review of 10 CFR Part 72 regulations was started to assess whether its requirements can be applied to the SAR and LA the storage of the TMI-2 spent fuel debris, or if amendments, exemptions, or additions to 10 CFR Part 72 are necessary. These assessments will be reported in Analysis of 10 CFR Part 72 Adequacy for Licensing Storage of TMI-2 Spent Fuel—Draft Letter Report (IM 5711-003-710).

Staff began the initial safety review of the DOE SAR during this period. One of the objectives for the initial safety review is to identify additional information from the DOE that would be necessary to complete the safety review and prepare an SER. These additional information needs will be documented in First Round Request for Additional Information—Draft Letter Report (IM 5711-004-710).

In the next period, TMI-2 ISFSI staff plans to (i) develop a literature review on characterization of TMI-2 fuel debris, (ii) pursue a literature review to identify seismic hazard issues relevant to siting of TMI-2 ISFSI at INEEL, (iii) provide an analysis of 10 CFR Part 72 regulations, and (iv) conduct a technical review of TMI-2 ISFSI SAR.

2 MANAGEMENT ISSUES

None to report.

3 MAJOR PROBLEMS

None to report.

4 SUMMARY OF SCHEDULE CHANGES

Schedule changes for IMs are included in table 2. Deliverables completed in period 11 are provided in table 3 and listed in the Executive Summary.

5 SUMMARY OF FINANCIAL STATUS

Table 4 summarizes the CNWRA financial status in the context of authorized funds provided by the NRC. Total commitments of the CNWRA are $105,238. The appendix lists planned and actual costs to date, as well as variances between these, without allowance for fee, on both a per-period and a cumulative basis. These data do not include commitments. Pertinent financial information is provided for the FS JC, WSS JC, TWRS JC, and TMI-2 ISFSI JC as well as for COPS and seven KTIs. The planned costs per period for the ITS JC reflect the CNWRA OPS, Revision 9 Change 3. Those for the WSS JC and TWRS JC represent accommodations made in Revision 6 Change 2 and Revision 0 Change 2, respectively. Those costs per period for the TMI-2 JC refer to estimates presented in Revision 0 Change 0.

Period 11 expenditures increased 11.6 percent from last period. Through period 11, the CNWRA composite (all four JCs) was underspent by $159,870 or 2.0 percent; the CT JC was underspent by $138,933 or 1.9 percent; the WSS JC was underspent by $40,315 or 68.0 percent; the TWRS JC was overspent by $26,138 or −4.4 percent; and the TMI-2 ISFSI JC was underspent by $6,760 or 14.0 percent. With the exception of the WSS JC, the other three JCs evidenced a higher spending level for period 11. During this period, expenditures in the CT JC rose by 10.0 percent over the previous period—indicating higher spending, excluding COPS, in all KTIs except ARDES; disbursements in the WSS JC decreased again to reflect only limited administrative-type charges; expenditures in the TWRS JC rose from the previous period—indicating work on certain deliverables associated primarily with subtask 1.6; and spending in the TMI-2 ISFSI JC stayed within authorized limits for work assigned.

As shown in table 1, the CNWRA has 43 core and 1 limited-term staff members. The CNWRA will submit revised Staffing and Hiring Plans when FY98 budgets become better known. The available pool of approved consultants and subcontractors remains at 45. Expenditures for consultants, subcontractors, and SwRI labor in all JCs as a percentage of the CNWRA composite spending were 28.8 percent for period 11 in FY97. This increase in expenditures resulted primarily from payment for consultants' accumulated invoices. For consultants and subcontractors alone, this percentage was 22.5.

This FYTD no capital or sensitive equipment was purchased with NRC funds (other than overhead, general and administrative expenses, and fees).

TD JC

The JC cumulative cost variance through period 11 was 1.9 percent. Expenditures in this JC increased from the previous period in all but the ARDES KTI and COPS. Specific rationales for over/underspending for COPS and each KTI follow.

The cost variance for COPS was −0.1 percent. The cost variance was −0.8 percent for the Management, Planning, and Computer Support Subtask (5708-158) and 2.6 percent for the QA

Subtask (5708-159). Expenditures in the former subtask increased because of reallocation of certain labor resources. Expenses in the latter subtask decreased substantively from the previous period reflecting completion of QA audit activities.

The cost variance for the IA KTI during this period was 0.3 percent. Although spending during this period increased over last period as a result of payments to subcontractors, it is anticipated costs will track closely with the planned cost for the remainder of the FY.

The cost variance for the SDS KTI was 6.6 percent. Increased spending is anticipated in future periods as consultant work continues on the analysis of the gravity data, PSHA investigations, and fracture studies.

The cost variance for the ENFE KTI was 12.2 percent. Existing commitments not yet posted to this account are minimal and do not significantly reduce the cost variance. There may be further increases to this variance caused by reduced availability of consultant and CNWRA staff time.

There is no further activity in the CLST KTI. As of period 05, work has been deferred.

