United States Department of the Interior

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

IN REPLY REFER TO:

INFORMATION ONLY

October 10, 2003

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, September, 2003

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

September 2003

GEOLOGIC STUDIES

Geologic work in support of the Nye County early-warning drilling program (EWDP) continued. The data package entitled "Interpretation of the Lithostratigraphy in Deep Boreholes NC-EWDP-16P, NC-EWDP-27P, and NC-EWDP-28P, Nye County Early Warning Drilling Program, Phase IV A" was submitted for technical review. Those data represent the Yucca Mountain Project's initial examination and interpretation of subsurface lithostratigraphy near the southern part of Yucca Mountain. The data are intended for incorporation into cross sections and subsequent integration into hydrologic framework models.

Preparation of the geologic map of the potential southern repository-expansion area continued during September. The map received for USGS Director's approval in late September. Preparation of the package for data-management review and subsequent submittal to the TDMS has begun.

Geologic work also continued on fracture studies and on mechanical testing. Long-term creep testing continued on rock samples. Field work for fault-related fracture studies continued but is expected to be completed next month. In on-going statistical analysis of fractures, a discrete fracture network was developed to represent each of the litho-stratigraphic units of the repository host horizon (RHH). Analysis extracted fracture data from the full-periphery geologic maps of the Exploratory Studies Facility (ESF) and the ECRB (Enhanced Characterization of the Repository Block) Cross Drift. Addition of those data to the analysis will allow evaluation of the distribution of both fracture length and spacing. Fault data from the geologic framework model were received and will support work to account for effects and distribution of "mountain-scale" discontinuities.

Additional detailed fracture studies also continued. Mapping of fractures in slabs of core from RHH lithostratigraphic units continued. Samples from those slabs are being made into thin sections for polarizing microscope evaluation and confirmation of features identified macroscopically in the slabs. Several features associated with fractures help to determine if the fracture formed during cooling of the rock (at ~12.8 Ma), or at some time after the rock had cooled. For study of fractures that formed after the rock cooled, samples have been collected from near the tunnel wall and from the downhole end of boreholes to evaluate possible "drilling-induced" fracture formation. On-going

lithophysal mapping in the Cross Drift saw completion of eight angular traverses, with five in the upper lithophysal zone and three in the middle nonlithophysal zone, to document position and length of features (measured to the nearest 5 cm) along a line which crosses the drift, and to thereby quantify size and abundance of such features along the tunnel. Data collection in the tunnel has been completed for five panel maps in the upper lithophysal zone and in the middle nonlithophysal zone; electronic compilation of those maps continued. Panel maps document the position and shape of features (measured to the nearest 5 mm) in 1-m by 3-m areas on the left wall of the tunnel; again, size, shape, and abundance of features are quantified along the tunnel.

With the opening of the bulkhead at Station 22+01, inventory of large lithophysae (those with at least one axis greater than 0.5 m) continued in the lower lithophysal zone. That section of the tunnel has not been accessible since December 2001, so that inventory will enable contribution of large lithophysae to the calculated total porosity of the lower lithophysal zone in the Cross Drift. Requests for spatial surveys (northing, easting, elevation, and station) have been submitted for the large-lithophysae inventory, for targets used with the angular traverses and panel maps, and for the small-fracture detailed line surveys.

In unscheduled support to the revised Drift Degradation AMR and Subsurface Geotechnical Parameters Report, attachments to those reports were provided to describe methods of simulating lithophysal porosity from the ECRB Cross Drift in 50- by 200-m vertical cross sections. Those two-dimensional simulations of lithophysal porosity, and three-dimensional simulations created by constructing simulations every 5 m along the tunnel, are being used to evaluate rock strength near potential emplacement drifts.

Submittal of the revised deterministic seismic hazards assessment (DSHA) report currently is underway. The revised manuscript (technical review is complete) is under review by the YMPB Reports Specialist and subsequently will be submitted to USGS review. The lengthy period of preparation will have no impact on Program elements, as the work is not directly linked to other activity.

SATURATED-ZONE STUDIES

Processing and compilation of data packages derived from hydraulic cross-hole and tracer hydraulic testing at the Alluvial Testing Complex (ATC) continued for submittal to the TDMS/RPC. Similar work was carried out for data obtained from the ATC in monitoring of barometric pressure. Both sets of data and related data packages were completed in late September.

