



United States Department of the Interior

U. S. GEOLOGICAL SURVEY

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Denver Federal Center

Denver, Colorado 80225

IN REPLY REFER TO

INFORMATION ONLY

February 13, 2002

Victor W. Trebules
 Director, Office of Project Control
 Office of Civilian Radioactive Waste Management
 Office of Repository Development
 P.O. Box 364629
 North Las Vegas, Nevada 89036-8629

SUBJECT: Yucca Mountain Project Branch - U.S. Geological Survey (YMPB-USGS)
 Progress Report, January, 2003

Attached is the USGS progress report in the required format for the month of January, 2003.

If you have any questions or need further information, please call Raye Ritchey Arnold at (303)236-5050, ext 296.

Sincerely,

Raye Ritchey Arnold

for Robert W. Craig
 Technical Project Officer
 Yucca Mountain Project Branch
 U.S. Geological Survey

Enclosure:

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U.S. GEOLOGICAL SURVEY
Executive Summary
YUCCA MOUNTAIN PROJECT BRANCH

January 2003

GEOLOGY

In geologic work supporting development of borehole lithostratigraphy for the Nye County early-warning drilling program (EWDP), samples from two recently drilled Nye County boreholes remained in processing by the SMF. Due to furlough of much of the electrician workforce in Area 25, drying of processed samples cannot be completed in a timely manner. In related progress, however, responses to review comments were completed for the Phase III borehole lithostratigraphic data package, and that package was sent to the USGS Data Management group for submittal to the TDMS. Technical reviews and checker reviews of Phase III cross sections, which depend in part on those borehole data, have been completed. Authors currently are responding to technical and checker review of those cross sections.

Compilation of attributions for the completed geologic map of the potential southern expansion area of the proposed repository continued. Those attributions are preparation for the USGS Publications Group review of that map for USGS Director's approval.

Comment resolution after technical review of the Deterministic Seismic Hazards Analysis continued. Required revisions have taken longer than anticipated. There is no impact of delay related to other Program elements.

Several efforts continued in relation to underground mapping and rock testing, including geological support to ECRB work. Assembly of a rock-mechanical data package containing data from direct-shear testing was completed, and technical and checker review will begin on schedule. Creep-testing activity continued. Test samples have been prepared, and instrumentation has been installed on test specimens. Stochastic inputs for the drift-degradation AMR were collected and have been transmitted to the EBS (engineered barrier system) group. Collection of thin-section samples continued. Small-scale fracture traverses began on January 6; to date, two small-scale fracture traverses have been conducted, with a third traverse partially complete. Significant effort was directed to development of chapters for the Design AMR, with that task expected to be completed in early February.

In deferred work, a data package containing Phase I and Phase II lithophysal data was completed, and that combined package was transmitted to the TDMS/RPC on January 31, in completion of milestones **PAGSW930M4 [Phase II Lithophysal Data to TDMS/RPC]** and **PAGSW931M4 [Phase I Lithophysal Data to TDB/RPC]**. Preparation of the package supporting the Alcove #8/Niche #3 mapping continued.

Routine video observation of conditions behind a sealed Cross-Drift bulkhead on January 13 revealed a plume of smoke, first noticed and reported by **David Black**, a **USGS-S.M. Stoller Corp.** contractor. Following subsequent evacuation of the underground facility, the YMP Mine Rescue team, including **USGS/Bureau of Reclamation** rescue-team member **Rob Lung**, evaluated conditions in the Cross Drift. The team successfully determined the apparent cause of the fire, and its suppression, all under the challenge of maintaining integrity of data in hydrologic experiments being conducted behind ECRB bulkheads.