The cost variance for the TEF KTI was -1.5 percent. Although costs accelerated during this period, spending is expected to remain on target during period 12.

There is no further activity in the RDTME KTI. As of period 05, work has been deferred.

The cost variance for the TSPAI KTI was −3.4 percent. This variance is comparable to that of the previous period and reflects intense efforts on TPA Version 3.1 code development, testing, and documentation. Spending is expected to remain at about the current level through the end of the FY. The NRC staff and management were previously notified that additional funding would be needed to complete work on TPA Version 3.1 code, however, these costs may not exceed available funds at the JC level.

The cost variance for the ARDES KTI was −3.3 percent. The cost variance reflects increased effort on the borehole dilution study. The spending rate for this KTI is expected to decrease because staff activities have been redirected to TPA Version 3.1 code testing.

The cost variance for the USFIC KTI was 7.7 percent. Adjustments for existing commitments not yet posted to this account change this variance to 7.5 percent. This variance may increase in the future with additional staff work on the ARDES and TSPAI KTIs.

There is no further activity in the RT KTI. As of period 05, work has been deferred.

The cost variance for WSS was 68.0 percent. Spending during this reporting period was related essentially to administrative tasks. For the next period, increased expenditures are expected due to new tasking as part of the project. The variance should decrease in the last two periods when the operations plan revision is completed and related work commences.

The cost variance for the TWRS project was −4.4 percent. The variance reflects continued activities in subtasks 1.2, 1.5, and 1.6 related to deliverables in these subtasks. The rate of spending is expected to decrease in the next period because of the completion of the first deliverable in subtask

1.6 (Preliminary HLW Chemistry Manual). The deferral of final reports in subtasks 1.2 and 1.6 will help to decrease the rate of spending to the end of FY97.

The cost variance for the TMI-2 ISFSI project was 14.0 percent. Spending is expected to remain on target during period 12.

Table 1. CNWRA Core Staff—Current Profile and Hiring Plan* (Period 11)

EXPERTISE/EXPERIENCE	CURRENT NO.	PROFESSIONAL STAFF	POSITIONS OPEN FY97
ADMINISTRATION	4	H.GARCIA, W.PATRICK, J.RUSSELL, B.SAGAR	
CHEMICAL PROCESSING ENGNG.	1	V.JAIN	
CODE ANALYSIS/DEVELOPMENT	2	R.JANETZKE, R.MARTIN	1
DOSE/RISK/HAZARD ANALYSIS	0		2
ELECTROCHEMISTRY	1	G.CRAGNOLINO	
ENGINEERING GEOLOGY/GEOLOGICAL ENGNG	2	R.CHEN, G.OFOEGBU	
ENVIRONMENTAL SCIENCES	1	P.LaPLANTE	
GEOCHEMISTRY/PHYS.CHEM.	5	W.MURPHY, R.PABALAN, E.PEARCY, J.PRIKRYL, D.TURNER	
GEOHYDROLOGY/HYDROGEOLOGY	4	R.FEDORS, R.GREEN, S.STOTHOFF, J.WINTERLE	1
GEOLOGY	2	L.McKAGUE, M.MIKLAS	
HYDROLOGIC TRANSPORT	2	A.ARMSTRONG, G.WITTMEYER	1
INFORMATION MANAGEMENT SYSTEMS	1	R.MARSHALL	
MATERIAL SCIENCES	2	D.DUNN, N.SRIDHAR	
MINING ENGINEERING	1	S-M.HSIUNG	
NUCLEAR ENGINEERING	1	M.JARZEMBA	1
OPERATIONAL HEALTH PHYSICS	1	J.WELDY	
PERFORMANCE ASSESSMENT	2	R.BACA, S.MOHANTY	3
QUALITY ASSURANCE	1	B.MABRITO	
RADIOISOTOPE GEOCHEMISTRY	1	D.PICKETT	
ROCK MECHANICS, INCLUDING CIVIL/STRUC. ENGR.	3	M.AHOLA, A.CHOWDHURY, A.GHOSH	
SOURCE-TERM/SPENT FUEL DEGRAD	1	P.LICHTNER	
STRUCTURAL GEOLOGY/SEISMO-TECTONICS	2	D.FERRILL, J.STAMATAKOS	
SYSTEMS ENGINEERING	1	P.MACKIN	
VOLCANOLOGY/IGNEOUS PROCESSES	2(1)†	C.CONNOR, M.CONWAY†, B.HILL	
TOTAL	**43(1)†**		**9**

* SEE STAFFING PLAN FOR DETAILS (Open positions will not be filled in FY97 pending resolution of the FY98 budget.)
† LIMITED TERM

Table 2. Summary of Schedule Changes (Period 11)