Highlights of work on modeling of the Death Valley regional flow system (DVRFS) during September included developmental work on the hydrogeologic framework model, the transient model, and supporting elements, as well as work on modeling-report chapters. Knowledge exchange among participants continued, as did developmental work on DVRFS predictive capabilities. Integration of hydrogeologic data continued,

with the focus on preparation, installation, and development of software for handling various aspects of data use and visualization. Staff worked with (contractor) reVision, Inc., to install and optimize GEOPRO, v. 2.0, as part of on-going improvements to the modeling-support infrastructure (which also contribute to DVRFS predictive capabilities). The GEOPRO package was demonstrated for USGS-YMPB and USGS Nevada Nuclear Security Administration (NNSA) technical program managers. The transient model, supporting data bases, and software tools were transferred to a server for use in Tucson, Arizona. Work also continued on development and management of spatial data bases supporting the flow model.

Hydrogeologic DVRFS model development continued in work on 3-D hydrogeologic framework-model (HFM) construction, with final edits accomplished on the geologic conceptual-model chapter for the modeling report. (Additional chapters likewise received final editing.) Also in the HFM arena, on-going HFM parameterization focused on contributions to modeling-report chapters based on hydraulic properties.

Flow-model calibration and evaluation continued as well. Staff accomplished review and revision of flow-model contributions to the transient-flow modeling report. A draft of that chapter was completed and submitted to the report editor for colleague review. Flow-model calibration was finalized. Flow-model evaluation discovered problems with accounting budgets (as related to model operation, *not* to finances) and with unreasonable storage terms in transient-model runs. Model code was updated to improve precision, and errors were corrected. Important changes to the flow-model report chapter included revision of the upper model boundary to be consistent with the modeled water table by incorporation of inactive cells into the top layer of the model to account for differences between the simulated and estimated water table. Model runs were updated with inactive cells where the simulated water levels were more than 15 m below the base of model cells. A suite of model runs, including forward runs and calculation of model-parameter sensitivity to observations, was conducted to obtain model-evaluation statistics for the draft flow-model chapter. Additional work focused on preparation of illustrations for that report, and on-going participation in the knowledge-exchange process continued during September.

A milestone accomplishment from August 2003 was incompletely reported. The Death Valley regional modeling team completed assembly and preliminary manuscript editing of the DVRFS modeling chapter of the Death Valley regional flow-system report. That accomplishment satisfied milestone PAGSM37CM5 [Memorandum to TPO: Completed Editing Flow Modeling Chapter] on August 29, but that milestone citation unintentionally was deleted from the August summary report.

Once again, knowledge exchange took an important role. Preparations related to the September knowledge-exchange meeting (held in San Diego) included construction of agendas and summaries of meeting topics and material. The overall knowledge-exchange summary was compiled for the USGS-YMPB TPO and for the NNSA program manager. Tabulated data were edited for appendix 1 of the DVRFS model report. Chapters of the modeling report also were edited, and all six finalized chapters were submitted to the

YMPB Publications Specialist for colleague review. (Chapters were sent out to reviewers on September 30.)

UNSATURATED-ZONE STUDIES

Moisture monitoring in the ESF and in the ECRB Cross Drift continued, mostly with work on accumulated data. Preparation of the ESF and Cross-Drift moisture-monitoring data package continued. Responses were compiled for the completed checking process. Spreadsheets were updated with preliminary data. Monitoring station TRH03 was shut down. Preparation of ESF and Cross-Drift moisture-monitoring data-package elements was delayed by temporary assignment of personnel to the ECRB bulkhead re-entry effort.

Bulkhead moisture monitoring saw opening of bulkheads on September 8, 2003, with staff access behind those bulkheads allowed on September 16. Data temporarily are not being collected at most stations as the instrumentation is being replaced. Equipment was removed for closing calibrations. Installation of new instrumentation is underway and expected to be completed by early October. Maintenance work on bulkhead moisture-monitoring equipment continued; new batteries are being installed to keep that equipment operational for a year. Bulkhead moisture-monitoring data were received from the TCO and processed. Assembly of the related moisture-monitoring data package, including compilation of the data summary for RTD/HDP (resistance temperature device/heat-dissipation probe) data acquired in the bulkheaded ECRB Cross Drift from November 2001 to May 2003, will resume after work behind the bulkheads is finished (with completion anticipated for November).

In on-going investigation of the chemical and isotopic composition of pore water, a preliminary data package for extracted pore water was compiled and currently is in the checking process, with completion expected soon. Extraction of pore water and analysis of additional samples of core from borehole USW SD-9 continued, in efforts to obtain a more complete set of analyses taken from the surface to the proposed repository horizon.