Quantification of lithophysal porosity using in-situ tests continued, and a summary of the distribution of lithophysal cavities and fractures in the host rock for Slot Test #3 was delivered to the analytical team for Sandia National Laboratories. The actual data and summary are in technical and checker review. The basic configuration of Slot Test #3 is similar to previous slot tests. Slot Test #3, however, is located in the invert of the ECRB Cross Drift at Station 21+25. The test consists of two 1.3-m-deep vertical slots and a central 30.5-cm-diameter, 1.8-m-deep, vertical borehole. The respective abundances of the groundmass and lithophysal cavities were determined with panel and borehole maps and a slot map of slot-1/A. (The "panel map" is an overlay on a photograph of the tunnel wall, the "borehole map" is based on a borehole video recording, and the "slot map" is a composite of 20 video-recording runs in the slot.) The techniques used to compile the panel, borehole, and slot maps provide good quality, spatially registered, feature-specific data, but resolution of the data-collection technique differs in the various maps and results in different minimum sizes of features in each type of map. Video recordings of the slots provide great detail with the ability to identify and map features as small as 7 mm across, and that resolution contrasts with the panel and borehole maps where the minimum size of mapped features typically are 8 mm and 13 cm diameter, respectively. Several pre- and post-test photographs were taken of the tunnel invert, and conditions such as incident light angle and "dry" versus "wet/damp" resulted in differences in usefulness and ability to identify and map various features. The low incident-angle lighting enhanced identification of cavities. In the completely "dry" rock photographs, identification of features is difficult due to minimal color contrast of those features. The "damp" rock photographs document, however, variations in how different features (matrix-groundmass versus rims and spots, for example) retain moisture and those photographs thereby aid in identification of such features.

SATURATED-ZONE STUDIES

Monitoring for barometric response began at the Alluvial Test Complex (ATC) during the week of January 20 by activation of the MAGI Westbay data logger to collect background pressures and temperatures from transducers installed in borehole NC-EWDP-19IM1 for cross-hole hydraulic and tracer testing at the ATC. Those background pressures will be used to calculate barometric efficiency and will provide data for the Saturated-Zone In Situ Testing AMR. During January, water levels from boreholes USW H-4, UE-25 WT #14, UE-25 WT #3, and UE-25 ONC #1, all observation wells during long-term pumping at the C-hole complex from May 1996 to November 1997, were

filtered to remove effects of earth tides and barometric changes. Those filtered data will be used to calculate anisotropy of horizontal hydraulic conductivity for fractured volcanic units. Derivatives of drawdown curves from those wells also were calculated as part of the effort to obtain values for anisotropy. Work also continued during January on Software Management Reports (SMRs) for several computer programs, including Injection-Pumpback.vi, Streltsova-Adams.vi, and Recirc.vi. Those SMRs are expected to be submitted to Software Configuration Management (SCM) during February. [Please note that any use herein of private firm or brand names is for identification and explanatory purposes only and does not constitute endorsement by the United States Geological Survey or other agency of the U.S. government.]

Efforts also were on-going in manipulation and integration of hydrogeologic data related to modeling of ground-water flow in the Death Valley regional flow system (DVRFS). Flow-model post-processing was converted from discontinued software to ArcMap, v. 8.1. Data-frame explanation classifications were automated with predefined intervals for integer and floating-point grid data in ArcMap. Additional code-supporting modifications were completed. Knowledge-exchange and DVRFS modeling-meeting support was enhanced by improvements to the project web site. Other modifications supported data presentations and visualizations for the transient-model report. A letter report describing progress and improvements in the hydrogeologic framework model for the transient flow model was prepared, in completion of **milestone PAGSM32AM5 [Progress HFM Updates - Transient Model]** on January 31. Collaborative work with UGTA (Underground Test Area of the Nevada Test Site) ground-water flow modelers concerned approaches for data integration and development of consistent models; results of that work will be presented in an administrative report to DOE. New post-processing code was developed to extract and visualize effective hydraulic conductivity values estimated by the Hydrologic Unit Flow (HUF) package of MODFLOW2000. Conversion of existing post-processing codes to newer technology available through ArcGIS was initiated. Newly developed Modpath codes were interfaced with the existing post-processor.

