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

For the Fiscal Reporting Period

December 21, 1996 – January 17, 1997

PMPR No. 97-4

January 31, 1997

TABLE OF CONTENTS

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
AI	Administrative Item
AECL	Atomic Energy of Canada Limited
AES	Atomic Emission Spectrometry
AGU	American Geophysical Union
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
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
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
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
EIS	Environmental Impact Statement
EM	Element Manager
EMPA	Electron Microprobe Analysis

ABBREVIATIONS (cont'd)

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 Transport
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	HLW 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
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
INEL	Idaho National Engineering 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
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
LSS	Licensing Support System
LSSPP	Licensing Support System Pilot Project
LSSTB	Licensing Support System Test Bed
LWR	Light Water Reactor
Ma	Million Years Ago
METRA	Mass and Energy TRAnsport
MGDS	Mined Geologic Disposal System
MH	Mechanical-Hydrological
MIC	Microbially Influenced Corrosion
MIT	Massachusetts Institute of Technology
MM	Major Milestone
MO	Management and Operations
MOU	Memorandum of Understanding
MPC	Multi-Purpose Canister

ABBREVIATIONS (cont'd)

MRS	Monitored Retrievable Storage
MSS	Multispectral Scanner
MTU	Metric Ton of Uranium
NAS	National Academy of Sciences
NAWG	Natural Analogue Working Group
NCR	Nonconformance Reports
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	Probalistic Fault Displacement Hazard
PI	Principal Investigator
PMDA	Program Management Decision Analysis
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
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
ROC	Repository Operations Criteria
RPD	Regulatory Program Database
RRT	Regulatory Requirement Topic
RSRG	Real Space Renormalization Group
RT	Radionuclide Transport
RTS	Radwaste Treatment System
SAR	Safety Analysis Report
SCA	Site Characterization Analysis
SCC	Substantially Complete Containment
SCCEX	Substantially Complete Containment Example
SCM	Surface Complexation Models
SCP	Site Characterization 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
SDMP	Site Decommissioning Management Plan
SF	Spent Fuel
SFPO	Spent Fuel Project Office
SFVF	San Francisco Volcanic Field
SGML	Standard Generalized Markup Language
SHE	Standard Hydrogen Electrodes

ABBREVIATIONS (cont'd)

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
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, Arizona
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
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
VA	Viability Assessment
VCS	Version Control System
VF	Vitrification Facility
VIEW_PVH	View Probability of Volcanic Hazards
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
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 4

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

- Five volcanology presentations: (i) 1995 Eruptions of Cerro Negro, Nicaragua; (ii) Modeling Tephra Dispersal from Basaltic Cinder Cone Eruptions: Application to Risk Analyses; (iii) Decoupled Response of ^{222}Rn and Hg Degassing through Soils During the 1995 Eruptions of Cerro Negro Volcano, Nicaragua; (iv) LandSat TM, SPOT, and SLAR Interpretation of the Volcanic and Structural Features of the Greenwater and Saline Ranges, Inyo County, California, USA and (v) Dilation-Tendency Analysis of Faults Controlling the Quaternary Mesa Butte Cinder Cone Alignment, San Francisco Volcanic Field, Arizona, USA were made during the International Association of Volcanology and Chemistry of the Earth's Interior meeting.

- A paper, Timing of Basaltic Volcanism along the Mesa Butte Fault in the San Francisco Volcanic Field, Arizona, from $^{40}Ar/^{39}Ar$ Dates: Implications for the Longevity of Cinder Cone Alignments, was published this period in the *Journal of Geophysical Research*. A second paper, Reassessment of Neogene Volcanism Near Yucca Mountain, Nevada, was accepted for publication in *EOS*.

- CNWRA staff made a presentation on Numerical Modeling of Ground Motion Related to a Curved Bare Mountain Fault at the Department of Energy Seismic Source Characterization and Ground Motion Characterization workshops in Salt Lake City.

- The Thermodynamic and Kinetic Analyses—Journal Paper was submitted.

- The revision of the letter report, Review Comments on Exploratory Studies Facility (ESF) Alcove Ground Support Analysis and ESF Ground Support—Structural Analysis was submitted.

- The Radiometric Dating of Minerals from the Nopal I Deposit—Journal Paper was submitted.

- The revision to the FY97 CNWRA Operations Plans (OPS) Rev 9 Chg 0 for the high-level waste repository program was submitted.

The DWM JC year-to-date (YTD) cost variance was 16.3 percent. This variance reflects spending estimates from the approved CNWRA OPS Rev 9 Chg 0.

In the Division of Industrial and Medical Nuclear Safety JC, the CNWRA staff transmitted a revised letter report, Review of the Safety Analysis Report (SAR) for Fuel Receiving and Storage Facility, West Valley Nuclear Services-SAR-012, Revision 0, Draft C, and Resolution of West Valley Demonstration Project (WVDP) Responses, to the Nuclear Regulatory Commission (NRC) staff for forwarding to the WVDP. The YTD cost variance to this JC was 64.3 percent.

In the Division of Fuel Cycle Safety and Safeguards JC, the CNWRA staff will initiate preparation of a draft interim report, Hanford Tank Waste Remediation System Familiarization Report, in response to a number of NRC comments on the first report in Subtask 1.1, Hanford Tank Waste Remediation System Familiarization Report—Chapter 2: Description of Site and Facilities. In addition, the staff is preparing an internal draft report, Quality Assurance Program Survey. The YTD cost variance was 55.6 percent.

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

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ESTIMATED BUDGET: $89,898,141

PERIOD OF PERFORMANCE: 10/15/92-9/26/97

PERIOD OF THIS REPORT: 12/21/96-01/17/97

1 TECHNICAL

1.1 CNWRA Operations (COPS)

In addition to a wide range of day-to-day activities, COPS accomplishments included (i) submission of the revision to the CNWRA OPS Rev 9 Chg 0 and the Operations Plan for the WSS Rev 6 Chg 1; (ii) involvement in discussions between the NRC and CNWRA management concerning an SDMP SOW, the proposed DFCSE Regulatory Guides Project, and allocation of the CNWRA resources to the NRC programs for FY97; (iii) participation in weekly HLW Management Board meetings; (iv) extensive work with the corrective and preventive action process to complete action on the two remaining CARs from the annual CNWRA QA audit, along with the conduct of scheduled and unscheduled surveillance activities; and (v) participation in the monthly NRC/CNWRA Computer Coordination Meeting, continued discussion with cognizant LLNL staff concerning the audit of the CNWRA Computer Security System, and support for maintaining LAN operations.