In continued isotopic support for thermal testing, staff prepared a short presentation on chemistry and moisture contents of core samples from borehole CHEMSAMP3. Based on preliminary data obtained on both CHEMSAMP1 and CHEMSAMP3, there is an increase in the nitrate/chloride ratios in pore-water and condensate mixtures compared to the ambient pore water. Because of the importance of those chemical constituents to waste-package corrosion pathways, additional analyses and/or modeling may be required to understand fully the distribution and origin of that water. The water composition, the analyses, and potential implications will be a topic for discussion at the next thermal test workshop (scheduled for October).

Isotopic chemistry also supported delineation of unsaturated-zone flow zones using U-series studies. Additional analyses of whole-rock samples from various lithostratigraphic units in borehole USW SD-9 were digested and processed for U and Th chemistry, then analyzed by thermal ionization mass spectrometry. Reduction of raw SD-9 whole-rock

data was initiated in September, using standard data corrections. All data acquired in FY2003 will be reduced and compiled over the next several weeks. Those data will be used to evaluate variations in radioactive disequilibrium and associated water/rock interaction with depth in the repository block. Although a new Thermo Triton solid-source mass spectrometer was delivered to the YMPB Environmental Sciences Team laboratory, installation awaits completion of electrical service and scheduling of a Thermo engineer to perform the installation.

Other isotopic work utilized the University of California at Los Angeles CAMECA ion microprobe to collect oxygen isotope data. Traverses across late calcite in three different samples were made in an attempt to define patterns of variation that could be associated with variations in Pleistocene climate. Raw data have not been reduced and compiled. Additional analyses by microdigestion of an opaline sample previously analyzed in August were made to investigate the pattern of ages older than 140 ka. A series of microdigestions on a second opal sample were also performed. Data from that analysis have not yet been reduced. Isotopic data collected on secondary minerals during FY2003 were reviewed, and data-package compilations began.

In unscheduled work, access to the Solitario Canyon fault behind bulkheads in the ECRB Cross Drift became available when the bulkhead doors were opened in September. A suite of samples traversing the fault was collected, including material from both the hanging wall and the footwall, as well as fault gouge and material unaffected by faulting (sampled at distance in the footwall [repository] block). Tuff in proximity to the fault is highly tectonized and comminuted and is altered extensively (bleached and oxidized). The intensity of fracturing and alteration diminishes away from the fault in the footwall block. The samples contain clear physical evidence for extensive water-rock interaction associated with the Solitario Canyon fault, although the age of alteration is not clear from field relations. Samples will be analyzed for U-Th isotopes in FY2004 to determine the degree of Pleistocene U-series disequilibrium associated with focused flow along that major block-bounding fault.

WATER-RESOURCES MONITORING

Ground-water levels were measured at 34 sites in routine monitoring, and ground-water discharge was measured at five springs and at one flowing well. Ground-water and spring-discharge monitoring data collected during August were checked and filed. The Summary Monitoring Report for Calendar Year 2000—2002 received USGS Nevada District approval on September 17. The related data package for calendar year 2000—2002 monitoring was submitted to the YMPB on September 25, and the Summary Monitoring Report was submitted to the YMPB and to DOE in late September.

Compilation by **W. Clay Hunter, U.S. Geological Survey,** Yucca Mountain Project Branch.

USGS Milestone Report

October 1, 2002 September 30, 2003

Sorted by Baseline Date

Level: 3

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

USGS Milestone Report

October 1, 2002 September 30, 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	8/22/2003	8/22/2003
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	10/30/2003	
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	2/18/2003	2/18/2003
PAGSZ303M4	Final Report to Customer & TDMS	12/27/2002	11/17/2003	
PAGSW530M4	Rock Mech (Direct Shear) Data to TDMS/RPC	1/10/2003	6/13/2003	6/13/2003
PAGSW260M4	Letter Report: 1st Qtr FY03	1/31/2003	1/31/2003	1/31/2003
PAGSM925M4	Phase 3 X-sections DP to TDMS/RPC	2/21/2003	5/21/2003	5/21/2003
PAGSW22M4	Fault Infiltration/Tracer Exp Data Pkg--TDMS/RPC	2/28/2003	3/14/2003	3/14/2003
PAGSW937M4	Spot & Rim Hydrologic Prop DP - TDMS/RPC	3/31/2003	4/30/2003	4/30/2003
PAGSW262M4	Letter Report: 2nd Qtr FY03	4/30/2003	4/30/2003	4/30/2003
PAGSW605M4	Fract & Lithophysal Char Final Data to TDMS/RPC	5/30/2003	4/1/2004	
PAGSW85M4	ESF Moisture Monitoring Data Pkg to TDMS/RPC	5/30/2003	3/1/2004	
PAGSM203M4	Phase IV Lithostrat Data to TDMS/RPC	6/2/2003	10/20/2003	