Three-dimensional hydrogeologic model development also continued. Inconsistencies found in cross sections were used to correct the hydrogeologic framework model (HFM). Cross sections through the HFM along the model boundary were provided to GeoTrans and National Park Service workers, as were newly calculated decay coefficients for hydraulic conductivity segregated by zones within hydrogeologic units. Some of that HFM development work was described for the Las Vegas chapter of the Association of Engineering Geologists in a presentation on January 14 by W. Belcher of the USGS.

Modeling of ground-water flow in the Death Valley regional flow system and compilation of related data continued. Modified zonation schemes for the Intrusive Confining Unit (ICU), Lower Carbonate Aquifer (LCA), and the Lower Clastic Confining Unit (LCCU) were developed to better aid calibration of the flow model. Other work addressed incorporation of depth decay in the volcanoclastic units (VSU) and in other hydrogeologic units. Hydrologic flow barriers (HFBs) were added to the model to represent major faults perpendicular to flow and to represent more clearly discharge

areas near faults. Those HFBs, for example, included a detachment fault and thrust fault on northern Bare Mountain. Refinements also addressed spatial definition of hydrogeologic-unit parameters for the LCA, LCCU, and VSU, with particular improvements in the Ash Meadows discharge area to allow more accurate flow simulations. New visualization tools involving particle-tracking paths from constant-head cells on the model boundary, discharge areas, and recharge areas have provided more information to refine hydraulic conductivity and head along constant-head boundaries. Those new visualization tools have been tested extensively. Staff participated in knowledge-exchange and modeling-unit meetings which focused on particle-path visualizations and potential HFM adjustments. Also discussed were hydrogeologic options to model calibration. Work continued with the Tucson flow modelers to evaluate calibration of the DVRFS flow model. Staff automated tracking of particles from the flow model and incorporated those particle paths into 3-D visualizations. Additional evaluations and calibrations of the flow model continued. Development of modeled recharge zones and areas was initiated to accommodate flow from high-recharge areas. Other work developed code to select constant-head zones confined within aquifers. Those cells were identified and added to 3-D visualizations. Particles were tracked from current model runs based on layers and parameter names to help exhibit the effect of constant heads on the flow model. A newly developed visualization tool permitted inspection of simulated ground-water flow paths with 3-D cross sections and other HFM components.

Generic predictions and evaluation options were developed for individual flow-model simulations that will be incorporated into predictive modeling tools. Work began on evaluation of applicability of algebraic flow-model response functions, which could allow easy determination of the hydrologic impact of a suite of imposed stresses (such as ground-water pumping, increased recharge, and others), in place of a more difficult-to-use fully functional 3-D hydrogeologic ground-water flow model.

Work in Site-scale hydrochemistry again continued. All equipment, which could be obtained before finalization of well-head design is complete, was purchased. Additional equipment may be needed after BSC completes testing design.

UNSATURATED-ZONE STUDIES

In the deferred-work category, alcove moisture monitoring concluded the Alcoves #3 and #4 data package, and that package was sent to the TDMS on January 17. The Alcove #7 data package moved through technical review. Discrepancies between instrument manufacturers claims and the calibration-certificate documentation resulted in delays in the checker process. Appropriate clarifications were made, and the Alcove #7 package was sent to the USGS Data Management group for submission to the TDMS, which is anticipated in February.

The infiltration experiment in Alcove #8/Niche #3 continued. Water application to the large plot continued, with weekly visits by staff to confirm function. Water application

has slowed down, perhaps related to boundary conditions, to degree of wet-up, or other relation. Water application occurred at a much slower rate than used in the trench experiment, perhaps indicating that the large-plot configuration does not benefit from fault transfer as did the trench. Mold problems continued in Alcove #8, with required use of Tyvex suits and protective equipment behind the bulkhead. Sampling continued. Tracers have been chosen for use in the large-plot experiment. Six tracers will be applied in pairs to three zones in the plot. (Zone #1 is made up of plots 1 and 2; zone #2 is made up of plots 3, 4, 5, 6, 7, 8, and 9; and zone #3 is made up of plots 10, 11, and 12.) Middle to late February is the expected start date, and tracer application will be manual. Of several data packages related to the trench work, two saturated-condition data packages are complete and in the data base. The unsaturated-condition package remained in review at this writing.