Status of the CNWRA staffing is indicated in table 1. Recruitment efforts and interviews continued for the open positions indicated in table 1. Two positions have been filled. One PA engineer (health physics) will begin work next period, while a chemical/process engineer will join the staff in period 7. The CNWRA awaits NRC approval for a third revision to the Draft Staffing and Hiring Plans submitted last period for NRC review and approval.

In the next period, the CNWRA expects to (i) participate in an NRC/CNWRA Management Meeting at TWFN; (ii) continue providing comprehensive corrective and preventive actions

in response to the two remaining CNWRA QA audit CARs by coordinating technical staff responses, conducting scheduled QA surveillances of tasks and subtasks, and developing the CNWRA QRAM; and (iii) address the results of the LLNL audit of the CNWRA Computer Security System as well as continue CNWRA LAN operation and maintenance support.

1.2 Igneous Activity (IA)

Five volcanology presentations were made during the International Association of Volcanology and Chemistry of the Earth's Interior meeting at the close of this period. These were (i) 1995 Eruptions of Cerro Negro, Nicaragua; (ii) Modeling Tephra Dispersal from Basaltic Cinder Cone Eruptions: Application to Risk Analyses; (iii) Decoupled Response of ^{222}Rn and Hg Degassing through Soils During the 1995 Eruptions of Cerro Negro Volcano, Nicaragua; (iv) LandSat TM, SPOT, and SLAR Interpretation of the Volcanic and Structural Features of the Greenwater and Saline Ranges, Inyo County, California, USA; and (v) Dilation-Tendency Analysis of Faults Controlling the Quaternary Mesa Butte Cinder Cone Alignment, San Francisco Volcanic Field, Arizona, USA. These presentations summarize much of the work done in the IA KTI last fiscal year to characterize the consequences of small volume basaltic volcanism.

A paper, Timing of Basaltic Volcanism along the Mesa Butte Fault in the San Francisco Volcanic Field, Arizona, from $^{40}Ar/^{39}Ar$ Dates: Implications for the Longevity of Cinder Cone Alignments, was published this period in the *Journal of Geophysical Research*. This paper summarizes research in the San Francisco volcanic field. The results of this research suggest that probability models of the spatio-temporal recurrence rate of volcanism should incorporate mapped structures since these structures can serve repeatedly as preferred pathways for ascending magmas over long periods of time. A second paper, Reassessment of Neogene Volcanism Near Yucca Mountain, Nevada, was accepted during this period for publication in *EOS*.

In addition, preparations continued for the technical exchange with the DOE on volcanism presently scheduled for February 25-26, 1997. Preparations included dry runs of the joint NRC/CNWRA presentations for the NRC and CNWRA management.

Characterizing the dispersion of volcanic ash and radioactive waste continued during this period. Specifically, work initiated to test assumptions in the currently used model regarding the source term entrained in volcanic ash in the ascending eruption column. The IA staff are investigating the utility of applying thermodynamic models for eruption column behavior rather than using probability density functions for this source term. Additional coding and testing of the ash model in PVHA_VIEW was performed during this period.

In the next period preparations for the DOE technical exchange on volcanism will be the focus of all work in the IA KTI.

1.3 Structural Deformation and Seismicity (SDS)

CNWRA staff, along with a consultant, attended the DOE Seismic Source Characterization and Ground Motion Characterization workshops in Salt Lake City. The consultant discussed the theoretical possibility for large magnitude earthquakes on low angle normal faults—a phenomenon not observed in the historic record of earthquakes. It was pointed out that earthquakes along low angle faults would have very low recurrence rates (approximately once

in a thousand years), but could have high consequences (producing up to magnitude 8.0 earthquakes). The consultant also reviewed recent GPS data from the YMR. CNWRA staff made a presentation on numerical modeling of ground motion related to a curved BMF. Both presentations provided input to the DOE experts on PSHA and PFDHA.

Work began for a manuscript on Yucca Mountain Tectonics (IM 5708-471-730) to be submitted to a peer reviewed journal. The manuscript will focus on the tectonic setting of the YMR in preparation for issue resolution of tectonic models.

The SDS staff reviewed the FAULTING module user's manual (IM 5708-762-700) for the TSPAI KTI. In addition, these staff participated in discussions with TSPAI KTI staff on future revisions to the FAULTING module that will include new information on secondary faulting coming from staff interactions at the DOE PSHA and PFDHA workshops.

SDS input to the detailed TSPA-95 review was prepared and submitted to TSPAI KTI. Preliminary results and review of the auxiliary analyses performed for TSPA-95 indicated that additional work is required for a more complete and quantitative assessment of the consequences of fault displacement on WPs.

Revision of the milestone on Type 1 Faults in the Yucca Mountain Region (MM 5708-471-650) continued.

In the next period progress will be made on the manuscript on Yucca Mountain Tectonics (IM 5708-471-730) for a peer reviewed journal. It is anticipated that an Appendix 7 meeting with DOE contractors will take place next period to discuss PA modeling of faulting and its effect on WPs.

1.4 Evolution of the Near-Field Environment (ENFE)

Work continued on estimation of the near-field environment using the computer code MULTIFLO. Effects of different host rock mineral assemblages on solution composition and changes in porosity resulting from formation of alteration products are being investigated along with the change in porosity resulting from transformation of cristobalite to quartz. It was found that, depending on the choice of host rock minerals and associated kinetic rate constants, the pH could either increase or decrease as a result of evaporation. The change with time in the concentration of the chloride ion was calculated for cases of simple evaporation and those taking into account the reflux of liquid. At early times, evaporation enrichment factors calculated by considering simple evaporation (with no liquid flux) underestimated values with liquid flux. The increase in the enrichment factor at early times was attributed to the addition of chloride by the refluxing liquid, not accounted for in the pure evaporation calculation.

A CNWRA report reviewing a portion of the DOE Near-Field and Altered Zone Environment Report is being prepared as an AI. The CNWRA report questions the validity of the DOE calculations predicting large increases in porosity resulting from alteration of the tuff host rock. The DOE calculations appear to be conceptually flawed and may not present an adequate representation of the proposed repository environment.

Prolonged corrosion tests continued for times up to 953 d 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 aerated 1,000 ppm Cl^- solution at 95 °C has been in progress for 542 d at the open-circuit potential. During the last test segment, the corrosion potential was greater than the repassivation potential and localized corrosion of the specimen was observed.

The Thermodynamic and Kinetic Analyses—Journal Paper (IM 5708 561-711) was transmitted during this period. The Summary Results from Peña Blanca and Santorini—Journal Paper (IM 5708-561-720) received technical and programmatic review. Preparation continued on the Effects of Microbes on Near-Field Environment—Journal Paper (IM 5708-561-760).

