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# United States Department of the Interior

U. S. GEOLOGICAL SURVEY  
Box 25046 M.S. 421  
Denver Federal Center  
Denver, Colorado 80225

INFORMATION ONLY

August 13, 2003

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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, July, 2003

Attached is the USGS progress report in the required format for the month of July, 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**

July 2003

**GEOLOGICAL STUDIES**

Interpretations of borehole lithostratigraphy in Nye County early-warning drilling program (EWDP) drill holes NC-EWDP-16P, NC-EWDP-27P, and NC-EWDP-28P continued for inclusion in an upcoming data package. Because of severe hole deviations in that Phase IV drilling, additional calculations needed to be made to determine true vertical depths of contacts in those boreholes.

Mapping and related work continued on several fronts during July. The underground mapping team provided on-going mapping expertise to underground-construction and performance-confirmation groups, as well as discussion of mapping requirements for development of underground excavations at Yucca Mountain. Designers are assembling logistical plans for construction implementation and are trying to accommodate testing and mapping activities during perimeter and emplacement drift construction. In similar work, the mapping team continued to develop and refine borrow-pit investigations with BSC. Rock-mechanics testing in the ECRB Cross Drift also is ongoing. USBR-Denver lab staffers are compiling a status report for BSC in order to reach a decision on the duration of creep testing. Determination of fracture and lithophysal characteristics of the repository host horizon (RHH) continued during the month with several efforts. Analysis of fracture geometries and distributions is ongoing, as are elements of borehole analysis. Due to magnitude of informal review comments on the Drift Degradation Analysis Report, an interim change notice (ICN) for that report is being created. One aspect of concern is related to synthetic fracture geometries supplied to BSC from USGS/USBR. That ICN is expected to enter the checking process in August.

In other work, (old) milestone SPW712M5 [Data Package “Busted Butte General Geologic Notes Drawings for Mine Back Drift, Mine Back Access Drift, and Mine Backs 1 Through 8 (Drawings OA-46-353 Through OA-46-355)” to TDMS] was completed on July 29 with submittal of that data package.

Most effort to conduct in situ quantification of lithophysal porosity during July focused on redesign of Excel workbooks to enable data collection of feature-specific data or along linear traverses. Linear traverse and feature-specific data approaches each provide discrete values of location, size, and shape that are more versatile in use than the “increment-averaged” data collected for THERM-K boreholes 1 through 11. An Excel workbook was created for collecting fracture data and calculating 3-point solutions of the

orientations of fractures (producing values for strike and dip). Those fracture-specific data differ from the "increment counted" data collected for THERM-K boreholes 1 through 11. The Excel workbooks have been used in test cases, but they have not been used in THERM-K boreholes 12 through 19. Consequently, some modification of the workbooks might be needed to accommodate specific borehole conditions. No data collection was carried out during the month.

Comment resolution from technical reviews of the Deterministic Seismic Hazard Analysis (DSHA) is nearing completion. Required revisions have taken longer than anticipated, but completion is anticipated in August. As the DSHA is a carry-over item, there is no impact on other Project elements.

## **SATURATED-ZONE STUDIES**

Scheduled work to derive barometric efficiency from limited data from the Alluvial Test Complex (ATC) was interrupted temporarily by high-priority efforts directed toward revisions to the SZ In Situ Testing AMR. Also interrupted was compilation of related hydraulic-testing data packages. In another issue, note that active work to conduct hydraulic and tracer testing at the ATC had halted abruptly due to withdrawal of permits by the State of Nevada. With no indication of intent to alter that position, the Project-level decision was made to demobilize the ATC site and defer all planned hydraulic testing to (at least) FY2005. Demobilization took place in June 2003, and all equipment was removed. Nye County personnel took part in a final site inspection. A memo describing those actions represented completion on July 14 of milestone **PAGSM43PM4 [Memo to DOE Finalizing Close-out of ATC Work]**.

Several elements of work in Site-scale hydrochemistry continued. Analysis of water samples from well J-12 has begun, although results are not yet available. The related data package, however, is expected to be ready for checking in August. Equipment purchases and planned sampling of WT- and H- wells, along with subsequent analysis, were all cancelled as a result of the re-planning effort. In hydrochemical support to the Nye County EWDP, preparations are in place for the next sampling trip to Inyo and Nye Counties scheduled for early August.

Multiple efforts again continued in development of Death Valley regional flow-system (DVRFS) modeling, including work in integration of hydrogeologic data, development of the 3-D model and its geologic framework, development and calibration of the flow model, knowledge exchange, and development of model-visualization schemes. Work in hydrogeologic data integration included installation of new data-base software and loading of transient-model data into the data base. Staff continued development of management tools for spatial data bases supporting the flow model. Work on 3-D hydrogeologic model development focused on review and corrections to the hydrogeologic framework model (HFM). Thickness distributions of various units in the HFM were examined to identify any inconsistencies. Modeling identified inconsistencies in the Penoyer Valley which were corrected, and a new framework model was developed

incorporating updates to HFM units. Contributions to HFM report chapters were assembled, based on those updates, along with material for progress reports, including contributions based on compilation of hydraulic properties. Major recent changes resulting from progress in flow-model calibration included completion of a preliminary draft of the flow-modeling chapter (although without figures), improved parameter estimation performed on the vertical anisotropy in the transient model, simulation (and correction) of model hydraulic heads to be consistent with land surface(s) by adjustment of modeled hydraulic conductivity, and application (to volcanic units in the flow model) of a decrease in hydraulic conductivity with depth. That last correction improved starting hydraulic heads in the transient model. Parameter estimation in previous models had produced physically unreasonable values of vertical anisotropy, so incorporation of more detail in the flow model for both aquifers and confining units in the valley-fill geologic units improved success in estimation of vertical anisotropy. Updates and changes were communicated to the modeling team in the knowledge-exchange meeting held in Las Vegas July 15—16.