In related developments, although the trench continued to drain, tensiometer data are no longer collected, and pressure transducers have been removed for calibration. Evaporation data and HDP data will be collected from the trench. Routine data transfer from the TCO occurred, and those data were processed. A self-assessment conducted on the steps involved with that data transfer found room for improvement, and implementations of those adjustments were recorded in scientific notebook SN-120-v8.

Bulkhead moisture monitoring continued. In the deferred category, on-going data preparation and collection continued of temperature and relative humidity (TRH), barometric pressure, and wind-speed data. Video data have been sent for review, with that process still incomplete. The opening of bulkheads and retrieval of instruments for closing calibrations was scheduled for 60 to 90 days after the unventilated entry of February 4. The deepest (farthest from the portal) two bulkheads have not been opened, and moisture monitoring has continued. A fire (later determined to be electrical in origin) required that the bulkhead at Station 22+10 be opened for entry of the Mine Rescue Team and associated mine-safety personnel. The planned and anticipated bulkhead opening on January 13 to install and replace equipment did not occur due to safety concerns and stand-down of most electrical work. Personnel from the USGS and LBNL prepared to make observations and to switch out equipment which required calibration. Bulkhead moisture-monitoring equipment received maintenance work. Routine receipt of data from the TCO occurred, and those data were processed. Biweekly camera monitoring continued, and appropriate entries were made in scientific notebook SN-133-v2.

Characterization testing of core and lithophysal material continued (in the deferred category). Samples were received from the SMF and from Sandia, and the material was evaluated for sampling. Sample materials were photographed to illustrate spot and rim attributes. After photography of the material, actual samples were taken using a rock saw to remove spot and rim material from the groundmass. A rock saw also removed matrix/groundmass samples from specimens. Hydrologic properties were measured, making use of a newly opened scientific notebook.

Work on characterization of the chemical and isotopic composition of pore water continued. Water was extracted from four intervals of ThermK (thermal conductivity)

borehole cores for chemical analysis with emphasis on organic constituents. Those analyses have begun, and preliminary data indicate carboxylic acid content at less than 10 mg/L, perhaps indicating that previously analyzed samples with high organic-acid content are an artifact of the method of preservation. Further analyses are pending. Preparation of final data packages, expected to be submitted next month, was initiated, in other isotopic support for thermal testing.

In unscheduled isotopic work, two samples of water collected from plastic sheeting installed in the ECRB Cross Drift behind the first bulkhead were analyzed. Results of the analyses are not yet finalized, but both samples have chemical characteristics which distinguish them from ambient pore water.

Isotopic work in U-series delineation of UZ flow zones continued. Processing of data packages containing bulk-rock U-series determinations was completed. Those packages were sent to the TDMS/RPC on January 29, in completion of milestone **PAGSZ206M4 [U Isotopes and Th Studies Data to TDMS/RPC]**.

Several analytical targets were defined for U-series disequilibrium studies. Those include drill-core samples from borehole USW SD-9 that previously have had pore water extracted and analyzed, including $^{234}\text{U}/^{238}\text{U}$ analyses. Up to 27 intervals are available for depths ranging from 58 to 1800 feet. Samples will be examined to avoid secondary minerals and processed to obtain powders for ^{234}U - ^{238}U - ^{230}Th - ^{232}Th isotope analyses. Those samples will help evaluate whether correlations exist between depth and U-series disequilibrium in a one-dimensional vertical profile. In addition, several faults have been targeted for sampling in the ESF and ECRB tunnels including the Solitario Canyon fault, the Ghost Dance fault, the Drill Hole Wash fault, and several faults in the shallow parts of the South Ramp. Sampling will allow further evaluation of the role of faults in focusing UZ flow at various localities. Arrangements have been made for a site visit to collect samples when the Cross Drift is open and ventilated in February or March.