The MULTIFLO code is being documented to meet TOP-018 requirements.

In the next period, TOP-018 documentation for the MULTIFLO code will continue. Estimation of the near-field environment using this computer code will continue as will long-term corrosion tests of Alloy 825. The Summary Results from Peña Blanca and Santorini—Journal Paper (IM 5708-561-720) will be submitted. Work will continue on Effects of Microbes on Near-Field Environment—Journal Paper (IM 5708-561-760) and on the AI reviewing DOE near-field and altered-zone environment interpretations. Review will resume of the DOE Summary and Synthesis Report on Mineralogy and Petrology Studies for the Yucca Mountain Site Characterization Project.

1.5 Container Life and Source Term (CLST)

EBSPAC Version 1.0 was released formally to the CNWRA and the NRC staffs. The EBSPAC Version 1.0 User's Manual (IM 5708-762-740) is being revised and will be issued at a later date as an IM in the TSPAI KTI.

Review of the Literature Pertaining to Grain Boundary Oxidation of Container Materials—Letter Report (IM 5708-571-640) is being edited to conform to CNWRA report format. A draft copy of this report was transmitted to the NRC staff last FY. The completed report was received from the CNWRA subcontractor (Professor R. Rapp, Ohio State University) and all copyright agreements were received from various publishers. The finished report, originally scheduled to be delivered in period 4, will be submitted in period 6.

In the next period, no further activities will take place in the CLST KTI.

1.6 Thermal Effects on Flow (TEF)

Study of the causative mechanisms leading to the formation of perched water bodies near the proposed repository area under nonisothermal conditions continued. Currently, analyses are being conducted to calculate the volume of water that can accumulate within the perched water bodies.

Alternative conceptual models are being evaluated to provide a basis for calculations that will be compared to ECM simulations. The 1988–89 LLNL G-Tunnel heater experiment is being used as the test case to compare results predicted by the different conceptual models with those of this heater experiment.

Gravity-driven refluxing is being analyzed to assess alternative conceptual models. A conceptual model was formulated based on the physics of this type of refluxing. Initial results identified conditions that could lead to accumulation of water on a heat-generating HLW canister.

The thermal conductivity of saturated welded tuff samples from the ALTS is being measured using the constructed apparatus. Tuff from the ALTS is similar to the TSw tuff. Preliminary measurements and analyses suggest that transfer of heat by conduction will contribute to heat movement for temperature gradients in excess of 100 °C/m and possibly as low as 50 °C/m.

Capability of the EBSPAC module is being evaluated for use in assessing the effect of thermohydrologic parameters on proposed repository performance. Preliminary EBSPAC calculations were performed using temperature and RH predictions reported in the NRC High-Level Radioactive Waste Program—Annual Progress Report, Fiscal Year 1996 (CNWRA 96-01A). Temperature and humidity near the WP are being calculated with a heat conduction only model. These results will be provided to the TSPAI KTI staff for use in analyses.

In the next period, TEF KTI plans include (i) analysis of nonisothermal groundwater flow, (ii) laboratory investigation of thermal conductivity, (iii) progress on implementing the MULTIFLO code, (iv) continued assessment of alternative conceptual models, (v) implementation of the EBSPAC module for use to assess the importance of thermohydrologic parameters on proposed repository performance, and (vi) continuation of sensitivity analyses.

1.7 Repository Design and Thermal-Mechanical Effects (RDTME)

The RDTME KTI section of the FY97 CNWRA OPS was submitted on December 30, 1996. This section reflected the discontinuation of RDTME KTI activities at the CNWRA after period 4 and continuation of limited activities at the NRC.

Revision of the letter report, Review Comments on ESF Alcove Ground Support Analysis and ESF Ground Support—Structural Analysis (IM 5708-671-650) was submitted during this reporting period.

In the next period, activities related to RDTME KTI will be discontinued.

1.8 Total System Performance Assessment and Integration (TSPAI)

The SRD for the TPA code Version 3 was completed along with technical and programmatic reviews. Code development and testing continued with the majority of effort devoted to the reader, subarea, sampled parameter, and inventory utility modules. Verification tests were conducted to check that the algorithms were correctly implemented. The container life part of EBSPAC was incorporated into TPA Version 3 and research began on integrating the release component. This part of EBSPAC will be run as a spawned process so that no requirements are placed on EBSPAC to change input/output file structure. Work also initiated on interfacing the NEFTRAN code with Version 3 of the TPA code. Specific changes in the implementation of the NEFTRAN code include (i) eliminating nuclide chains, (ii) making an arbitrary number of subareas, (iii) reducing the number of matrix/fracture combination pathways, and (iv) updating hydrostratigraphic layer thicknesses as well as properties.

Progress continued on short descriptions (one to two pages) for each TPA module for sensitivity studies. In addition, brief documents were prepared on the rationale for changes between Versions 2 and 3 of the TPA code and on specific module changes between Versions 2 and 3. A beta version of TPA code Version 3 is planned for completion early next period allowing other KTI teams the opportunity to exercise the code as they plan sensitivity studies. The SRD for the TPA code Version 3 will fulfill Software Requirements Document for TPA (IM 5708-762-710).

A user's guide for the initial version of the FAULTING module was submitted to the CNWRA for internal review. Editorial review was completed and technical review initiated. One potentially important limitation of the module is its capability to calculate only WPs affected by fault displacement. Currently, there are no models to link fault displacement to WP failure. This conservative assumption was primarily made because considerable work will be required to develop an abstraction of the mechanical response of WPs for both backfilled and unbackfilled drifts. Completion of the user's guide will fulfill User's Guide for FAULTING Module—Letter Report (IM 5708-762-700).

Preparation of write-ups for the detailed review of TSPA-95 continued. Draft versions were completed for all but one focus topic. Those completed include (i) volcanic eruption scenario; (ii) faulting, container lifetime; (iii) drift scale flux; and (iv) matrix diffusion effects. Preparation was initiated on the document on TSPA abstractions but awaits completion of computer runs of TPA code Version 2. A series of telecons with the NRC KTI team leads was held on the progress and findings of the detailed review. One pending decision is whether to delete the faulting focus topic because of the preliminary nature of the FAULTING module. Finalization of this work will fulfill Input to Detailed Review of the DOE TSPA-95—Letter Report (IM 5708-761-710).

A draft user's guide for the ASHPLUME module was completed. Documentation of the ASHPLUME code was conducted as a collaborative effort with the IA KTI. This module, originally developed under the PA Research Project, is designed to analyze dispersion of volcanic ash and spent fuel at locations from the proposed repository due to extrusive volcanic events. When the user's guide is concluded, it will fulfill User's Guide for ASHPLUME Module—Letter Report (IM 5708-762-720).