In additional work on flow-model calibration, hydrographs from major pumping areas and from a few specific areas with little pumping were selected for examination during the modeling process. Problems with the multi-node well package were identified—that package does not run properly with the newest version of the modeling code. Older code versions are being used to help determine appropriate corrections. Staff worked to reduce modeled residuals at wells near pumping centers. New characterizations for drains and pumping centers were implemented, and depth-decay options were explored. Updates were made to constant-head boundary conditions. Aquifer units were tested in various combinations of carbonate aquifer, or carbonate aquifer and lower volcanic units and sedimentary units. New model runs incorporated the multi-node well package using specific yield in the upper model layer for storage values. Flow-model visualization was improved with on-going modifications to the DVRFS post-processor to extract and visualize transient-model output from MODFLOW2000. Drafting of the hydrogeologic evaluation section of the final DVRFS model report continued. Work on GeoPro deliverable items continued in coordination with reVision, Inc., with progress demonstrated to the Death Valley modeling and management team in Las Vegas on July 16. Completed tasks included installation of SQL Server and GeoPro version 2.0 in Tucson, upload of databases supporting the transient DVRFS flow model, and preliminary development of a full product demonstration.

Knowledge exchange remained an important element of DVRFS work. A summary of the July knowledge-exchange meeting—held in Las Vegas with the regional ground-water flow-modeling team and associated stakeholder and interested groups—was produced and delivered to the USGS National Nuclear Safety Administration (NNSA) program manager and to the YMPB TPO. Citations from parts of the transient-flow model report were reviewed; missing reference citations were added as appropriate. Compilation, writing, and editing of report chapters also continued.

Work on DVRFS predictive capabilities (by contractor Newfields, Inc.) reflected continuing efforts on development of the Dynamic Systems Model prototype using the

DVRFS model for predicting response to pumping. Development also continued by Newfields, Inc., of accompanying documentation.

## UNSATURATED-ZONE STUDIES

The infiltration experiment at Alcove #8/Niche #3 continued, and data were routinely received from the TCO and processed. As before, the data represent the amount of water applied to the large plot, along with temperature, relative humidity, and barometric pressure data for the bulkheaded alcove. Only heat-dissipation probe (HDP) data are being collected around the trench, along with evaporation data. Ten of the large-plot stations were removed from the data-download list; full-ponded conditions prior to tracer application will trigger return of those stations to the download list. In the large-plot experiment, water application continued on plots 2 and 12. At the end of July, USGS staff began to reassemble ten remaining permeameters for a return to full water application in the plots (anticipated for August) in order to reach steady-state flow conditions for a possible tracer release in Fall 2003. Observations from Niche #3 show that significant dry-out has occurred in Niche #3, possibly indicating that most of the water applied to plots 2 and 12 is not making it to the niche.

Moisture-monitoring efforts in the ESF and the open Cross Drift continued during the month. Routine monitoring operations continued. Most field activity supported ECRB bulkhead stations (see discussion below). Weekly data reception from the TCO continued, and those data were processed and placed in the respective spreadsheets for ESF, ECRB, and Alcove #7 information. Preparation of respective ESF moisture-monitoring and Cross-Drift moisture-monitoring data packages was delayed, awaiting completion of ECRB bulkhead and Alcove #8 priority work. In addition to unscheduled field work in support of bulkhead moisture monitoring, further unscheduled effort assisted the transfer of equipment out of the Site Maintenance Facility to a new building. Investigation of NCR issues successfully demonstrated that equipment with out-of-compliance closing calibrations had not caused data problems; additional investigations of similar sort continued.

Cessation of power behind the bulkheads in the ECRB Cross Drift continued to impact moisture monitoring in the bulkheaded areas. On July 7, a re-entry was conducted for observations. After five months with no power, conditions remained very wet in most of the bulkheaded areas. On July 8, all storage modules were removed, and the contained data were extracted. Several heat-dissipation-probe (HDP) station loggers were removed. Data are being collected at 8 of the instrumented 23 stations, as of July 22. Moisture-monitoring equipment is being maintained, although without power, the batteries eventually will drain and data collection will terminate. Bulkheaded moisture-monitoring data were received from the TCO and processed. A bulkhead re-entry to perform maintenance and/or replace bulkhead moisture-monitoring equipment remains on the schedule for August 18 to September 11, 2003. Work continued on the data summary for data collected from November 5, 2001, to May 15, 2003 in the bulkheaded ECRB Cross Drift.

Work in determination of chemical and isotopic composition of pore water continued in limited fashion. The centrifuge currently is fully utilized for thermal-test core samples, and extractions for ambient water investigations have ceased for the time being. Compilation of data is underway in preparation for the next data-package submittal.

In support to the Thermal Test work, extraction of water from the ChemSamp3 core continued to produce useful samples. Analysis of several water samples produced from the upper wetting front is underway. Moisture content appears to fall off abruptly about 50 ft into the borehole, in close agreement with predictions made by E. Sonnenthal (of LBNL). No samples of water have been collected recently from any zone in the Drift-scale Test hydrology boreholes, and consequently no Sr or U data have been collected. The Thermal Test team has again delayed the next-scheduled workshop.

In unscheduled work, the following abstracts were submitted for a special session to be held at the annual meeting of the Geological Society of America in Fall 2003:

“Geochemistry of pore water from the unsaturated zone at Yucca Mountain, Nevada,” by K. Scofield and T. Oliver; and

“Strontium isotopes in pore water and travel time in the unsaturated zone, Yucca Mountain, Nevada,” by B. Marshall and K. Futa.

Both abstracts are in the approval process. The second of the abstracts discusses the very consistent Sr isotopic ratios of both centrifuged water and water leachates of core, as well as possible travel-time implications of the data.

Work on aspects of determination of the hydrochronology of the Yucca Mountain flow system continued, but because the instruments cannot be retrieved due to closure of bulkheads, the data package will be submitted as a non-Q package in order to satisfy an FY2002 milestone. Available hydrochronological data have been integrated into the USGS data base.