MILESTONE NUMBER	TYPE	DESCRIPTION	ORIGINAL DATE	REVISED DATE	RATIONALE FOR CHANGE
5708-461-700	IM	Input to Issue Resolution Status Report Including Acceptance Criteria of Future Igneous Activity	08/30/97	09/15/97	Additional time required to incorporate NRC comments and to complete internal reviews.
5708-461-770	IM	Review of DOE Igneous Activity Synthesis Report	09/26/97	TBD FY98	Report not received. Review will be completed when report is received.
5708-471-700	IM	Issue Resolution Status Report Including Acceptance Criteria on Tectonic Models	07/15/97	08/22/97	Higher priority unscheduled TPA work
5708-471-710	IM	Sensitivity Analysis Using Faulting Module—Letter Report	05/12/97	TBD FY98	TPA code will not be finalized in time to meet the planned delivery date. Will become FY98 deliverable.
5708-471-711	IM	Geologic Input for TPA Version 3.0 Code—Letter Report	04/30/97	08/29/97	Higher priority unscheduled work; additional checking and comparison of stratigraphic data
5708-471-712	IM	Sensitivity Analysis Using SEISMO Module—Letter Report	09/26/97	TBD FY98	TPA code will not be finalized in time to meet the planned delivery date. Will become FY98 deliverable.
5708-471-745	IM	Issue Resolution Status Report Including Acceptance Criteria on Type I Faults	05/27/97	08/15/97	Higher priority unscheduled TPA work
5708-471-760	IM	Structural Influence of Faulting on Magmatism	07/15/97	09/2/97	Higher priority work on fracture analysis; availability of consultant
5708-661-740	IM	Ventilation Effects on Repository—Journal Paper	09/05/97	TBD FY98	Substitute numerical analysis by laboratory scale experiment
5708-771-720	IM	Summary of Information Relevant to the Specification of the Critical Group and Reference Biosphere—CNWRA Report	08/18/97	08/25/97	Permit additional time for CNWRA internal review process

Table 2. Summary of Schedule Changes (Period 11) (cont'd)

MILESTONE NUMBER	TYPE	DESCRIPTION	ORIGINAL DATE	REVISED DATE	RATIONALE FOR CHANGE
5708-771-760	IM	Detailed Dilution Analysis Related to Exposure Scenarios Involving Water Wells—Letter Report	08/29/97	09/26/97	Need to redirect effort to TPA Version 3.1 code testing
5708-861-748	IM	Cl-36 Data From the ESF—Journal Paper	09/25/97		Proposed new IM
5709-102-720	IM	Final Solidification Progress Report	08/08/97	TBD	Accommodate review of LMAES submittals per NRC guidance
5709-106-705	IM	Preliminary HLW Chemistry Manual	05/16/97	08/08/97	Problems with document production and need for additional reviews
5709-106-710	IM	Final HLW Chemistry Manual	08/18/97	TBD	Accommodate review of LMAES submittals per NRC guidance; allow NRC staff review of preliminary report

Tabl 3. Deliverables (Period 11)

MILESTONE NO.	TYPE	DESCRIPTION	ORIGINAL COMPLETION DATE	REVISED DATE	# OF REVISIONS	ACTUAL COMPLETION DATE	REASON (IF DELAYED)
5708-159-720	IM	FY97 CNWRA QA Audit—Letter Report	09/26/97	08/13/97	1	07/11/97	Accelerated audit
5708-461-760	IM	Dispersion of Basaltic Tephra from 1995 Cerro Negro Eruption--Journal Article	06/26/97	07/14/97	1	07/11/97	Higher priority work on ground magnetic survey; correction to code
5708-471-731	IM	Geometric, Thermal, and Temporal Constraints on the Tectonic Evolution of Bare Mountain—Journal Article	06/30/97	07/18/97	1	07/14/97	Resource constraint in GIS area
5708-561-750	IM	Preparation of Evaluation of Cement-Water Interactions—Letter Report	07/26/97			07/23/97	
5708-861-730	IM	Infiltration—Journal Paper	05/16/97	07/31/97	2	07/29/97	Higher priority work on TPA code

Table 4. Financial Status (Period 11)

COPS/KTI/WSS/ TWRS/TMI	Funds Authorized	Funds Costed to Date	Funds Uncosted	Commitments
COPS	2,860,935	2,508,406	352,530	2,300
IA	1,588,523	1,393,980	194,543	5,939
SDS	2,283,711	1,966,648	317,064	21,301
ENFE	1,656,875	1,303,347	353,528	44,238
CLST	825,740	794,308	31,433	0
TEF	1,271,770	1,115,660	156,110	7,825
RDTME	835,512	800,592	34,921	0
TSPAI	3,474,325	3,063,406	410,919	12,360
ARDES	697,858	648,096	49,762	0
USFIC	1,383,145	1,114,261	268,884	1,175
RT	496,803	478,741	18,062	0
DWM COSTS	17,375,198	15,187,444	2,187,754	
DWM AWARD FEE	0	0	0	
DWM BASE FEE	0	563,021	(563,021)	
TOTAL DWM	17,375,198	15,750,465	1,624,733	95,138
WSS COSTS	620,126	571,313	48,812	0
WSS AWARD FEE	0	0	0	
WSS BASE FEE	0	26,011	(26,011)	
TOTAL WSS	620,126	597,324	22,802	0
TWRS COSTS	703,706	623,979	79,727	3,300
TWRS AWARD FEE	40,997	0	40,997	
TWRS BASE FEE	27,332	24,216	3,116	
TOTAL TWRS	772,035	648,195	123,840	3,300
TMI-2 FUEL DEBRIS	144,241	41,391	102,850	6,800
TMI-2 AWARD FEE	8,430	0	8,430	
TMI-2 BASE FEE	5,619	1,597	4,022	
TOTAL TMI-2	158,290	42,989	115,302	6,800
TOTAL	18,925,649	17,038,973	1,886,676	105,238

Note: All authorized funds have been allocated.