Development of the SEISMO module progressed. This module will be tailored to represent current WP design and emplacement geometry. In addition, work advanced on the computer modeling study of drift stability which has been transferred to the TSPAI KTI from the RDTME KTI.

The TSPAI staff continued to provide nominal support on the CDOCS software. A meeting with the NRC staff in the following period has been scheduled to more clearly define the scope of activities for both CDOCS and LSSTB.

In the next period, the Software Requirements Document for TPA (IM 5708-762-710) and the User's Guide for FAULTING Module—Letter Report (IM 5708-762-700) will be transmitted. In addition, sections for the Input to Detailed Review of the DOE TSPA-95—Letter Report (IM 5708-761-710) will be completed and the CNWRA review process will begin. Development, modification, and testing of TPA code Version 3, modules and utilities will continue.

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

The CNWRA staff coordinated with the NRC on-site representative at YM to obtain information on soil properties, soil chemistry, and farm locations in the YM area. This information will be used to refine staff understanding of likely exposure scenarios for incorporation into scheduled evaluations of reference biospheres and critical groups. Coordination with the TSPAI KTI staff was conducted to update parameter information for dose calculations.

Near the end of this reporting period, the NRC approved resumption of work related to developing a strategy for revising 10 CFR Part 60 to conform with an anticipated new EPA Standard for HLW disposal.

As an extension of the previous analyses of dilution, a set of computer simulations of radionuclide transport were conducted. These computer simulations confirmed that using a volumetric source term produced results similar to those generated using a fixed concentration boundary condition at the source location.

In the next period, CNWRA staff will assist the NRC staff as they prepare a briefing to the Commission on a strategy for revising 10 CFR Part 60. When the updated EPA Standard for HLW disposal is formally published in the *Federal Register*, the CNWRA will assist the NRC in the review and comment process. Evaluations of exposure scenarios at YM will continue. If tasked, the CNWRA will support the NRC in review of proposed changes to 10 CFR Part 960.

1.10 Unsaturated and Saturated Flow under Isothermal Conditions (USFIC)

During this period, field investigations in Solitario Canyon were conducted to gather information to be used in watershed-scale modeling. Progress was made in examining climatic information to reconstruct a climatic signal and in reviewing studies of arid-zone vegetation effects on infiltration. Work continued on modeling drift-scale fluxes and integrating geochemical data into a 3D saturated-zone hydrostratigraphic model to examine saturated-zone mixing.

Field investigations in Solitario Canyon gathered information that will alter current conceptual and mathematical models of that portion of the watershed. Reconnaissance-level studies of the main channel's morphology and vegetal cover suggest that no significant runoff event occurred recently in its lower reaches; however, in its upper reaches brush stranded in channel vegetation and rock crevices indicate that the channel has been active recently. If runoff events are actually more frequent in the upper reaches than in the lower reaches, then either channel infiltration must be greater in lower channel reaches or orographic effects on precipitation must be more pronounced. Both mechanisms are currently being evaluated in the KINEROS-based Solitario Canyon distributed watershed model to assess effects on the frequency, duration, and magnitude of simulated runoff events.

The CNWRA studies to date on infiltration have conservatively assumed that plant transpiration does not occur. A literature review regarding the impacts of arid-zone plants on infiltration was initiated to support evaluation of the DOE implementation of plant transpiration effects.

Collating and interpreting past climatic information including data from the Devil's Hole progressed. Climatic information will provide estimates of temperature and precipitation for input to infiltration models to examine how infiltration at YM may have varied during glacial cycles.

Efforts toward developing insight into fracture flow processes at the drift scale using numerical simulation moved forward. The MULTIFLO code was used to perform 2D simulations of flow in heterogeneous matrix blocks—examining the impact of various boundary conditions and drift representations. These isothermal realizations are closely coordinated with the TEF KTI where such simulations are used to evaluate thermal effects on flow.

Preliminary interpretation of chemical data including reported chloride concentrations in meteoric precipitation and unsaturated zone water chemistry at YM suggests deep infiltration rates consistent with energy balance calculations. Analysis of groundwater focused on YM, Amargosa Valley, Fortymile Canyon, and Oasis Valley to identify and quantify possible vertical and horizontal mixing.

In the next period, the USFIC staff will (i) draft an IRSR for shallow infiltration, (ii) analyze infiltration-model behavior and assumptions, (iii) assemble available climatic data into a form suitable for predictions of future infiltration rates, (iv) prepare drift-scale simulations of discrete-fracture percolation, and (v) develop the saturated zone subregional-scale 3D hydrostratigraphic model.

1.11 Radionuclide Transport (RT)

Radiometric Dating of Minerals from the Nopal I Deposit—Journal Paper (IM 5708-871-720) was submitted. It will be published as part of the proceedings for the 7th Natural Analogue Working Group Meeting sponsored by the CEC. The paper, Isotopic Constraints on Radionuclide Transport at Peña Blanca, is a summary and synthesis of U/Pb and U-series data from Nopal I as they relate to the history of U mobility, with implications for approaches to modeling radionuclide transport at YM.

In the next period, all activities will be discontinued in the RT KTI.

1.12 Waste Solidification Systems (WSS)

The CNWRA staff transmitted a revised letter report, Review of the SAR for Fuel Receiving and Storage Facility, WVNS-SAR-012, Revision 0, Draft C, and Resolution of WVDP Responses (IM 5706-001-701), to the NRC staff for forwarding to the WVDP. This report reviewed the WVDP responses to the open items listed in the previous draft transmittal and resolved these items.

In the next period, no significant activity is expected.

1.13 Tank Waste Remediation System (TWRS)

The NRC staff had a number of significant comments on the first report in Subtask 1.1, Hanford Tank Waste Remediation System Familiarization Report—Chapter 2: Description of Site and Facilities (IM 5709-101-710) that was submitted. Based on these comments and

following a visit to the Hanford site on January 13-15, 1997, an interim report, Hanford Tank Waste Remediation System Familiarization Report (IM 5709-101-720), will be revised and resubmitted in a draft form by February 28, 1997. Following the NRC review of this draft report, the final report, Hanford Tank Waste Remediation System Familiarization Report (IM 5709-101-730), will be submitted by March 28, 1997. Investigations into Hanford tank waste inventories for chapter 3 of the Familiarization Report continued. The chapter will emphasize estimated chemical and radionuclide inventories, summarize the range of variation and uncertainties, and compare these factors with available analytical data. Access was obtained to the TWINS web-based database at PNNL where a wide range of Hanford tanks analytical and characterization information is available via an Internet site. Initial efforts to view and download data were successful.