Samples from lithostratigraphic units in borehole USW SD-9 were digested, processed and analyzed for  $^{234}\text{U}/^{238}\text{U}$  and  $^{230}\text{Th}/^{238}\text{U}$  ratios. Those data have not yet been reduced. Calibrations of U-series spikes, however, were completed, and details were submitted to the Records Center. The contract for a new multi-collector thermal ionization mass spectrometer has been awarded to the Thermo Finnigan company, and all related arrangements have been completed.

Other on-going isotopic work enhanced uranium-series (U-series) delineation of UZ flow zones and derived microclimate records from fracture minerals. Plans were made to collect O and C isotopic data by ion microprobe under contract at the University of California at Los Angeles laboratory. The contract for that analytical work, including QC sample plan, was reported last month and is expected to be finalized soon. Additional work involved measurement of micro-elevation profiles of blades of opal in preparation for U-series dating by sequential microdigestion. Multiple microdigestions have been completed and will be analyzed by in-house thermal ionization mass spectrometry. In

unscheduled work, revisions were completed to the final draft of a manuscript entitled "Improved spatial resolution for U-series dating of opal at Yucca Mountain, USA, using ion-probe and in-situ microdigestion," by J. Paces, L. Neymark, J.L. Wooden, and H.M. Persing. That manuscript, revised from the version representing an FY2003 milestone, will be published in the peer-reviewed technical journal *Geochimica et Cosmochimica Acta*.

Additional isotopic and chemical work continued in support of specific studies. As a result of work previously conducted in determining geochemical and physical characteristics of dust from the ESF, Peterman reviewed parts of the AMR entitled "Environment on the Surface of the Drip Shield and Waste Package Outer Barrier" [DI: ANL-EBS-MD-000001]. Peterman was assigned the sections concerned specifically with the geochemistry of dust, particularly water-soluble components. Other work involved the validation of Project chlorine-36 ( $^{36}\text{Cl}$ ) data. A draft of the  $^{36}\text{Cl}$  report was completed with the addition of an appendix in which LANL presents alternative interpretations. That report is now in checking review. Compliance checking is awaiting baseline qualification of data-acquisition software "Fudger." One USGS review has been completed by Dr. Tom Kotzer (University of Saskatchewan), with delivery of that review expected in early August.

## WATER-RESOURCES MONITORING

Ground-water levels at were measured at 34 sites, and ground-water discharge was measured at five springs and at one flowing well. Ground-water and spring-discharge data collected during June were checked and filed. Data review was conducted on ground-water levels and discharges collected and compiled for monitoring sites during April through June 2003. A subsequent letter report describing that data set was prepared and was delivered to DOE on July 31, 2003, in completion of milestone **PAGSW264M4 [Letter Report: 3rd Qtr FY03]**. In addition, USGS staff met with DOE for discussion of possible changes in the ground-water network for the next fiscal year.



**USGS Milestone Report**  
**October 1, 2002 July 31, 2003**  
Sorted by Baseline Date

**Level: 3**

<b>Deliverable</b>	<b>Due Date</b>	<b>Expected Date</b>	<b>Completed Date</b>
<b>PAGSC2040D</b> Training Cost Information Annual Update	12/19/2002	12/12/2002	12/12/2002
<b>PAGSC2050D</b> Annual Training Plan	6/30/2003	6/26/2003	6/26/2003
<b>PAGSC2060D</b> Annual Training Needs Assessment	6/30/2003	6/26/2003	6/26/2003

**USGS Milestone Report**  
**October 1, 2002 July 31, 2003**  
Sorted by Baseline Date

**Level: 4**

<b>Deliverable</b>	<b>Due Date</b>	<b>Expected Date</b>	<b>Completed Date</b>
<b>PAGSW932M4</b> Supplemental Fracture Data to TDB/RPC	10/25/2002	11/1/2002	11/1/2002
<b>PAGSW258M4</b> Letter Report: 4th Qtr FY02	10/31/2002	10/31/2002	10/31/2002
<b>PAGSM930M4</b> USGS Dir. Approval of Map of S. Expansion Area	11/8/2002	8/22/2003	
<b>PAGSW930M4</b> Phase II Lithophysal Data to TDMS/RPC	11/15/2002	1/31/2003	1/31/2003
<b>PAGSW931M4</b> Phase I Lithophysal Data to TDB/RPC	11/15/2002	1/31/2003	1/31/2003
<b>PAGSM935M4</b> S. Expansion Area Data to TDMS/RPC	11/26/2002	9/23/2003	
<b>PAGSZ132M4</b> Interpretive Rpt on Opal Geochronology	12/13/2002	12/13/2002	12/13/2002
<b>PAGSZ651M4</b> Interpretive Rpt on Initial U-series Data	12/13/2002	12/13/2002	12/13/2002
<b>PAGSM920M4</b> Phase 3 Lithologies Data Pkg to TDMS/RPC	12/17/2002	2/18/2003	2/18/2003
<b>PAGSZ303M4</b> Final Report to Customer & TDMS	12/27/2002	9/26/2003	
<b>PAGSW530M4</b> Rock Mech (Direct Shear) Data to TDMS/RPC	1/10/2003	6/13/2003	6/13/2003
<b>PAGSW260M4</b> Letter Report: 1st Qtr FY03	1/31/2003	1/31/2003	1/31/2003
<b>PAGSM925M4</b> Phase 3 X-sections DP to TDMS/RPC	2/21/2003	5/21/2003	5/21/2003
<b>PAGSW22M4</b> Fault Infiltration/Tracer Exp Data Pkg--TDMS/RPC	2/28/2003	3/14/2003	3/14/2003
<b>PAGSW937M4</b> Spot & Rim Hydrologic Prop DP - TDMS/RPC	3/31/2003	4/30/2003	4/30/2003
<b>PAGSW262M4</b> Letter Report: 2nd Qtr FY03	4/30/2003	4/30/2003	4/30/2003
<b>PAGSW605M4</b> Fract & Lithophysal Char Final Data to TDMS/RPC	5/30/2003	10/17/2003	
<b>PAGSW85M4</b> ESF Moisture Monitoring Data Pkg to TDMS/RPC	5/30/2003	3/1/2004	
<b>PAGSM203M4</b> Phase IV Lithostrat Data to TDMS/RPC	6/2/2003	9/30/2003	