APPENDIX A
Planned and Actual Costs, and Cost Variances Period 11, FY97

CNWRA COMPOSITE TOTAL ESTIMATE COST														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	878,458	848,730	837,396	717,525	734,600	747,901	189,495	757,629	745,749	768,645	792,445	821,317	789,825	8,018,565
Act Pd Cost	845,277	652,931	629,882	568,010	701,880	677,693	662,431	778,935	771,065	743,622	829,684	0	0	7,858,695
Variance, $	33,181	195,800	207,515	149,515	32,740	70,202	(472,945)	(21,306)	(25,315)	25,023	(37,239)	0	0	159,870
Variance, %	3.8%	23.1%	24.8%	20.8%	4.5%	9.4%	-249.6%	-2.8%	-3.4%	3.3%	-4.7%	0.0%	0.0%	2.0%
Est FY Cumul	878,458	1,727,188	2,564,585	3,282,110	4,016,710	4,764,611	4,954,096	5,711,725	6,457,475	7,226,120	8,018,565	8,839,881	9,629,706	
Act FY Cumul	845,277	1,498,208	2,128,089	2,696,099	3,397,960	4,075,659	4,738,089	5,517,025	6,288,090	7,031,711	7,858,695	0	0	
% Complete	8.9%	15.8%	22.4%	28.4%	35.8%	43.0%	50.0%	58.2%	66.3%	73.0%	81.6%	0.0%	0.0%	
Cumul Var, $	33,181	228,981	436,496	586,010	618,750	688,952	216,007	194,701	169,385	197,109	159,870	0	0	
Cumul Var, %	3.8%	13.3%	17.0%	17.9%	15.4%	14.5%	4.4%	3.4%	2.6%	2.7%	2.0%	0.0%	0.0%	
DIVISION OF WASTE MANAGEMENT (DWM) 5708-000														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	779,359	749,755	739,763	743,685	676,002	682,676	172,578	692,019	687,892	702,778	686,737	70[illegible]10	555,978	7,213,243
Act Pd Cost	832,548	596,259	581,181	512,833	615,075	628,012	590,682	706,036	708,780	668,173	734,732	0	0	7,174,311
Variance, $	(53,189)	153,496	158,582	230,852	60,927	54,663	(418,104)	(14,017)	(20,888)	34,605	(47,996)	0	0	138,933
Variance, %	-6.8%	20.5%	21.4%	31.0%	9.0%	8.0%	-242.3%	-2.0%	-3.0%	4.9%	-7.0%	0.0%	0.0%	1.9%
Est FY Cumul	779,359	1,529,114	2,268,877	3,012,563	3,688,565	4,371,241	4,543,818	5,235,837	5,923,729	6,626,507	7,313,243	8,018,253	8,704,231	
Act FY Cumul	832,548	1,428,806	2,009,988	2,522,821	3,137,896	3,765,908	4,356,590	5,062,626	5,771,406	6,439,576	7,174,311	0	0	
% Complete	9.6%	16.4%	23.1%	29.0%	36.1%	43.3%	50.1%	58.2%	66.3%	74.0%	82.4%	0.0%	0.0%	
Cumul Var, $	(53,189)	100,308	258,889	489,742	550,669	605,332	187,228	173,211	152,323	186,928	138,933	0	0	
Cumul Var, %	-6.8%	6.6%	11.4%	16.3%	14.9%	13.8%	4.1%	3.3%	2.6%	2.8%	1.9%	0.0%	0.0%	

CNWRA OPERATIONS (COPS)
5708-150

ITEM	01	02	03	04	05	06	07	08	09	0	11	12	13	Total
Est Pd Cost	124,493	124,594	123,421	123,635	123,421	123,636	67,033	123,908	123,243	124,053	122,970	124,342	122,800	1,304,413
Act Pd Cost	138,117	106,238	113,089	138,661	58,224	106,267	115,364	123,070	148,681	138,518	119,884	0	0	1,305,115
Variance, $	(13,624)	18,355	10,331	(15,026)	65,197	17,369	(48,325)	838	(25,438)	,14,465)	3,067	0	0	(1,702)
Variance, %	-10.9%	14.7%	8.4%	-12.2%	52.8%	14.0%	-72.1%	0.7%	-20.6%	-11.7%	2.5%	0.0%	0.0%	-0.1%
Est FY Cumul	124,493	249,087	372,507	496,143	619,564	743,200	810,239	934,147	1,057,390	1,181,443	1,304,413	1,428,755	1,551,555	
Act FY Cumul	138,117	244,355	357,445	496,106	554,330	660,598	775,962	895,032	1,047,714	1,186,232	1,306,115	0	0	
% Complete	8.9%	15.7%	23.0%	32.0%	35.7%	42.6%	50.0%	57.9%	67.5%	76.5%	84.2%	0.0%	0.0%	
Cumul Var, $	(13,624)	4,731	15,062	37	65,233	82,602	34,277	35,115	9,676	(4,789)	(1,702)	0	0	
Cumul Var, %	-10.9%	1.9%	4.0%	0.0%	10.5%	11.1%	4.2%	3.8%	0.9%	-0.4%	-0.1%	0.0%	0.0%	