Input of tank information (including type, volume capacity, watch list category, and chemical and radionuclide inventory) into a GIS database on Hanford waste tanks was completed. The GIS format is intended to provide a convenient and graphically oriented tool for accessing and presenting data on Hanford waste tanks, piping, and other TWRS-related facilities. Additional facts regarding the TWRS system will be input into the database, if deemed useful by the NRC staff. Information on watch-list tanks already in the database will be revised based on new material regarding the close-out of the ferrocyanide safety issue.

As part of subtask 1.3, guidelines for the hazard evaluation procedures published by the Center for Chemical Process Safety were reviewed. Use of a consultant to assist the CNWRA staff in the selection of one or two hazard analysis methodologies appropriate for Hanford TWRS is being explored.

In subtask 1.4, preparation continued on the outline for the Interim Report on Methodologies for Consequence Criteria Development (IM 5709-104-710). An exhaustive set of NIOSH IDLH levels (for those hazardous chemicals for which these recommendations exist) is being developed. The hazardous chemicals expected to be found at the Hanford TWRS for which no NIOSH IDLH value exists will be determined. Possible performance measures for use in formulating consequence criteria were analyzed. For example, determining hazardous exposures to members of the public, the EPA typically uses levels of concern as opposed to the PEL levels specified in 29 CFR Part 1910 (which sets limits for occupational exposures). The NRC may wish to consider this finding in formulating consequence criteria. Background information relating chemical toxicities to radiation exposures was also reviewed (NUREG-1391).

Activity under subtask 1.5 focused on review of the DOE document, Technical Basis for Classification of Low-Activity Waste Fraction from Hanford Site Tanks, WHC-SD-WM-TI-699. The overall objective of this document is to obtain NRC concurrence on the classification of the LAW as incidental waste, thereby enabling disposal of this waste on-site and removing it from NRC licensing authority. Activities during this period included (i) discussions with the NRC staff on the format and content of Interim Report on the DOE Hanford Tank Waste Classification (IM 5709-105-710) and preparation of a first draft of this report, (ii) attendance at presentations on Hanford tank waste classification provided by the DOE staff and contractors at Hanford, and (iii) comparison of the DOE disposal system performance objectives with those contained in 10 CFR Part 61.

As part of the activities in subtask 1.6, development of an outline for the HLW chemistry manual (IM 5709-106-710) advanced based on information from newly acquired references.

A copy of the Environmental Simulation Program Version 5.3 developed by OLI Systems, Inc. was acquired. This program is being used by Hanford scientists to simulate chemical processing (e.g., leaching and washing) of tank wastes. Thermodynamic data relevant to Hanford wastes developed at PNNL will be provided by OLI Systems, Inc. after evaluation by their staff.

In subtask 1.7, literature searches were concluded and an initial draft report, Quality Assurance Program Survey (IM 5709-107-710), prepared. Information gained from the Hanford site visit will be included in this report, scheduled for CNWRA internal review during period 5.

In the next period, the draft report, Hanford Tank Waste Remediation System Familiarization Report (IM 5709-101-720), will be finalized. Subtask 1.5 will focus on examining the results of a DOE preliminary PA of the disposal system and completion of the IM report. The report, Quality Assurance Program Survey (IM 5709-107-710), will be transmitted.

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 4 are provided in table 3.

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 $200,512. 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 DWM JC, DIMNS JC, and DFCSS JC as well as for COPS and ten KTIs. Three of these KTIs are terminated this period (see letter from B. Meehan to W. Patrick, September 27, 1996). The planned costs per period for the DWM JC reflect the approved CNWRA OPS, Rev 9 Chg 0.

This period expenditures fell by 9.8 percent from last period. Based on the approved spending estimates, the CNWRA composite (all three JCs) was underspent by $714,159 or 20.9 percent, the DWM JC was underspent by $489,663 or 16.3 percent, the DIMNS JC was underspent by $24,592 or 64.3 percent, and the DFCSS JC was underspent by $199,904 or 55.6 percent. During period 4, the DWM JC spending decreased almost 12 percent—reflecting the sunset of three KTIs and reduced spending in ARDES; expenditures in the DIMNS JC fell significantly due to lack of additional tasking, while those for the DFCSS JC rose from the previous period because of additional activity in the subtasks.

As indicated in table 1, the CNWRA has 40 core and 2 limited-term staff members. The CNWRA awaits NRC approval of a Draft Staffing and Hiring Plans—Third Revision which was conveyed to

the NRC via a memorandum from W. Patrick to J. Linehan dated December 12, 1996. Two offers were accepted; a PA engineer (health physics) will begin during period 5 and a chemical process engineer will start in period 7. The available pool of approved consultants and subcontractors has been adjusted to 42. Expenditures for consultants, subcontractors, and SwRI labor in all JCs as a percentage of the CNWRA composite spending were 10.7 percent for period 4 in FY97. For consultants and subcontractors alone, this percentage was 9.3 percent as payments resumed for consultants and subcontractors.

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

DWM JC

The DWM JC cumulative cost variance through period 4 was 16.3 percent.

Expenditures in this JC declined by 11.8 percent from the previous period. Expenses rose in COPS from last period, and spending declined over period 3 in all KTIs except IA and TEF. Specific rationales for over/underspending for COPS and each KTI follow.

The cost variance for COPS was 0.0 percent. The cost variance was -8.8 percent for the Management, Planning, and Computer Support Subtask (5708-158) and 33.1 percent for the Quality Assurance Subtask (5708-159). These variances reflect the approved spending plan in the most recent CNWRA OPS Rev 9 Chg 0. Expenditures in the former subtask increased over period 3 associated with loading correspondence into CDOCS. Expenses in the latter subtask declined since period 1, however, are expected to escalate as preparations for the annual QA audit begin.

The cost variance for the IA KTI was 11.4 percent. It is anticipated the variance will decrease as analytical and field expenses are incurred during the next several periods.

The cost variance for the SDS KTI was -21.9 percent and is the result of FY96 carryover expenses paid during previous periods. Period 4 costs were 25 percent below revised budgeted expenses. Spending is expected to decline in period 5 because of an unfilled staff position and reallocation of staff to non-SDS KTI activities.

The cost variance for the ENFE KTI was 43.3 percent. This variance is anticipated to decrease as labor adjustments are completed. This variance is caused, in part, by absence of full staffing at the CNWRA. In addition, staff who would support ENFE KTI issues are working on other KTIs to meet pressing deadlines.