**USGS Milestone Report**  
**October 1, 2002 July 31, 2003**  
Sorted by Baseline Date

**Level: 4**

<b>Deliverable</b>	<b>Due Date</b>	<b>Expected Date</b>	<b>Completed Date</b>
<b>PAGSM435M4</b> ATC Barometric Monitoring Data to TDMS/RPC	6/2/2003	10/15/2003	
<b>PAGSW26M4</b> Plot Infiltration/Tracer Exp Data Pkg - TDMS/RPC	6/30/2003	6/30/2003	6/30/2003
<b>PAGSW537M4</b> Rock Mechanics (Creep Test) Data to TDMS/RPC	7/8/2003	9/30/2003	
<b>PAGSW264M4</b> Letter Report: 3rd Qtr FY03	7/31/2003	7/31/2003	7/31/2003

**USGS Milestone Report**  
**October 1, 2002 July 31, 2003**  
Sorted by Baseline Date

**Level: 5**

<b>Deliverable</b>	<b>Due Date</b>	<b>Expected Date</b>	<b>Completed Date</b>
<b>PAGSM37EM5</b> Mtg Summary to TPO	10/31/2002	10/25/2002	10/25/2002
<b>PAGSM37FM5</b> Mtg Summary to TPO	11/29/2002	11/29/2002	11/29/2002
<b>PAGSM30AM5</b> Intro Chap Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
<b>PAGSM32CM5</b> Intro Chapters Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
<b>PAGSM32EM5</b> Mid-Year Progress HFM Discretization	12/31/2002	12/19/2002	12/19/2002
<b>PAGSM32GM5</b> Prg Rpt - Updates Based on Hydrgeo Parameteriztn	12/31/2002	12/19/2002	12/19/2002
<b>PAGSM34CM5</b> Intro Chapters Rpt Contribution to Rpt Editor	12/31/2002	12/20/2002	12/20/2002
<b>PAGSM373M5</b> Annotated Outline of Report to TPO	12/31/2002	12/18/2002	12/18/2002
<b>PAGSM37GM5</b> Mtg Summary to TPO	12/31/2002	12/20/2002	12/20/2002
<b>PAGSM32AM5</b> Progress HFM Updates - Transient Model	1/31/2003	1/31/2003	1/31/2003
<b>PAGSM37HM5</b> Mtg Summary to TPO	1/31/2003	2/7/2003	2/7/2003
<b>PAGSM30BM5</b> Update Hydrogeologic Data Integration Progress	2/28/2003	2/28/2003	2/28/2003
<b>PAGSM36AM5</b> Update on Predictive Capability Progress	2/28/2003	2/28/2003	2/28/2003
<b>PAGSM37AM5</b> Memo to TPO: Completion - Editing Intro Chapters	2/28/2003	2/28/2003	2/28/2003
<b>PAGSM37IM5</b> Mtg Summary to TPO	2/28/2003	2/28/2003	2/28/2003
<b>PAGSM32DM5</b> Report Contribution to Report Editor	3/31/2003	3/31/2003	3/31/2003
<b>PAGSM34AM5</b> Progress Report Flow Modeling	3/31/2003	3/31/2003	3/31/2003
<b>PAGSM37JM5</b> Mtg Summary to TPO	3/31/2003	3/31/2003	3/31/2003
<b>PAGSM202M5</b> Phase IV Lithostrat Data to USGS DMG	4/1/2003	9/19/2003	

**USGS Milestone Report**  
**October 1, 2002 July 31, 2003**  
 Sorted by Baseline Date

**Level: 5**

<b>Deliverable</b>	<b>Due Date</b>	<b>Expected Date</b>	<b>Completed Date</b>
<b>PAGSM434M5</b> ATC Barometric Monitoring Data to DMU	4/1/2003	8/13/2003	
<b>PAGSM37KM5</b> Mtg Summary to TPO	4/30/2003	4/30/2003	4/30/2003
<b>PAGSM37BM5</b> Memo to TPO: Completion - Editing HFM/Db Chap	5/30/2003	5/30/2003	5/30/2003
<b>PAGSM37LM5</b> Mtg Summary to TPO	5/30/2003	6/6/2003	6/6/2003
<b>PAGSM32BM5</b> Progress HFM Updates - Transient Model	6/30/2003	6/30/2003	6/30/2003
<b>PAGSM34DM5</b> Report Contribution to Report Editor	6/30/2003	6/30/2003	6/30/2003
<b>PAGSM37MM5</b> Mtg Summary to TPO	6/30/2003	6/30/2003	6/30/2003
<b>PAGSM32FM5</b> Year-End Progress HFM Discretization	7/31/2003	7/31/2003	7/31/2003
<b>PAGSM32HM5</b> Prg Rpt - Updates Based on Hydrgeo Parameteriztn	7/31/2003	7/31/2003	7/31/2003
<b>PAGSM37NM5</b> Mtg Summary to TPO	7/31/2003	7/31/2003	7/31/2003

**YMP PLANNING AND CONTROL SYSTEM (PACS)**

**MONTHLY COST/FTE REPORT**

Participant U.S. Geological Survey  
Date Prepared 8/13/2003 03:11 PM

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

<u>CURRENT MONTH END</u>							<u>FISCAL YEAR</u>		
WBS ELEMENT	ACTUAL COSTS	PARTICIPANT HOURS	SUBCONTRACT HOURS	PURCHASE COMMITMENTS	SUBCONTRACT COMMITMENTS	ACCRUED COSTS	APPROVED BUDGET	APPROVED FUNDS	CUMMULATIVE COSTS
1.5.01.01	494	2363	323	0	73	0	3444	0	2750
1.5.01.05	146	520	398	0	0	0	543	0	491
1.5.01.06	342	530	756	0	76	0	748	0	806
1.5.01.07	42	530	9	0	0	0	579	0	381
1.5.01.09	671	1375	1041	0	67	0	2326	0	2190
1.5.03.03	589	1732	1397	0	143	0	2077	0	2131
1.5.03.04	352	619	497	0	9	0	1975	0	1617
1.5.03.07	127	35	65	0	21	0	1430	0	1106
1.5.03.13	49	380	217	0	152	0	175	0	88
1.5.03.14	26	217	0	0	33	0	150	0	73
	2838	8301	4703	0	574	0	13447	0	11633