IGNEOUS ACTIVITY (IA)
5708-460

ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	61,936	62,080	61,695	62,522	61,659	62,547	61,393	66,725	65,267	66,819	65,264	67,211	65,182	697,907
Act Pd Cost	56,487	66,448	47,904	49,147	68,279	64,272	55,501	65,506	64,133	63,798	94,192	0	0	695,666
Variance, $	5,450	(4,368)	13,791	13,375	(6,620)	(1,724)	5,893	1,219	1,134	3,020	(28,928)	0	0	2,241
Variance, %	8.8%	-7.0%	22.4%	21.4%	-10.7%	-2.8%	9.6%	1.8%	1.7%	4.5%	-44.3%	0.0%	0.0%	0.3%
Est FY Cumul	61,936	124,016	185,711	248,233	309,892	372,439	433,833	500,557	565,824	632,643	697,907	765,118	830,300	
Act FY Cumul	56,487	122,935	170,839	219,986	288,265	352,537	408,037	473,543	537,676	601,474	695,666	0	0	
% Complete	6.8%	14.8%	20.6%	26.5%	34.7%	42.5%	49.1%	57.0%	64.8%	72.4%	83.8%	0.0%	0.0%	
Cumul Var, $	5,450	1,081	14,872	28,247	21,627	19,903	25,796	27,015	28,149	31,169	2,241	0	0	
Cumul Var, %	8.8%	0.9%	8.0%	11.4%	7.0%	5.3%	5.9%	5.4%	5.0%	4.9%	0.3%	0.0%	0.0%	

STRUCTURAL DEFORMATION AND SEISMICITY (SDS) 5708-470														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	80,954	75,326	73,577	74,537	73,547	74,674	135,351	81,514	84,326	86,311	84,323	86,392	84,324	924,940
Act Pd Cost	161,282	80,540	73,497	55,866	79,808	64,021	33,346	66,405	69,028	87,166	93,209	0	0	864,167
Variance, $	(80,327)	(5,214)	80	18,671	(6,261)	10,654	102,505	15,109	15,298	(856)	(8,886)	0	0	60,773
Variance, %	-99.2%	-6.9%	0.1%	25.0%	-8.5%	14.3%	75.5%	18.5%	18.1%	-0.1%	-10.5%	0.0%	0.0%	6.6%
Est FY Cumul	80,954	156,281	229,857	304,394	377,941	452,615	588,466	669,980	754,306	840,617	924,940	1,011,332	1,095,655	
Act FY Cumul	161,282	241,822	315,319	371,185	450,993	515,014	548,359	614,764	683,792	770,958	864,167	0	0	
% Complete	14.7%	22.1%	28.8%	33.9%	41.2%	47.0%	50.0%	56.1%	62.4%	70.4%	78.9%	0.0%	0.0%	
Cumul Var, $	(80,327)	(85,541)	(85,462)	(66,791)	(73,052)	(62,398)	40,107	55,216	70,514	69,659	60,773	0	0	
Cumul Var, %	-99.2%	-54.7%	-37.2%	-21.9%	-19.3%	-13.8%	6.8%	8.2%	9.3%	8.3%	6.6%	0.0%	0.0%	
EVOLUTION OF THE NEAR-FIELD ENVIRONMENT (ENFE) 5708-560														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	81,110	80,823	80,614	81,142	80,445	81,342	(80,569)	96,668	94,803	96,955	94,461	97,240	94,460	787,795
Act Pd Cost	62,233	52,181	38,993	30,224	62,256	78,861	73,040	85,251	65,977	65,305	77,652	0	0	691,974
Variance, $	18,877	28,642	41,621	50,918	18,189	2,481	(153,609)	11,417	28,826	31,649	16,809	0	0	95,821
Variance, %	23.3%	35.4%	51.6%	62.8%	22.6%	3.1%	109.7%	11.8%	30.4%	32.6%	17.8%	0.0%	0.0%	12.2%
Est FY Cumul	81,110	161,933	242,548	323,690	404,135	485,477	404,909	501,576	596,380	693,334	787,795	885,035	979,495	
Act FY Cumul	62,233	114,414	153,407	183,631	245,888	324,748	397,788	483,039	549,017	614,323	691,974	0	0	
% Complete	6.4%	11.7%	15.7%	18.7%	25.1%	33.2%	40.6%	49.3%	56.1%	62.7%	70.6%	0.0%	0.0%	
Cumul Var, $	18,877	47,519	89,140	140,059	158,248	160,729	7,120	18,537	47,363	79,012	95,821	0	0	
Cumul Var, %	23.3%	29.3%	36.8%	43.3%	39.2%	33.1%	1.8%	3.7%	7.9%	11.4%	12.2%	0.0%	0.0%	