The cost variance for the CLST KTI was −2.0 percent. The slight excess spending reflects close out activities related to revision of the EBSPAC code revision and preparation of Review of the Literature Pertaining to Grain Boundary Oxidation of Container Materials--Letter Report (IM 5708-571-640). The CNWRA account for this KTI was closed January 17, 1997. Some additional spending is anticipated due to residual billing from a consultant.

The cost variance for the TEF KTI was 18.7 percent. It is anticipated spending will increase due to greater use of consultants for the assigned activities.

The cost variance for the RDTME KTI was 5.9 percent. Although activities related to this KTI terminate this period, residual payments for work already performed may appear as expenses in period 5.

The cost variance for the TSPAI KTI was 19.3 percent, but is expected to be reduced as new staff are added to the PA Element. A health physics position in PA was recently filled. Interviews continue for three open positions. Additional use of SwRI staff and consultants will be necessary to accelerate completion, testing, and documentation of the TPA code.

The cost variance for the ARDES KTI was 53.1 percent. This positive variance reflects sharply reduced activity in this KTI pending further tasking related to review of a proposed EPA Standard for HLW disposal. Resumption of this activity should increase expenditures for this KTI in the next period.

The cost variance for the USFIC KTI was 36.6 percent which is anticipated to decrease as the CNWRA hydrogeology staffing is completed.

The cost variance for the RT KTI was 0.4 percent. No further spending is anticipated, but residual payments related to previous activities may create some expenses in this KTI next period.

The cost variance for WSS was 64.3 percent. The spending rate is expected to decrease considerably due to lack of tasking.

The cost variance for the TWRS project was 55.6 percent. Expenditures should escalate with acquisition of new staff and consultants. Budget uncertainties in this project, however, may require spending plans to be revised in subsequent periods.

Table 1. CNWRA Core Staff—Current Profile and Hiring Plan* (Period 4)

EXPERTISE/EXPERIENCE	CURRENT NO.	PROFESSIONAL STAFF	POSITIONS OPEN FY97
ADMINISTRATION	4	H.GARCIA, W.PATRICK, J.RUSSELL, B.SAGAR	
CHEMICAL PROCESSING ENGNG.	0		1
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.PIKRYL, D.TURNER	
GEOHYDROLOGY/HYDROGEOLOGY	3	R.GREEN, S.STOTHOFF, J.WINTERLE	2
GEOLOGY	2	L.McKAGUE, M.MIKLAS	
HYDROLOGIC TRANSPORT	1	G.WITTMEYER	2
INFORMATION MANAGEMENT SYSTEMS	1	R.MARSHALL	
MATERIAL SCIENCES	2(1)†	P.ANGELL†, D.DUNN, N.SRIDHAR	
MINING ENGINEERING	1	S-M.HSIUNG	
NUCLEAR ENGINEERING	1	M.JARZEMBA	1
OPERATIONAL HEALTH PHYSICS			1
PERFORMANCE ASSESSMENT	3	R.BACA, R.MANTEUFEL, S.MOHANTY	2
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, B.HILL, M.CONWAY†	
TOTAL	40(2)†		12

* SEE STAFFING PLAN FOR DETAILS (Open positions will be filled in FY97 on a selective basis due to budget reduction.)
† LIMITED TERM

Table 2. Summary of Schedule Changes (Period 4)

MILESTONE NUMBER	TYPE	DESCRIPTION	ORIGINAL DATE	REVISED DATE	RATIONALE FOR CHANGE
5708-158-730	IM	CNWRA Computer Certification Letter Report	02/24/97	04/28/97	Will await NRC guidance based on LLNL report findings.
5708-571-640	IM	Review of Literature Pertaining to Grain Boundary Oxidation of Container Materials—Letter Report	01/17/97	02/21/97	The draft report submitted by the subcontractor is being reformatted. There was a delay in receipt of copyright agreements for figures.
5709-101-720	IM	Nature of Tank Wastes and Hazards—Interim Report	01/24/97	02/28/97	Chapters 3 and 4 of the TWRS familiarization report will be combined with chapter 2 and revised according to the NRC comments. This then will be submitted as a draft familiarization report. Additional time is needed to acquire reports to address the NRC comments.
5709-101-730	IM	Consolidated Hanford Tank Waste Familiarization Report—Final Report	02/14/97	03/28/97	The draft familiarization report (5708-101-720) will be reviewed by the NRC and their comments will be addressed in the final report.

Table 3. Deliverables (Period 4)

MILESTONE NO.	TYPE	DESCRIPTION	ORIGINAL COMPLETION DATE	REVISED DATE	# OF REVISIONS	ACTUAL COMPLETION DATE	REASON (IF DELAYED)
5706-001-701	IM	Review of the SAR for Fuel Receiving and Storage Facility, WVNS-SAR-012, Revision 0, Draft C, and Resolution of WVDP Responses—Letter Report	12/16/96			12/12/96	NRC acceptance received 1/2/97; updated report was submitted 1/14/97.
5708-561-711	IM	Thermodynamics and Kinetic Analyses—Journal Paper	01/03/97	01/06/97		01/06/97	Delivered upon receipt of period 2 PMPR approval
5708-671-650	IM	Review Comments on ESF Alcove Ground Support Analyses and ESF Ground Support—Structural Analysis—Letter Report	09/27/96			09/26/96	Received NRC conditional acceptance. Resubmitted 1/16/97.
5708-871-720	IM	Radiometric Dating of Minerals from the Nopal I Deposit—Journal Paper	03/22/97	01/10/97	1	01/08/97	Delivered early

Table 4. Financial Status (Period 4)

COPS/KTI/WSS/TWRS	Funds Authorized	Funds Costed to Date	Funds Uncosted	Commitments
COPS	1,823,081	1,698,396	124,685	0
IA	1,021,059	918,300	102,759	4,950
SDS	1,467,355	1,473,665	(6,310)	17,804
ENFE	988,015	795,004	193,011	64,900
CLST	1,034,017	793,457	240,560	0
TEF	752,056	689,210	62,846	66,164
RDTME	1,060,494	798,705	261,789	9,923
TSPAI	1,875,928	1,760,710	115,219	26,901
ARDES	602,210	488,988	113,222	0
USFIC	795,076	641,562	153,515	1,172
RT	620,453	477,957	142,495	639
DWM COSTS	12,039,744	10,535,954	1,503,790	
DWM AWARD FEE	0	0	0	
DWM BASE FEE	0	408,681	(408,681)	
TOTAL DWM	12,039,744	10,944,635	1,095,109	192,452
WSS COSTS	620,126	565,948	54,178	0
WSS AWARD FEE	0	0	0	
WSS BASE FEE	0	24,459	(24,459)	
TOTAL WSS	620,126	590,406	29,720	0
TWRS COSTS	505,654	159,631	346,024	8,060
TWRS AWARD FEE	33,600	0	33,600	
TWRS BASE FEE	20,746	6,187	14,559	
TOTAL TWRS	560,000	165,817	394,183	8,060
TOTAL	13,219,870	11,700,858	1,519,012	200,512
Note: All authorized funds have been allocated.				