**U.S. GEOLOGICAL SURVEY**

**ESTIMATED COSTS FOR October 1, 2002 - July 31, 2003**

8/13/2003 3:11:49 PM

	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
4568-9U001 Science Advisors	41.0	37.7	36.8	42.2	42.0	46.8	39.6	32.6	42.3	44.5	0.0	0.0	405.45
4568-9U010 Publications	19.2	34.2	3.9	8.3	11.4	7.8	3.9	4.0	53.9	-14.3	0.0	0.0	132.31
4568-9U040 Tectonics	21.5	10.3	1.7	4.6	6.0	3.3	0.0	2.4	7.2	6.2	0.0	0.0	63.25
4568-9U041 Water Levels	3.4	0.0	4.7	0.9	2.8	3.0	6.5	0.1	4.0	3.2	0.0	0.0	28.54
4568-9U042 Geophysics	0.0	0.4	0.0	0.0	0.0	0.0	5.3	-1.5	0.0	0.4	0.0	0.0	4.69
4568-9U060 Mapping Expertise (USBR)	14.6	8.0	4.5	9.2	6.1	5.8	3.7	15.4	7.9	7.0	0.0	0.0	82.13
4568-9U081 Geochemistry	11.7	11.5	11.2	11.4	8.3	729.0	0.1	1.3	1.2	206.5	0.0	0.0	992.34
<b>819Y01 USGS Technical Advisory Capability</b>	<b>111.4</b>	<b>102.2</b>	<b>62.8</b>	<b>76.6</b>	<b>76.6</b>	<b>795.7</b>	<b>59.0</b>	<b>54.3</b>	<b>116.6</b>	<b>253.6</b>	<b>0.0</b>	<b>0.0</b>	<b>1,708.70</b>
4568-9U002 Br Chief, Asst Br Chief, Deputy TPO, Tea	38.5	63.0	53.9	68.1	91.7	91.2	44.2	27.7	36.6	89.9	0.0	0.0	604.74
<b>819Y11 USGS Branch Management</b>	<b>38.5</b>	<b>63.0</b>	<b>53.9</b>	<b>68.1</b>	<b>91.7</b>	<b>91.2</b>	<b>44.2</b>	<b>27.7</b>	<b>36.6</b>	<b>89.9</b>	<b>0.0</b>	<b>0.0</b>	<b>604.74</b>
4568-9U003 Planning & Project Control	27.4	23.4	32.8	33.1	24.0	31.1	42.5	28.9	42.7	47.1	0.0	0.0	332.90
<b>819Y21 USGS Planning &amp; Project Control</b>	<b>27.4</b>	<b>23.4</b>	<b>32.8</b>	<b>33.1</b>	<b>24.0</b>	<b>31.1</b>	<b>42.5</b>	<b>28.9</b>	<b>42.7</b>	<b>47.1</b>	<b>0.0</b>	<b>0.0</b>	<b>332.90</b>
<b>1.5.01.01 Project Support - Project Manageme</b>	<b>177.2</b>	<b>188.6</b>	<b>149.5</b>	<b>177.8</b>	<b>192.3</b>	<b>918.0</b>	<b>145.7</b>	<b>110.9</b>	<b>195.8</b>	<b>390.5</b>	<b>0.0</b>	<b>0.0</b>	<b>2,646.35</b>
<b>1.5.01</b>	<b>177.2</b>	<b>188.6</b>	<b>149.5</b>	<b>177.8</b>	<b>192.3</b>	<b>918.0</b>	<b>145.7</b>	<b>110.9</b>	<b>195.8</b>	<b>390.5</b>	<b>0.0</b>	<b>0.0</b>	<b>2,646.35</b>
4568-9U030 Regulatory Compliance Support	40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	42.3	0.0	0.0	386.73
<b>819Y31 USGS Regulatory Compliance Support</b>	<b>40.8</b>	<b>40.4</b>	<b>30.3</b>	<b>44.8</b>	<b>35.8</b>	<b>47.1</b>	<b>53.6</b>	<b>22.5</b>	<b>29.2</b>	<b>42.3</b>	<b>0.0</b>	<b>0.0</b>	<b>386.73</b>
<b>1.5.01.05 Project Support - Compliance Manag</b>	<b>40.8</b>	<b>40.4</b>	<b>30.3</b>	<b>44.8</b>	<b>35.8</b>	<b>47.1</b>	<b>53.6</b>	<b>22.5</b>	<b>29.2</b>	<b>42.3</b>	<b>0.0</b>	<b>0.0</b>	<b>386.73</b>
<b>1.5.01</b>	<b>40.8</b>	<b>40.4</b>	<b>30.3</b>	<b>44.8</b>	<b>35.8</b>	<b>47.1</b>	<b>53.6</b>	<b>22.5</b>	<b>29.2</b>	<b>42.3</b>	<b>0.0</b>	<b>0.0</b>	<b>386.73</b>
4568-9U024 Computer/Network Support	26.4	25.5	23.6	27.2	24.8	19.3	32.2	25.6	28.0	27.3	0.0	0.0	260.00
<b>819Y15 USGS Commputer/Network Support</b>	<b>26.4</b>	<b>25.5</b>	<b>23.6</b>	<b>27.2</b>	<b>24.8</b>	<b>19.3</b>	<b>32.2</b>	<b>25.6</b>	<b>28.0</b>	<b>27.3</b>	<b>0.0</b>	<b>0.0</b>	<b>260.00</b>
4568-9U025 Property Management	24.1	20.5	27.0	23.4	20.2	32.5	29.5	28.9	25.3	24.7	0.0	0.0	256.07
<b>819Y16 USGS Property Management</b>	<b>24.1</b>	<b>20.5</b>	<b>27.0</b>	<b>23.4</b>	<b>20.2</b>	<b>32.5</b>	<b>29.5</b>	<b>28.9</b>	<b>25.3</b>	<b>24.7</b>	<b>0.0</b>	<b>0.0</b>	<b>256.07</b>
<b>1.5.01.06 Project Support - Information Manag</b>	<b>50.6</b>	<b>46.0</b>	<b>50.6</b>	<b>50.6</b>	<b>44.9</b>	<b>51.8</b>	<b>61.7</b>	<b>54.5</b>	<b>53.4</b>	<b>52.0</b>	<b>0.0</b>	<b>0.0</b>	<b>516.07</b>
<b>1.5.01</b>	<b>50.6</b>	<b>46.0</b>	<b>50.6</b>	<b>50.6</b>	<b>44.9</b>	<b>51.8</b>	<b>61.7</b>	<b>54.5</b>	<b>53.4</b>	<b>52.0</b>	<b>0.0</b>	<b>0.0</b>	<b>516.07</b>
4568-9U061 Water Resources Monitoring	16.8	32.5	26.7	22.2	31.1	3.6	75.2	19.9	29.9	28.7	0.0	0.0	286.60
<b>819Y41 USGS Water Resources Monitoring</b>	<b>16.8</b>	<b>32.5</b>	<b>26.7</b>	<b>22.2</b>	<b>31.1</b>	<b>3.6</b>	<b>75.2</b>	<b>19.9</b>	<b>29.9</b>	<b>28.7</b>	<b>0.0</b>	<b>0.0</b>	<b>286.60</b>
4568-9U062 Safety	9.1	9.4	9.3	9.3	9.8	8.9	8.3	7.0	10.2	9.9	0.0	0.0	91.05