Work also began on determination of microclimate records in fracture minerals. Experiments designed to improve mechanical microsampling of thin layers of opal were initiated. Although in-situ microdigestions were successful in the past, measuring the amounts of material removed was difficult, yet critical to determining growth rates. Mechanical manipulation of subsamples may allow additional control on sampling depths. No results are available at this time.

Examination of physical and geochemical characteristics of ESF dust continued. A new report described FY2001 and FY2002 dust collections and analysis. That report, entitled *Geochemistry of dust in the Exploratory Studies Facility, Yucca Mountain, Nevada*, was reviewed, revised, approved by the Director of the U.S. Geological Survey, and submitted and accepted by the American Nuclear Society for presentation and publication at the 10th International High-Level Radioactive Waste Management Conference in Las Vegas in late March 2003. In unscheduled work, staff assisted BSC in preparation of materials for presentation to the Nuclear Waste Technical Review Board (NWTRB) on January 28.

Efforts to validate previously collected chlorine-36 (^{36}Cl) data also continued. The Project has decided to bring in another technical team to attempt to validate the ^{36}Cl results. That team, however, has not been identified. The USGS is to continue planned work to complete the report which will synthesize all of the validation work. The Lawrence Livermore National Laboratory currently is working on submittal of their relevant data to the TDMS, with completion of those submittals expected by early March. USGS staff has begun researching TDMS materials in preparation for compilation of that final report.

WATER-RESOURCES MONITORING

Ground-water levels were measured at 34 sites, and ground-water discharge was measured at one flowing well. Ground-water and spring-discharge data collected during December were checked and filed. Electric tapes were calibrated, based on concurrent steel- and electric-tape measurements, using the UNLV Harry Reed Center's steel reference tapes. Steel tapes were calibrated with a USGS steel reference tape. Preparation of the data package for calendar-year 2002 continued. A letter report describing preliminary results of water-level and spring-flow monitoring during the first quarter of FY2003 was written for the TPO, completing milestone **PAGSW260M4 [Letter Report: 1st Qtr FY03 Water-Level Monitoring]** on January 31.

USGS Milestone Report
October 1, 2002 - January 31, 2003
Sorted by Baseline Date

Level: 4

Deliverable	Due Date	Expected Date	Completed Date
PAGSW932M4 Supplemental Fracture Data to TDB/RPC	10/25/2002	11/1/2002	11/1/2002
PAGSW258M4 Letter Report: 4th Qtr FY02	10/31/2002	10/31/2002	10/31/2002
PAGSM930M4 USGS Dir. Approval of Map of S. Expansion Area	11/8/2002	3/14/2003	
PAGSW930M4 Phase II Lithophysal Data to TDMS/RPC	11/15/2002	1/31/2003	1/31/2003
PAGSW931M4 Phase I Lithophysal Data to TDB/RPC	11/15/2002	1/31/2003	1/31/2003
PAGSM935M4 S. Expansion Area Data to TDMS/RPC	11/26/2002	3/28/2003	
PAGSZ132M4 Interpretive Rpt on Opal Geochronology	12/13/2002	12/13/2002	12/13/2002
PAGSZ651M4 Interpretive Rpt on Initial U-series Data	12/13/2002	12/13/2002	12/13/2002
PAGSM920M4 Phase 3 Lithologies Data Pkg to TDMS/RPC	12/17/2002	2/14/2003	
PAGSZ303M4 Final Report to Customer & TDMS	12/27/2002	6/11/2003	
PAGSW530M4 Rock Mech (Direct Shear) Data to TDMS/RPC	1/10/2003	3/7/2003	
PAGSW260M4 Letter Report: 1st Qtr FY03	1/31/2003	1/31/2003	1/31/2003
PAGSW604M4 Fract & Lithophysal Char Prelim Data to TDMS/RPC	1/31/2003	2/20/2003	