APPENDIX A
Planned and Actual Costs, and Cost Variances Period 4, FY97

CNWRA COMPOSITE
TOTAL ESTIMATE COST

ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	878,378	848,730	837,397	845,753	766,579	785,238	763,971	786,879	760,086	788,919	758,839	792,719	757,915	3,410,258
Act Pd Cost	845,277	652,931	629,882	568,010	0	0	0	0	0	0	0	0	0	2,696,099
Variance, $	33,101	195,799	207,516	277,742	0	0	0	0	0	0	0	0	0	714,159
Variance, %	3.8%	23.1%	24.8%	32.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.9%
Est FY Cumul	878,378	1,727,108	2,564,505	3,410,258	4,176,837	4,962,075	5,726,046	6,512,925	7,273,011	8,061,930	8,820,769	9,613,488	10,371,403	
Act FY Cumul	845,277	1,498,208	2,128,089	2,696,099	0	0	0	0	0	0	0	0	0	
% Complete	8.2%	14.4%	20.5%	26.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	33,101	228,900	436,416	714,159	0	0	0	0	0	0	0	0	0	
Cumul Var, %	3.8%	13.3%	17.0%	20.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	779,279	749,755	739,764	743,686	676,003	682,676	674,161	684,100	670,906	686,027	669,772	688,443	668,914	3,012,484
Act Pd Cost	832,548	596,259	581,181	512,833	0	0	0	0	0	0	0	0	0	2,522,821
Variance, $	(53,269)	153,496	158,583	230,853	0	0	0	0	0	0	0	0	0	489,663
Variance, %	-6.8%	20.5%	21.4%	31.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.3%
Est FY Cumul	779,279	1,529,034	2,268,798	3,012,484	3,688,487	4,371,163	5,045,324	5,729,424	6,400,329	7,086,356	7,756,128	8,444,571	9,113,485	
Act FY Cumul	832,548	1,428,806	2,009,988	2,522,821	0	0	0	0	0	0	0	0	0	
% Complete	9.1%	15.7%	22.1%	27.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	(53,269)	100,227	258,810	489,663	0	0	0	0	0	0	0	0	0	
Cumul Var, %	-6.8%	6.6%	11.4%	16.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

CNWRA OPEPATIONS (COPS) 5708-150														
ITEM	01	02	03	04	05	06	07	08	09	10	11	12	13	Total
Est Pd Cost	124,493	124,594	123,421	123,635	123,421	123,636	123,244	123,908	123,243	124,053	122,971	124,341	122,800	496,143
Act Pd Cost	138,117	106,238	113,089	138,661	0	0	0	0	0	0	0	0	0	496,106
Variance, $	(13,624)	18,355	10,332	(15,026)	0	0	0	0	0	0	0	0	0	37
Variance, %	-10.9%	14.7%	8.4%	-12.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Est FY Cumul	124,493	249,087	372,508	496,143	619,564	743,200	866,445	990,353	1,113,597	1,237,649	1,360,620	1,484,961	1,607,761	
Act FY Cumul	138,117	244,355	357,445	496,106	0	0	0	0	0	0	0	0	0	
% Complete	8.6%	15.2%	22.2%	30.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	(13,624)	4,731	15,063	37	0	0	0	0	0	0	0	0	0	
Cumul Var, %	-10.9%	1.9%	4.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	61,795	62,522	61,659	62,547	61,393	62,628	61,168	62,661	61,166	63,052	61,085	248,233
Act Pd Cost	56,487	66,448	47,904	49,147	0	0	0	0	0	0	0	0	0	219,986
Variance, $	5,450	(4,368)	13,791	13,375	0	0	0	0	0	0	0	0	0	28,247
Variance, %	8.8%	-7.0%	22.4%	21.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.4%
Est FY Cumul	61,936	124,016	185,711	248,233	309,892	372,439	433,833	496,461	557,629	620,290	681,456	744,508	805,593	
Act FY Cumul	56,487	122,935	170,839	219,986	0	0	0	0	0	0	0	0	0	
% Complete	7.0%	15.3%	21.2%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	5,450	1,081	14,872	28,247	0	0	0	0	0	0	0	0	0	
Cumul Var, %	8.8%	0.9%	8.0%	11.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	73,453	74,846	73,087	75,071	73,085	75,153	73,085	304,394
Act Pd Cost	161,282	80,540	73,497	55,866	0	0	0	0	0	0	0	0	0	371,185
Variance, $	(80,327)	(5,214)	80	18,671	0	0	0	0	[illegible]	0	0	0	0	(66,791)
Variance, %	-99.2%	-6.9%	0.1%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-21.9%
Est FY Cumul	80,954	156,281	229,857	304,394	377,941	452,615	526,069	600,914	674,001	749,073	822,158	897,311	970,396	
Act FY Cumul	161,282	241,822	315,319	371,185	0	0	0	0	0	0	0	0	0	
% Complete	16.6%	24.9%	32.5%	38.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	(80,327)	(85,541)	(85,462)	(66,791)	0	0	0	0	0	0	0	0	0	
Cumul Var, %	-99.2%	-54.7%	-37.2%	-21.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	80,161	81,593	79,704	81,881	79,483	82,166	79,482	323,690
Act Pd Cost	62,233	52,181	38,993	30,224	0	0	0	0	0	0	0	0	0	183,631
Variance, $	18,877	28,642	41,621	50,918	0	0	0	0	0	0	0	0	0	140,059
Variance, %	23.3%	35.4%	51.6%	62.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	43.3%
Est FY Cumul	81,110	161,933	242,548	323,690	404,135	485,477	565,638	647,231	726,935	808,816	888,299	970,465	1,049,947	
Act FY Cumul	62,233	114,414	153,407	183,631	0	0	0	0	0	0	0	0	0	
% Complete	5.9%	10.9%	14.6%	17.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	18,877	47,519	89,140	140,059	0	0	0	0	0	0	0	0	0	
Cumul Var, %	23.3%	29.3%	36.8%	43.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