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819Y51 USGS Safety	9.1	9.4	9.3	9.3	9.8	8.9	8.3	7.0	10.2	9.9	0.0	0.0	91.05
1.5.01.07 Project Support - Environmental, Saf	25.9	41.9	35.9	31.5	40.9	12.4	83.5	26.9	40.1	38.6	0.0	0.0	377.64
1.5.01	25.9	41.9	35.9	31.5	40.9	12.4	83.5	26.9	40.1	38.6	0.0	0.0	377.64
4568-9U011 Reports Specialists	18.0	18.5	18.5	20.1	17.4	17.3	18.3	13.7	14.8	19.5	0.0	0.0	175.94
4568-9U012 Data Management	49.3	30.9	31.3	35.4	33.8	33.7	34.5	34.7	34.9	22.9	0.0	0.0	341.50
4568-9U013 Records Support	22.2	2.8	4.5	5.7	21.5	-9.1	6.1	7.0	7.1	4.5	0.0	0.0	72.17
4568-9U014 QAS Support	7.0	6.4	7.3	12.5	29.6	-21.7	6.4	6.6	0.2	-1.6	0.0	0.0	52.76
819Y12 USGS Data, Records & Reports	96.5	58.6	61.6	73.6	102.3	20.1	65.4	62.0	57.0	45.3	0.0	0.0	642.38
4568-9U021 Administrative Support & Personnel Servi	33.2	34.8	34.1	67.5	26.0	75.8	15.0	18.2	26.2	53.8	0.0	0.0	384.72
4568-9U022 Facilities Management	0.0	0.0	0.2	10.8	43.0	55.2	218.1	87.4	42.8	122.1	0.0	0.0	579.67
819Y13 USGS Administration & Facilities	33.2	34.8	34.3	78.3	69.0	131.0	233.1	105.6	69.0	175.9	0.0	0.0	964.39
4568-9U023 Training	15.8	17.2	25.4	18.5	6.9	13.7	15.8	12.4	8.3	7.1	0.0	0.0	140.95
819Y14 USGS Training	15.8	17.2	25.4	18.5	6.9	13.7	15.8	12.4	8.3	7.1	0.0	0.0	140.95
1.5.01.09 Project Support - General Project Ser	145.5	110.6	121.2	170.5	178.2	164.8	314.4	180.0	134.3	228.3	0.0	0.0	1,747.72
1.5.01	145.5	110.6	121.2	170.5	178.2	164.8	314.4	180.0	134.3	228.3	0.0	0.0	1,747.72
4568-9U050 Alcove 7/X-Drift Instrument Strains	7.8	5.5	3.9	20.4	7.7	0.2	3.8	2.2	4.7	-0.5	0.0	0.0	55.67
4568-9U063 Alcove 8/Niche 3 Infiltration	25.9	22.1	29.9	21.4	28.3	22.4	21.5	23.4	17.1	10.5	0.0	0.0	222.55
4568-9U064 Moisture Monitoring ESF & X-Drift	19.2	14.7	13.3	20.8	11.6	23.6	13.6	19.2	53.2	33.5	0.0	0.0	222.88
4568-9U065 Bulkhead Moisture Monitoring	8.2	7.7	21.4	17.6	14.9	32.4	-14.9	33.4	26.3	18.7	0.0	0.0	165.54
4568-9U066 Support to UZ In-Situ Processes AMR	7.3	7.7	2.6	5.0	-0.9	0.2	9.2	5.6	6.6	8.1	0.0	0.0	51.44
AUZG01 USGS UZ Moisture Studies	68.4	57.6	71.2	85.3	61.6	78.8	33.1	83.8	107.9	70.3	0.0	0.0	718.07
4568-9U085 U-Series Delineation of UZ Flow Zones	26.8	5.8	20.1	17.3	9.2	3.7	13.4	15.1	10.8	-13.9	0.0	0.0	108.26
4568-9U086 Complete Chlorine 36 Validation	5.0	13.8	11.8	9.9	24.3	10.9	13.0	28.7	19.7	-19.6	0.0	0.0	117.48
4568-9U087 Chemical & Isotopic Composition of Pore	30.4	38.0	52.2	32.4	25.3	23.6	36.4	16.1	21.9	-26.2	0.0	0.0	250.00
4568-9U088 ECRB H2O, H2O Vapor & Gas Chemistry	0.0	4.6	1.6	0.3	5.2	26.8	9.2	1.8	5.6	1.9	0.0	0.0	57.01
4568-9U089 Microclimate Records in Fracture Mineral	13.9	17.0	13.3	16.6	20.1	41.8	28.2	20.7	26.4	-51.4	0.0	0.0	146.40
AUZG02 USGS UZ Isotope Hydrology	75.9	79.2	99.0	76.6	83.9	106.8	100.2	82.4	84.4	-109.2	0.0	0.0	679.15
4568-9U090 Isotope Support for Thermal Testing	7.9	12.9	18.7	29.0	-2.5	12.5	16.5	6.4	4.5	-7.9	0.0	0.0	97.95