CONTAINER LIFE AND SOURCE TERM (CLST)
5708-570

ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	30,612	20,094	20,521	20,094	0	0	0	0	0	0	0	0	0	91,322
Act Pd Cost	56,243	15,698	13,946	7,257	848	2	0	0	0	0	0	0	0	93,994
Variance, $	(25,630)	4,396	6,575	12,837	(848)	(2)	0	0	0	0	0	0	0	(2,672)
Variance, %	-83.7%	21.9%	32.0%	63.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-2.9%
Est FY Cumul	30,612	50,707	71,228	91,322	91,322	91,322	91,322	91,322	91,322	91,322	91,322	91,322	91,322	
Act FY Cumul	56,243	71,940	85,886	93,144	93,992	93,994	93,994	93,994	93,994	93,994	93,994	0	0	
% Complete	61.6%	78.8%	94.0%	102.0%	102.9%	102.9%	102.9%	102.9%	102.9%	102.9%	102.9%	0.0%	0.0%	
Cumul Var, $	(25,630)	(21,234)	(14,659)	(1,822)	(2,670)	(2,672)	(2,672)	(2,672)	(2,672)	(2,672)	(2,672)	0	0	
Cumul Var, %	-83.7%	-41.9%	-20.6%	-2.0%	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%	-2.9%	0.0%	0.0%	

THERMAL EFFECTS ON FLOW (TEF)
5708-660

ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	58,817	58,899	58,512	59,028	58,154	59,028	21,178	59,189	58,037	59,457	58,035	59,570	58,032	608,334
Act Pd Cost	56,775	43,156	39,111	52,125	66,898	51,597	48,050	58,887	70,939	62,356	67,723	0	0	617,618
Variance, $	2,042	15,743	19,401	6,903	(8,745)	7,431	(26,872)	302	(12,902)	(2,899)	(9,688)	0	0	(9,284)
Variance, %	3.5%	26.7%	33.2%	11.7%	-15.0%	12.6%	-126.9%	0.5%	-22.2%	-4.9%	-16.7%	0.0%	0.0%	-1.5%
Est FY Cumul	58,817	117,716	176,229	235,256	293,410	352,438	373,616	432,805	490,842	550,299	608,334	667,904	725,936	
Act FY Cumul	56,775	99,932	139,043	191,168	258,066	309,663	357,712	416,599	487,538	549,894	617,618	0	0	
% Complete	7.8%	13.8%	19.2%	26.3%	35.5%	42.7%	49.3%	57.4%	67.2%	75.7%	85.1%	0.0%	0.0%	
Cumul Var, $	2,042	17,784	37,186	44,089	35,344	42,775	15,903	16,206	3,303	404	(9,284)	0	0	
Cumul Var, %	3.5%	15.1%	21.1%	18.7%	12.0%	12.1%	4.3%	3.7%	0.7%	0.1%	-1.5%	0.0%	0.0%	

REPOSITORY DESIGN AND THERMAL-MECHANICAL EFFECTS (RDTME) 5708-670														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	25,569	23,337	23,707	23,337	0	0	0	0	0	0	0	0	0	95,950
Act Pd Cost	26,768	23,095	32,011	8,424	1,679	207	0	0	0	0	0	0	0	92,184
Variance, $	(1,199)	243	(8,304)	14,913	(1,679)	(207)	0	0	0	0	0	0	0	3,766
Variance, %	-4.7%	1.0%	-35.0%	63.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%
Est FY Cumul	25,569	48,906	72,613	95,950	95,950	95,950	95,950	95,950	95,950	95,950	95,950	95,950	95,950	
Act FY Cumul	26,768	49,862	81,873	90,297	91,976	92,184	92,184	92,184	92,184	92,184	92,184	0	0	
% Complete	27.9%	52.0%	85.3%	94.1%	95.9%	96.1%	96.1%	96.1%	96.1%	96.1%	96.1%	0.0%	0.0%	
Cumul Var, $	(1,199)	(956)	(9,261)	5,653	3,974	3,766	3,766	3,766	3,766	3,766	3,766	0	0	
Cumul Var, %	-4.7%	-2.0%	-12.8%	5.9%	4.1%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%	0.0%	0.0%	
TOTAL SYSTEM PERFORMANCE ASSESSMENT AND INTEGRATION (TSPAI) 5708-760														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	166,917	156,614	150,062	150,893	150,062	150,955	149,527	164,097	168,199	171,977	168,002	172,666	167,703	1,747,303
Act Pd Cost	162,260	111,904	124,509	105,297	175,657	194,857	172,634	207,440	200,079	175,394	176,635	0	0	1,806,667
Variance, $	4,656	44,710	25,553	45,596	(25,596)	(43,903)	(23,107)	(43,343)	(31,880)	(3,417)	(8,633)	0	0	(59,364)
Variance, %	2.8%	28.5%	17.0%	30.2%	-17.1%	-29.1%	-15.5%	-26.4%	-19.0%	-2.0%	-5.1%	0.0%	0.0%	-3.4%
Est FY Cumul	166,917	323,531	473,593	624,485	774,547	925,502	1,075,029	1,239,126	1,407,325	1,579,301	1,747,303	1,919,969	2,087,672	
Act FY Cumul	162,260	274,164	398,673	503,970	679,628	874,485	1,047,119	1,254,559	1,454,638	1,630,032	1,806,667	0	0	
% Complete	7.8%	12.1%	19.1%	24.1%	32.6%	41.9%	50.2%	60.1%	69.7%	78.1%	86.5%	0.0%	0.0%	
Cumul Var, $	4,656	49,366	74,919	120,515	94,919	51,017	27,910	(15,433)	(47,313)	(50,730)	(59,364)	0	0	
Cumul Var, %	2.8%	15.3%	15.8%	19.3%	12.3%	5.5%	2.6%	-1.2%	-3.4%	-3.2%	-3.4%	0.0%	0.0%	