CONTAINER LIFE AND SOURCE TERM (CLST) 5708-670														
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	0	0	0	0	0	0	0	0	0	93,144
Variance, $	(25,630)	4,396	6,575	12,837	0	0	0	0	0	0	0	0	0	(1,822)
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%	-2.0%
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	0	0	0	0	0	0	0	0	0	
% Complete	61.6%	78.8%	94.0%	102.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	(25,630)	(21,234)	(14,659)	(1,822)	0	0	0	0	0	0	0	0	0	
Cumul Var, %	-83.7%	-41.9%	-20.6%	-2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	58,121	59,189	58,037	59,457	58,035	59,570	58,032	235,256
Act Pd Cost	56,775	43,156	39,111	52,125	0	0	0	0	0	0	0	0	0	191,168
Variance, $	2,042	15,743	19,401	6,903	0	0	0	0	0	0	0	0	0	44,089
Variance, %	3.5%	26.7%	33.2%	11.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.7%
Est FY Cumul	58,817	117,716	176,229	235,256	293,410	352,438	410,558	469,747	527,784	587,241	645,277	704,846	762,878	
Act FY Cumul	56,775	99,932	139,043	191,168	0	0	0	0	0	0	0	0	0	
% Complete	7.4%	13.1%	18.2%	25.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	2,042	17,784	37,186	44,089	0	0	0	0	0	0	0	0	0	
Cumul Var, %	3.5%	15.1%	21.1%	18.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	0	0	0	0	0	0	0	0	0	90,297
Variance, $	(1,199)	243	(8,304)	14,913	0	0	0	0	0	0	0	0	0	5,653
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%	5.9%
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	0	0	0	0	0	0	0	0	0	
% Complete	27.9%	52.0%	85.3%	94.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	(1,199)	(956)	(9,261)	5,653	0	0	0	0	0	0	0	0	0	
Cumul Var, %	-4.7%	-2.0%	-12.8%	5.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	166,837	156,613	150,062	150,893	150,062	150,955	149,527	151,347	148,129	151,852	147,855	152,542	147,555	624,406
Act Pd Cost	162,260	111,904	124,509	105,297	0	0	0	0	0	0	0	0	0	503,970
Variance, $	4,576	44,709	25,553	45,596	0	0	0	0	0	0	0	0	0	120,436
Variance, %	2.7%	28.5%	17.0%	30.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	19.3%
Est FY Cumul	166,837	323,450	473,513	624,406	774,468	925,424	1,074,951	1,226,298	1,374,426	1,526,278	1,674,133	1,826,675	1,974,231	
Act FY Cumul	162,260	274,164	398,673	503,970	0	0	0	0	0	0	0	0	0	
% Complete	8.2%	13.9%	20.2%	25.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	4,576	49,286	74,839	120,436	0	0	0	0	0	0	0	0	0	
Cumul Var, %	2.7%	15.2%	15.8%	19.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	43,757	44,426	43,813	44,608	43,444	44,784	43,253	177,267
Act Pd Cost	38,571	21,178	14,667	8,653	0	0	0	0	0	0	0	0	0	83,069
Variance, $	5,838	23,134	29,487	35,739	0	0	0	0	0	0	0	0	0	94,198
Variance, %	13.1%	52.2%	66.8%	80.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	53.1%
Est FY Cumul	44,410	88,721	132,875	177,267	221,167	265,559	309,316	353,742	397,355	441,963	485,407	530,190	573,443	
Act FY Cumul	38,571	59,749	74,416	83,069	0	0	0	0	0	0	0	0	0	
% Complete	6.7%	10.4%	13.0%	14.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	5,838	28,972	58,459	94,198	0	0	0	0	0	0	0	0	0	
Cumul Var, %	13.1%	32.7%	44.0%	53.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	84,505	86,163	83,925	86,443	83,734	86,835	83,622	342,429
Act Pd Cost	50,108	58,439	62,069	46,546	0	0	0	0	0	0	0	0	0	217,163
Variance, $	35,691	27,201	22,851	39,523	0	0	0	0	0	0	0	0	0	125,266
Variance, %	41.6%	31.8%	26.9%	45.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	36.6%
Est FY Cumul	85,799	171,440	256,360	342,429	427,243	513,344	597,849	684,012	767,936	854,379	938,113	1,024,948	1,108,571	
Act FY Cumul	50,108	108,547	170,617	217,163	0	0	0	0	0	0	0	0	0	
% Complete	4.5%	9.8%	15.4%	19.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	35,691	62,892	85,743	125,266	0	0	0	0	0	0	0	0	0	
Cumul Var, %	41.6%	36.7%	33.4%	36.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	0	0	0	0	0	0	0	0	0	73,102
Variance, $	(4,963)	655	(2,803)	7,403	0	0	0	0	0	0	0	0	0	291
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%	0.4%
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	0	0	0	0	0	0	0	0	0	
% Complete	32.3%	56.0%	85.1%	99.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	(4,963)	(4,308)	(7,112)	291	0	0	0	0	0	0	0	0	0	
Cumul Var, %	-26.5%	-11.7%	-12.8%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	8,265	9,990	8,045	9,991	8,043	10,165	8,041	38,240
Act Pd Cost	6,285	249	[illegible]16	2,799	0	0	0	0	0	0	0	0	0	13,648
Variance, $	3,482	9,391	4,877	6,841	0	0	0	0	0	0	0	0	0	24,592
Variance, %	35.7%	97.4%	53.1%	71.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	64.3%
Est FY Cumul	9,767	19,407	28,600	38,240	46,538	56,432	64,697	74,687	82,731	92,722	100,765	110,930	118,971	
Act FY Cumul	6,285	6,534	10,849	13,648	0	0	0	0	0	0	0	0	0	
% Complete	5.3%	5.5%	9.1%	11.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	3,482	12,874	17,751	24,592	0	0	0	0	0	0	0	0	0	
Cumul Var, %	35.7%	66.3%	62.1%	64.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	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	92,426	82,278	92,868	81,545	92,789	81,136	92,901	81,024	94,111	80,960	359,534
Act Pd Cost	6,445	56,423	44,385	52,378	0	0	0	0	0	0	0	0	0	159,630
Variance, $	82,888	32,912	44,056	40,048	0	0	0	0	0	0	0	0	0	199,904
Variance, %	92.8%	36.8%	49.8%	43.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	55.6%
Est FY Cumul	89,332	178,667	267,107	359,534	441,812	534,481	616,026	708,815	789,951	882,852	963,876	1,057,987	1,138,947	
Act FY Cumul	6,445	62,867	107,252	159,630	0	0	0	0	0	0	0	0	0	
% Complete	0.6%	5.5%	9.4%	14.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Cumul Var, $	82,888	115,799	159,856	199,904	0	0	0	0	0	0	0	0	0	
Cumul Var, %	92.8%	64.8%	59.8%	55.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	