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<b>AUZG03</b> USGS Drift-Scale Test ESF	7.9	12.9	18.7	29.0	-2.5	12.5	16.5	6.4	4.5	-7.9	0.0	0.0	97.95
<b>1.5.03.03</b> Safety Analyses - Unsaturated Zone	152.2	149.7	188.9	190.9	143.1	198.1	149.8	172.6	196.8	-46.9	0.0	0.0	1,495.17
<b>1.5.03</b>	<b>152.2</b>	<b>149.7</b>	<b>188.9</b>	<b>190.9</b>	<b>143.1</b>	<b>198.1</b>	<b>149.8</b>	<b>172.6</b>	<b>196.8</b>	<b>-46.9</b>	<b>0.0</b>	<b>0.0</b>	<b>1,495.17</b>
4568-9U043 Hydrogeologic Data Integration	13.4	12.2	-2.6	4.0	3.5	114.0	-47.9	17.2	99.6	132.1	0.0	0.0	345.53
4568-9U044 3D Hydrogeologic Model Development	1.2	0.5	0.5	5.4	0.0	0.0	22.0	18.4	104.2	17.6	0.0	0.0	169.72
4568-9U045 Flow Model Calibration and Evaluation	3.9	8.1	6.6	5.7	8.8	47.8	6.6	8.4	24.0	25.2	0.0	0.0	145.03
4568-9U046 DVRFS Knowledge Exchange Protocol	0.0	0.0	0.0	0.0	0.0	0.0	37.0	23.3	9.6	-21.2	0.0	0.0	48.80
4568-9U047 DVRFS Predictive Capability	0.0	0.0	0.0	0.0	0.0	69.6	0.0	0.0	0.0	4.2	0.0	0.0	73.78
<b>819Y61</b> USGS Death Valley Regional Flow Mod	18.5	20.7	4.5	15.0	12.3	231.5	17.7	67.4	237.4	157.9	0.0	0.0	782.86
4568-9U048 Cross-hole Hydraulic & Tracer Testing AT	27.4	27.2	18.7	14.6	17.3	21.7	14.0	25.1	22.3	15.1	0.0	0.0	203.42
4568-9U049 Nye County EWDP Borehole Lithostratigr	12.3	10.2	1.1	17.9	10.0	10.6	16.0	7.9	10.9	-8.6	0.0	0.0	88.60
4568-9U051 Deferred - Lithostratigraphic Support to N	0.0	0.0	18.6	4.2	-1.5	0.0	1.3	1.2	0.1	-2.9	0.0	0.0	21.06
4568-9U052 Deferred - X-Hole Hydraulic & Tracer Tstg	0.0	0.0	14.6	7.1	13.0	8.8	8.7	2.6	8.1	9.1	0.0	0.0	71.93
4568-9U053 Deferred - Map Proposed Repository Exp	0.0	0.0	0.0	0.0	0.0	0.0	9.0	-0.4	7.5	9.6	0.0	0.0	25.68
4568-9U072 Support to Proposed Surface Workover T	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
<b>ASZG01</b> USGS SZ Investigations	39.8	37.5	53.1	43.7	38.8	41.1	49.0	36.5	48.9	22.3	0.0	0.0	410.69
4568-9U082 Isotopic/Hydrochemical Support to the AT	0.0	4.1	0.0	0.2	0.1	1.6	0.0	-1.2	1.2	3.1	0.0	0.0	9.06
4568-9U083 Hydrochronology of the Yucca Mountain	0.0	0.0	0.0	0.0	11.8	-1.3	0.6	0.1	0.8	-0.2	0.0	0.0	11.90
4568-9U084 Site-Scale Hydrochemistry	19.4	-0.1	15.8	15.0	6.3	13.5	47.1	25.2	19.8	27.3	0.0	0.0	189.44
4568-9U092 Isotope/Hydrochemical Support to Nye C	7.7	23.9	-1.4	6.4	17.1	-7.7	6.2	9.5	9.8	5.4	0.0	0.0	77.01
<b>ASZG02</b> USGS SZ Isotope Hydrology	27.1	28.0	14.4	21.6	35.4	6.1	53.9	33.6	31.7	35.6	0.0	0.0	287.40
<b>1.5.03.04</b> Safety Analyses - Saturated Zone Flo	85.4	86.3	72.0	80.3	86.5	278.7	120.7	137.5	318.0	215.8	0.0	0.0	1,480.95
<b>1.5.03</b>	<b>85.4</b>	<b>86.3</b>	<b>72.0</b>	<b>80.3</b>	<b>86.5</b>	<b>278.7</b>	<b>120.7</b>	<b>137.5</b>	<b>318.0</b>	<b>215.8</b>	<b>0.0</b>	<b>0.0</b>	<b>1,480.95</b>
4568-9U091 Geochem/Physical Characterization of E	2.1	2.8	1.8	3.8	1.5	38.4	4.1	2.7	0.4	1.2	0.0	0.0	58.88
<b>AEBG01</b> USGS Effects of Water-Rock Interactio	2.1	2.8	1.8	3.8	1.5	38.4	4.1	2.7	0.4	1.2	0.0	0.0	58.88
4568-9U067 Quantify Lithophysal Porosity - In Situ Te	8.1	7.5	5.4	8.2	-0.2	1.2	0.5	0.4	0.4	0.1	0.0	0.0	31.50
4568-9U070 Deferred - Core & Lithophysae Char Tstg	0.0	0.1	0.9	6.1	5.3	27.8	18.7	-2.8	-0.5	0.5	0.0	0.0	56.11
<b>AEBG02</b> USGS Nevada Operations Support to E	8.1	7.6	6.3	14.3	5.1	29.0	19.2	-2.5	-0.1	0.6	0.0	0.0	87.60