USGS Milestone Report
October 1, 2002 - January 31, 2003
Sorted by Baseline Date

Level: 5

Deliverable	Due Date	Expected Date	Completed Date
PAGSM37EM5 Mtg Summary to TPO	10/31/2002	10/25/2002	10/25/2002
PAGSM37FM5 Mtg Summary to TPO	11/29/2002	11/29/2002	11/29/2002
PAGSM30AM5 Intro Chap Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
PAGSM32CM5 Intro Chapters Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
PAGSM32EM5 Mid-Year Progress HFM Discretization	12/31/2002	12/19/2002	12/19/2002
PAGSM32GM5 Prg Rpt - Updates Based on Hydrgeo Parameteriztn	12/31/2002	12/19/2002	12/19/2002
PAGSM34CM5 Intro Chapters Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
PAGSM373M5 Annotated Outline of Report to TPO	12/31/2002	12/18/2002	12/18/2002
PAGSM37GM5 Mtg Summary to TPO	12/31/2002	12/20/2002	12/20/2002
PAGSM32AM5 Progress HFM Updates - Transient Model	1/31/2003	1/31/2003	1/31/2003
PAGSM37HM5 Mtg Summary to TPO	1/31/2003	2/7/2003	

USGS Milestone Report
October 1, 2002 - January 31, 2003
Sorted by Baseline Date

Level: D

Deliverable	Due Date	Expected Date	Completed Date
PAGSC2040D Training Cost Information Annual Update	12/19/2002	12/12/2002	12/12/2002

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
 Date Prepared 2/13/2003 07 35 AM

Fiscal Month/Year January 31, 2003
Page 1 of 1

CURRENT MONTH END

FISCAL YEAR

WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCONTRACT HOURS	PURCHASE COMMITMENTS	SUBCONTRACT COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1 5 01.1	2	0	56	0	166	0	175	0	3
1 5 02 2	407	3205	1978	0	808	0	4582	0	1480
1 5 04 6	490	5076	2523	0	816	0	8665	0	1789
	899	8281	4557	0	1790	0	13422	0	3272

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ESTIMATED COSTS FOR October 1, 2002 - January 31, 2003