USGS Milestone Report

October 1, 2002 September 30, 2003

Sorted by Baseline Date

Level: 4

Deliverable		Due Date	Expected Date	Completed Date
PAGSW26M4	Plot Infiltration/Tracer Exp Data Pkg - TDMS/RPC	6/30/2003	6/30/2003	6/30/2003
PAGSW537M4	Rock Mechanics (Creep Test) Data to TDMS/RPC	7/8/2003	4/16/2004	
PAGSW264M4	Letter Report: 3rd Qtr FY03	7/31/2003	7/31/2003	7/31/2003
PAGSZ136M4	U-series & C-O Isotope Data Pkgs to TDMS/RPC	9/15/2003	1/15/2004	
PAGSZ049M4	Data Package to TDMS/RPC	9/19/2003	11/14/2003	
PAGSZ656M4	U-series Data to TDMS/RPC	9/19/2003	12/2/2003	
PAGSZ705M4	Data to TDMS/RPC	9/26/2003	3/12/2004	
PAGSM435M4	ATC Barometric Monitoring Data to TDMS/RPC	9/30/2003	9/30/2003	9/30/2003
PAGSW295M4	Summary Monitoring Report - CY00/CY02	9/30/2003	9/30/2003	
PAGSW56M4	Bulkhead Moisture Monitoring Data Pkg - TDMS/RPC	9/30/2003	12/16/2003	
PAGSW610M4	Rev 00A of Report	9/30/2003	1/30/2004	
PAGSW89M4	X-Drift Moisture Monitoring Data Pkg to TDMS/RPC	9/30/2003	3/1/2004	
PAGSZ604M4	Pore Water Data Package to TDMS/RPC	9/30/2003	10/31/2003	

USGS Milestone Report

October 1, 2002 September 30, 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	2/7/2003
PAGSM30BM5	Update Hydrogeologic Data Integration Progress	2/28/2003	2/28/2003	2/28/2003
PAGSM36AM5	Update on Predictive Capability Progress	2/28/2003	2/28/2003	2/28/2003
PAGSM37AM5	Memo to TPO: Completion - Editing Intro Chapters	2/28/2003	2/28/2003	2/28/2003
PAGSM37IM5	Mtg Summary to TPO	2/28/2003	2/28/2003	2/28/2003
PAGSM32DM5	Report Contribution to Report Editor	3/31/2003	3/31/2003	3/31/2003
PAGSM34AM5	Progress Report Flow Modeling	3/31/2003	3/31/2003	3/31/2003
PAGSM37JM5	Mtg Summary to TPO	3/31/2003	3/31/2003	3/31/2003
PAGSM202M5	Phase IV Lithostrat Data to USGS DMG	4/1/2003	10/8/2003	

USGS Milestone Report

October 1, 2002 September 30, 2003

Sorted by Baseline Date

Level: 5

Deliverable		Due Date	Expected Date	Completed Date
PAGSM37KM5	Mtg Summary to TPO	4/30/2003	4/30/2003	4/30/2003
PAGSM37BM5	Memo to TPO: Completion - Editing HFM/Db Chap	5/30/2003	5/30/2003	5/30/2003
PAGSM37LM5	Mtg Summary to TPO	5/30/2003	6/6/2003	6/6/2003
PAGSM32BM5	Progress HFM Updates - Transient Model	6/30/2003	6/30/2003	6/30/2003
PAGSM34DM5	Report Contribution to Report Editor	6/30/2003	6/30/2003	6/30/2003
PAGSM37MM5	Mtg Summary to TPO	6/30/2003	6/30/2003	6/30/2003
PAGSM32FM5	Year-End Progress HFM Discretization	7/31/2003	7/31/2003	7/31/2003
PAGSM32HM5	Prg Rpt - Updates Based on Hydrgeo Parameteriztn	7/31/2003	7/31/2003	7/31/2003
PAGSM37NM5	Mtg Summary to TPO	7/31/2003	7/31/2003	7/31/2003
PAGSM434M5	ATC Barometric Monitoring Data to DMU	8/28/2003	8/28/2003	8/28/2003
PAGSM30CM5	Update Hydrogeologic Data Integration Progress	8/29/2003	8/29/2003	8/29/2003
PAGSM36BM5	Update on Predictive Capability Progress	8/29/2003	8/29/2003	8/29/2003
PAGSM37CM5	Memo to TPO: Compl - Editing Flow Modeling Chapt	8/29/2003	8/29/2003	8/29/2003
PAGSM37OM5	Mtg Summary to TPO	8/29/2003	8/29/2003	8/29/2003
PAGSM34BM5	Progress Report Flow Modeling	9/30/2003	9/30/2003	9/30/2003
PAGSM37DM5	Memo to TPO: Draft Report to Technical Review	9/30/2003	9/30/2003	9/30/2003
PAGSM37PM5	Mtg Summary to TPO	9/30/2003	9/30/2003	9/30/2003