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4568-9U068 Rock Mechanics Testing in the ECRB (U	91.5	53.5	28.2	46.4	35.2	6.1	7.7	16.1	2.7	4.8	0.0	0.0	292.19
4568-9U069 Fracture & Lithophysal Characteristics of	43.7	53.1	48.7	81.5	65.1	31.0	45.3	99.9	72.2	34.2	0.0	0.0	574.65
4568-9U071 Deferred - QAS & Checking Support USB	0.0	0.0	2.1	3.6	0.2	0.0	0.0	0.0	0.7	-0.7	0.0	0.0	5.94
<b>AEBG03</b> USBR Testing Activities In Support of D	135.2	106.5	79.1	131.5	100.4	37.2	53.0	115.9	75.6	38.3	0.0	0.0	872.78
<b>1.5.03.07</b> Safety Analyses - EBS Performance	145.4	116.9	87.2	149.6	107.0	104.6	76.3	116.2	75.9	40.1	0.0	0.0	1,019.27
<b>1.5.03</b>	<b>145.4</b>	<b>116.9</b>	<b>87.2</b>	<b>149.6</b>	<b>107.0</b>	<b>104.6</b>	<b>76.3</b>	<b>116.2</b>	<b>75.9</b>	<b>40.1</b>	<b>0.0</b>	<b>0.0</b>	<b>1,019.27</b>
4568-9U016 USGS Data Verification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	14.9	19.9	0.0	0.0	45.73
<b>APAGD5</b> USGS Data Verification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	14.9	19.9	0.0	0.0	45.73
4568-9U015 USGS Data Verification	0.0	0.0	1.0	2.1	1.1	5.8	6.2	1.2	-4.0	3.2	0.0	0.0	16.51
<b>DTAG01</b> USGS Data Verification	0.0	0.0	1.0	2.1	1.1	5.8	6.2	1.2	-4.0	3.2	0.0	0.0	16.51
<b>1.5.03.13</b> Safety Analyses - Technical Data Ma	0.0	0.0	1.0	2.1	1.1	5.8	6.2	12.1	10.9	23.1	0.0	0.0	62.24
<b>1.5.03</b>	<b>0.0</b>	<b>0.0</b>	<b>1.0</b>	<b>2.1</b>	<b>1.1</b>	<b>5.8</b>	<b>6.2</b>	<b>12.1</b>	<b>10.9</b>	<b>23.1</b>	<b>0.0</b>	<b>0.0</b>	<b>62.24</b>
4568-9U004 USGS Support to Site Description	7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	14.7	0.0	0.0	61.62
4568-9U006 Support to LANL Cesium Study	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
<b>ANSG01</b> USGS Support to Site Description	7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	14.7	0.0	0.0	61.62
<b>1.5.03.14</b> Safety Analyses - Yucca Mountain Si	7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	14.7	0.0	0.0	61.62
<b>1.5.03</b>	<b>7.3</b>	<b>8.0</b>	<b>17.8</b>	<b>1.1</b>	<b>14.0</b>	<b>-1.9</b>	<b>-0.7</b>	<b>0.8</b>	<b>0.5</b>	<b>14.7</b>	<b>0.0</b>	<b>0.0</b>	<b>61.62</b>
<b>1.5</b>	<b>830.3</b>	<b>788.5</b>	<b>754.5</b>	<b>899.1</b>	<b>843.8</b>	<b>1,779.4</b>	<b>1,011.1</b>	<b>833.9</b>	<b>1,054.8</b>	<b>998.4</b>	<b>0.0</b>	<b>0.0</b>	<b>9,793.75</b>
<b>1.5 OPERATING</b>	<b>830.3</b>	<b>788.5</b>	<b>754.5</b>	<b>899.1</b>	<b>843.8</b>	<b>1,779.4</b>	<b>1,011.1</b>	<b>833.9</b>	<b>1,054.8</b>	<b>998.4</b>	<b>0.0</b>	<b>0.0</b>	<b>9,793.75</b>
<b>CAPITAL EQUIPMENT</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>GRAND TOTAL</b>	<b>830.3</b>	<b>788.5</b>	<b>754.5</b>	<b>899.1</b>	<b>843.8</b>	<b>1,779.4</b>	<b>1,011.1</b>	<b>833.9</b>	<b>1,054.8</b>	<b>998.4</b>	<b>0.0</b>	<b>0.0</b>	<b>9,793.75</b>
<b>FTEs</b>													
<b>FEDERAL</b>	<b>62.3</b>	<b>75.5</b>	<b>50.2</b>	<b>52.7</b>	<b>54.6</b>	<b>52.2</b>	<b>61.4</b>	<b>61.2</b>	<b>60.1</b>	<b>50.1</b>	<b>0.0</b>	<b>0.0</b>	
<b>CONTRACT</b>	<b>34.7</b>	<b>26.8</b>	<b>27.1</b>	<b>29.2</b>	<b>26.6</b>	<b>29.2</b>	<b>33.5</b>	<b>34.2</b>	<b>30.5</b>	<b>30.1</b>	<b>0.0</b>	<b>0.0</b>	
<b>TOTAL</b>	<b>97.0</b>	<b>102.4</b>	<b>77.3</b>	<b>81.9</b>	<b>81.2</b>	<b>81.5</b>	<b>94.8</b>	<b>95.3</b>	<b>90.5</b>	<b>80.2</b>	<b>0.0</b>	<b>0.0</b>	