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	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
4568-9U015 USGS Data Verification	00	00	10	21	00	00	00	00	00	00	00	00	306
DTAG01 USGS Data Verification	00	00	10	21	00	00	00	00	00	00	00	00	306
1.5 01.1.2.0 Data Verification	00	00	10	21	00	00	00	00	00	00	00	00	306
1.5 01.1	00	00	10	21	00	00	00	00	00	00	00	00	306
1.5 01	00	00	10	21	00	00	00	00	00	00	00	00	306
4568-9U048 Cross-hole Hydraulic & Tracer Testing AT	27.4	27.2	187	14.6	00	00	00	00	00	00	00	00	87.96
4568-9U049 Nye County EWDP Borehole Lithostratigr	12.3	10.2	1.1	17.9	00	00	00	00	00	00	00	00	41.64
4568-9U051 Deferred - Lithostratigraphic Support to N	00	00	18.6	4.2	00	00	00	00	00	00	00	00	22.80
4568-9U052 Deferred - X-Hole Hydraulic & Tracer Tstg	00	00	14.6	7.1	00	00	00	00	00	00	00	00	21.69
4568-9U053 Deferred - Map Proposed Repository Exp	00	00	00	00	00	00	00	00	00	00	00	00	00.00
ASZG01 USGS SZ Investigations	39.8	37.5	53.1	43.7	00	00	00	00	00	00	00	00	174.09
4568-9U082 Isotopic/Hydrochemical Support to the AT	00	4.1	00	0.2	00	00	00	00	00	00	00	00	4.32
4568-9U083 Hydrochronology of the Yucca Mountain	00	00	00	00	00	00	00	00	00	00	00	00	00.01
4568-9U084 Site-Scale Hydrochemistry	19.4	-0.1	15.8	15.0	00	00	00	00	00	00	00	00	50.12
4568-9U092 Isotope/Hydrochemical Support to Nye C	7.7	23.9	-1.4	6.4	00	00	00	00	00	00	00	00	36.68
ASZG02 USGS SZ Isotope Hydrology	27.1	28.0	14.4	21.6	00	00	00	00	00	00	00	00	91.12
1.5.02.2.3 Saturated Zone	66.9	65.5	67.5	65.3	00	00	00	00	00	00	00	00	265.22
4568-9U050 Alcove 7/X-Drift Instrument Strains	7.8	5.5	3.9	20.4	00	00	00	00	00	00	00	00	37.68
4568-9U063 Alcove 8/Niche 3 Infiltration	25.9	22.1	29.9	21.4	00	00	00	00	00	00	00	00	99.33
4568-9U064 Moisture Monitoring ESF & X-Drift	19.2	14.7	13.3	20.8	00	00	00	00	00	00	00	00	68.11
4568-9U065 Bulkhead Moisture Monitoring	8.2	7.7	21.4	17.6	00	00	00	00	00	00	00	00	54.82
4568-9U066 Support to UZ In-Situ Processes AMR	7.3	7.7	2.6	5.0	00	00	00	00	00	00	00	00	22.60
AUZG01 USGS UZ Moisture Studies	68.4	57.6	71.2	85.3	00	00	00	00	00	00	00	00	282.55
4568-9U085 U-Series Delineation of UZ Flow Zones	26.8	5.8	20.1	17.3	00	00	00	00	00	00	00	00	69.95
4568-9U086 Complete Chlorine 36 Validation	5.0	13.8	11.8	9.9	00	00	00	00	00	00	00	00	40.50
4568-9U087 Chemical & Isotopic Composition of Pore	30.4	38.0	52.2	32.4	00	00	00	00	00	00	00	00	152.93
4568-9U088 ECRB H2O, H2O Vapor & Gas Chemistry	00	4.6	1.6	0.3	00	00	00	00	00	00	00	00	6.56
4568-9U089 Microclimate Records in Fracture Mineral	13.9	17.0	13.3	16.6	00	00	00	00	00	00	00	00	60.72
AUZG02 USGS UZ Isotope Hydrology	75.9	79.2	99.0	76.6	00	00	00	00	00	00	00	00	330.65

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ESTIMATED COSTS FOR October 1, 2002 - January 31, 2003

2/13/2003 7:35:17 AM

	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
4568-9U090 Isotope Support for Thermal Testing	7.9	12.9	18.7	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.45
AUZG03 USGS Drift-Scale Test ESF	7.9	12.9	18.7	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.45
1.5.02.2.3 Unsaturated Zone	152.2	149.7	188.9	190.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	681.66
4568-9U004 USGS Support to Site Description	7.3	8.0	17.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.19
ANSG01 USGS Support to Site Description	7.3	8.0	17.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.19
1.5.02.2.3 Natural Systems	7.3	8.0	17.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.19
4568-9U091 Geochem/Physical Characterization of E	2.1	2.8	1.8	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.63
AEBG01 USGS Effects of Water-Rock Interactio	2.1	2.8	1.8	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.63
4568-9U067 Quantify Lithophysal Porosity - In Situ Te	8.1	7.5	5.4	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.13
4568-9U070 Deferred - Core & Lithophysae Char Tstg	0.0	0.1	0.9	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.10
AEBG02 USGS Nevada Operations Support to E	8.1	7.6	6.3	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.23
4568-9U068 Rock Mechanics Testing in the ECRB (U	91.5	53.5	28.2	46.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	219.64
4568-9U069 Fracture & Lithophysal Characteristics of	43.7	53.1	48.7	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	226.92
4568-9U071 Deferred - QAS & Checking Support USB	0.0	0.0	2.1	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.75
AEBG03 USBR Testing Activities in Support of D	135.2	106.5	79.1	131.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	452.31
1.5.02.2.4 Engineered Barrier System	145.4	116.9	87.2	149.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	499.18
1 5 02.2	371.8	340.2	361.4	406.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,480.25
1.5 02	371.8	340.2	361.4	406.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,480.25
4568-9U001 Science Advisors	41.0	37.7	36.8	42.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	157.65
4568-9U010 Publications	19.2	34.2	3.9	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.60
4568-9U040 Tectonics	21.5	10.3	1.7	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.11
4568-9U041 Water Levels	3.4	0.0	4.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.01
4568-9U042 Geophysics	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.42
4568-9U060 Mapping Expertise (USBR)	14.6	8.0	4.5	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.28
4568-9U081 Geochemistry	11.7	11.5	11.2	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.85
819Y01 USGS Technical Advisory Capability	111.4	102.2	62.8	76.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	352.92
4568-9U002 Br Chief, Asst Br Chief, Deputy TPO, Tea	38.5	63.0	53.9	68.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	223.47
819Y11 USGS Branch Management	38.5	63.0	53.9	68.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	223.47