ACTIVITIES RELATED TO DEVELOPMENT OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY YUCCA MOUNTAIN STANDARD (ARDES) 5708-770														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	44,410	44,312	44,154	44,392	43,901	44,392	(97,184)	19,139	15,475	16,146	15,331	16,258	15,237	234,466
Act Pd Cost	38,571	21,178	14,667	8,653	30,213	11,337	10,750	15,365	38,042	29,197	24,205	0	0	242,177
Variance, $	5,838	23,134	29,487	35,739	13,688	33,055	(107,934)	3,774	(22,567)	(13,051)	(8,874)	0	0	(7,710)
Variance, %	13.1%	52.2%	66.8%	80.5%	31.2%	74.5%	111.1%	19.7%	-145.8%	-80.8%	-57.9%	0.0%	0.0%	-3.3%
Est FY Cumul	44,410	88,721	132,875	177,267	221,167	265,559	168,375	187,514	202,989	219,135	234,466	250,724	265,961	
Act FY Cumul	38,571	59,749	74,416	83,069	113,282	124,618	135,369	150,734	188,775	217,972	242,177	0	0	
% Complete	14.5%	22.5%	28.0%	31.2%	42.6%	46.9%	50.9%	56.7%	71.0%	82.0%	91.1%	0.0%	0.0%	
Cumul Var, $	5,838	28,972	58,459	94,198	107,886	140,941	33,007	36,781	14,214	1,164	(7,710)	0	0	
Cumul Var, %	13.1%	32.7%	44.0%	53.1%	48.8%	53.1%	19.6%	19.6%	7.0%	0.5%	-3.3%	0.0%	0.0%	
UNSATURATED AND SATURATED FLOW UNDER ISOTHERMAL CONDITIONS (USFIC) 5708-860														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	85,799	85,640	84,921	86,069	84,814	86,101	(84,658)	80,780	78,542	81,081	78,351	81,331	78,239	747,419
Act Pd Cost	50,108	58,439	62,069	46,546	70,504	56,514	81,998	84,113	51,901	46,437	81,233	0	0	689,863
Variance, $	35,691	27,201	22,851	39,523	14,310	29,587	(166,656)	(3,333)	26,641	34,624	(2,883)	0	0	57,556
Variance, %	41.6%	31.8%	26.9%	45.9%	16.9%	34.4%	196.8%	-4.1%	33.9%	42.7%	-3.7%	0.0%	0.0%	7.7%
Est FY Cumul	85,799	171,440	256,360	342,429	427,243	513,344	428,686	509,466	588,008	669,068	747,419	828,750	906,989	
Act FY Cumul	50,108	108,547	170,617	217,163	287,667	344,181	426,179	510,292	562,192	608,629	689,863	0	0	
% Complete	5.5%	12.0%	18.8%	23.9%	31.7%	37.9%	47.0%	56.3%	62.0%	67.1%	76.1%	0.0%	0.0%	
Cumul Var, $	35,691	62,892	85,743	125,266	139,576	169,163	2,507	(826)	25,815	60,439	57,556	0	0	
Cumul Var, %	41.6%	36.7%	33.4%	36.6%	32.7%	33.0%	0.6%	-0.2%	4.4%	9.0%	7.7%	0.0%	0.0%	