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	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
4568-9U011 Reports Specialists	18.0	18.5	18.5	20.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	75.03
4568-9U012 Data Management	49.3	30.9	31.3	35.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	146.87
4568-9U013 Records Support	22.2	2.8	4.5	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.14
4568-9U014 QAS Support	7.0	6.4	7.3	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.32
819Y12 USGS Data, Records & Reports	96.5	58.6	61.6	73.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	290.36
4568-9U021 Administrative Support & Personnel Serv	33.2	34.8	34.1	67.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	169.62
4568-9U022 Facilities Management	0.0	0.0	0.2	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.03
819Y13 USGS Administration & Facilities	33.2	34.8	34.3	78.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	180.66
4568-9U023 Training	15.8	17.2	25.4	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.81
819Y14 USGS Training	15.8	17.2	25.4	18.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.81
4568-9U024 Computer/Network Support	26.4	25.5	23.6	27.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.74
819Y15 USGS Computer/Network Support	26.4	25.5	23.6	27.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.74
4568-9U025 Property Management	24.1	20.5	27.0	23.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	94.98
819Y16 USGS Property Management	24.1	20.5	27.0	23.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	94.98
4568-9U003 Planning & Project Control	27.4	23.4	32.8	33.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	116.72
819Y21 USGS Planning & Project Control	27.4	23.4	32.8	33.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	116.72
4568-9U030 Regulatory Compliance Support	40.8	40.4	30.3	44.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	156.29
819Y31 USGS Regulatory Compliance Support	40.8	40.4	30.3	44.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	156.29
4568-9U061 Water Resources Monitoring	16.8	32.5	26.7	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.35
819Y41 USGS Water Resources Monitoring	16.8	32.5	26.7	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.35
4568-9U062 Safety	9.1	9.4	9.3	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.02
819Y51 USGS Safety	9.1	9.4	9.3	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.02
4568-9U043 Hydrogeologic Data Integration	13.4	12.2	-2.6	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.96
4568-9U044 3D Hydrogeologic Model Development	1.2	0.5	0.5	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.58
4568-9U045 Flow Model Calibration and Evaluation	3.9	8.1	6.6	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.23
4568-9U046 DVRFS Knowledge Exchange Protocol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
4568-9U047 DVRFS Predictive Capability	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00

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	OCT EST	NOV EST	DEC EST	JAN EST	FEB EST	MAR EST	APR EST	MAY EST	JUN EST	JUL EST	AUG EST	SEP EST	TOTAL
819Y61 USGS Death Valley Regional Flow Mod	18.5	20.7	4.5	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.77
1.5.04.6.3.0 DOE Technical Support Services	458.5	448.3	392.1	490.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,789.10
1.5.04.6	458.5	448.3	392.1	490.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,789.10
1.5.04	458.5	448.3	392.1	490.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,789.10
1.5	830.3	788.5	754.5	899.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,272.41
1.5 OPERATING	830.3	788.5	754.5	899.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,272.41
CAPITAL EQUIPMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GRAND TOTAL	830.3	788.5	754.5	899.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,272.41
FTEs													
FEDERAL	61.0	77.0	50.2	52.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CONTRACT	34.7	26.8	27.1	29.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
TOTAL	95.7	103.8	77.3	81.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	