RADIONUCLIDE TRANSPORT (RT) 5708-870														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	18,741	18,036	18,581	18,036	0	0	0	0	0	0	0	0	0	73,394
Act Pd Cost	23,704	17,381	21,384	10,633	707	76	0	0	0	0	0	0	0	73,886
Variance, $	(4,963)	655	(2,803)	7,403	(707)	(76)	0	0	0	0	0	0	0	(493)
Variance, %	-26.5%	3.6%	-15.1%	41.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.7%
Est FY Cumul	18,741	36,777	55,358	73,394	73,394	73,394	73,394	73,394	73,394	73,394	73,394	73,394	73,394	
Act FY Cumul	23,704	41,085	62,469	73,102	73,810	73,886	73,886	73,886	73,886	73,886	73,886	0	0	
% Complete	32.3%	56.0%	85.1%	99.6%	100.6%	100.7%	100.7%	100.7%	100.7%	100.7%	100.7%	0.0%	0.0%	
Cumul Var, $	(4,963)	(4,308)	(7,112)	291	(416)	(493)	(493)	(493)	(493)	(493)	(493)	0	0	
Cumul Var, %	-26.5%	-11.7%	-12.8%	0.4%	-0.6%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	-0.7%	0.0%	0.0%	
WASTE SOLIDIFICATION SYSTEMS (WSS) 5706-000														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	9,767	9,640	9,193	9,640	8,298	9,894	(33,171)	9,990	8,045	9,991	8,043	10,165	8,041	59,330
Act Pd Cost	6,285	249	4,316	2,799	1,002	437	1,389	966	803	636	133	0	0	19,014
Variance, $	3,482	9,391	4,877	6,841	7,296	9,457	(34,560)	9,024	7,242	9,355	7,909	0	0	40,315
Variance, %	35.7%	97.4%	53.1%	71.0%	87.9%	95.6%	104.2%	90.3%	90.0%	93.6%	98.3%	0.0%	0.0%	68.0%
Est FY Cumul	9,767	19,407	28,600	38,240	46,538	56,432	23,261	33,251	41,296	51,287	59,330	69,494	77,535	
Act FY Cumul	6,285	6,534	10,849	13,648	14,651	15,087	16,476	17,442	18,245	18,881	19,014	0	0	
% Complete	8.1%	8.4%	14.0%	17.6%	18.9%	19.5%	21.2%	22.5%	23.5%	24.4%	24.5%	0.0%	0.0%	
Cumul Var, $	3,482	12,874	17,751	24,592	31,888	41,345	6,785	15,808	23,051	32,406	40,315	0	0	
Cumul Var, %	35.7%	66.3%	62.1%	64.3%	68.5%	73.3%	29.2%	47.5%	55.8%	63.2%	68.0%	0.0%	0.0%	

TANK WASTE REMEDIATION SYSTEM (TWRS)
5709-000

ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	89,332	89,334	88,441	(35,801)	50,300	55,332	50,079	55,620	49,813	55,876	49,514	56,462	49,402	597,841
Act Pd Cost	6,445	56,423	44,385	52,378	85,783	49,250	70,360	71,933	58,782	62,271	65,969	0	0	623,979
Variance, $	82,888	32,912	44,056	(88,179)	(35,483)	6,082	(20,281)	(16,313)	(8,969)	(6,395)	(16,455)	0	0	(26,138)
Variance, %	92.8%	36.8%	49.8%	246.0%	-70.5%	11.0%	-40.5%	-29.3%	-18.0%	-11.4%	-33.2%	0.0%	0.0%	-4.4%
Est FY Cumul	89,332	178,667	267,107	231,307	281,607	336,939	387,018	442,638	492,451	548,327	597,841	654,303	703,705	
Act FY Cumul	6,445	62,867	107,252	159,630	245,413	294,664	365,024	436,957	495,739	558,010	623,979	0	0	
% Complete	0.9%	8.9%	15.2%	22.7%	34.9%	41.9%	51.9%	62.1%	70.4%	79.3%	88.7%	0.0%	0.0%	
Cumul Var, $	82,888	115,799	159,856	71,676	36,193	42,275	21,994	5,681	(3,288)	(9,684)	(26,138)	0	0	
Cumul Var, %	92.8%	64.8%	59.8%	31.0%	12.9%	12.5%	5.7%	1.3%	-0.7%	-1.8%	-4.4%	0.0%	0.0%	

THREE MILE ISLAND UNIT 2 INDEPENDENT SPENT FUEL STORAGE INSTALLATION (TMI-2 ISFSI)
5711-000

ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	0	0	0	0	0	0	0	0	0	0	48,151	49,680	46,404	48,151
Act Pd Cost	0	0	0	0	0	0	0	0	0	12,542	28,849	0	0	41,391
Variance, $	0	0	0	0	0	0	0	0	0	(12,542)	19,302	0	0	6,760
Variance, %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.1%	0.0%	0.0%	14.0%
Est FY Cumul	0	0	0	0	0	0	0	0	0	0	48,151	97,832	144,236	
Act FY Cumul	0	0	0	0	0	0	0	0	0	12,542	41,391	0	0	
% Complete	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%	28.7%	0.0%	0.0%	
Cumul Var, $	0	0	0	0	0	0	0	0	0	(12,542)	6,760	0	0	
Cumul Var, %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.0%	0.0%	0.0%	