YMP PLANNING AND CONTROL SYSTEM (PACS)

MONTHLY COST/FTE REPORT

Participant U.S. Geological Survey
Date Prepared 10/9/2003 10:15 AM

Fiscal Month/Year September 30, 2003

	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
1.5.01.01	326	2031	334	0	43	0	3444	0	3233
1.5.01.05	53	462	336	0	0	0	543	0	488
1.5.01.06	67	404	841	0	0	0	748	0	646
1.5.01.07	71	660	0	0	0	0	579	0	516
1.5.01.09	14	1394	1041	0	0	0	2326	0	1911
1.5.03.03	188	1578	1541	0	4	0	2029	0	1850
1.5.03.04	96	830	527	0	0	0	1808	0	1690
1.5.03.07	125	465	127	0	12	0	1430	0	1252
1.5.03.13	22	216	251	0	152	0	175	0	110
1.5.03.14	10	60	0	0	33	0	148	0	83
	972	8100	4998	0	244	0	13230	0	11779

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 2002 - September 30, 2003

10/9/2003 10:15:20 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
4568-9U001	Science Advisors	41.0	37.7	36.8	42.2	42.0	46.8	39.6	32.6	42.3	44.5	61.7	69.4	536.59
4568-9U010	Publications	19.2	34.2	3.9	8.3	11.4	7.8	3.9	4.0	53.9	-14.3	0.4	78.0	210.64
4568-9U040	Tectonics	21.5	10.3	1.7	4.6	6.0	3.3	0.0	2.4	7.2	6.2	0.4	10.1	73.77
4568-9U041	Water Levels	3.4	0.0	4.7	0.9	2.8	3.0	6.5	0.1	4.0	3.2	12.0	6.0	46.55
4568-9U042	Geophysics	0.0	0.4	0.0	0.0	0.0	0.0	5.3	-1.5	0.0	0.4	8.1	1.2	13.99
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	1.6	6.4	90.15
4568-9U081	Geochemistry	11.7	11.5	11.2	11.4	8.3	729.0	0.1	1.3	1.2	206.5	46.5	43.5	1,082.33
819Y01	USGS Technical Advisory Capability	111.4	102.2	62.8	76.6	76.6	795.7	59.0	54.3	116.6	253.6	130.8	214.5	2,054.02
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	65.3	48.6	718.64
819Y11	USGS Branch Management	38.5	63.0	53.9	68.1	91.7	91.2	44.2	27.7	36.6	89.9	65.3	48.6	718.64
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	63.9	63.2	459.93
819Y21	USGS Planning & Project Control	27.4	23.4	32.8	33.1	24.0	31.1	42.5	28.9	42.7	47.1	63.9	63.2	459.93
1.5.01.01	Project Support - Project Manageme	177.2	188.6	149.5	177.8	192.3	918.0	145.7	110.9	195.8	390.5	260.0	326.3	3,232.59
1.5.01		**177.2**	**188.6**	**149.5**	**177.8**	**192.3**	**918.0**	**145.7**	**110.9**	**195.8**	**390.5**	**260.0**	**326.3**	**3,232.59**
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	47.7	53.5	487.89
819Y31	USGS Regulatory Compliance Support	40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	42.3	47.7	53.5	487.89
1.5.01.05	Project Support - Compliance Manag	40.8	40.4	30.3	44.8	35.8	47.1	53.6	22.5	29.2	42.3	47.7	53.5	487.89
1.5.01		**40.8**	**40.4**	**30.3**	**44.8**	**35.8**	**47.1**	**53.6**	**22.5**	**29.2**	**42.3**	**47.7**	**53.5**	**487.89**
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	32.7	30.4	323.07
819Y15	USGS Commputer/Network Support	26.4	25.5	23.6	27.2	24.8	19.3	32.2	25.6	28.0	27.3	32.7	30.4	323.07
4568-9U025	Property Management	24.1	20.5	27.0	23.4	20.2	32.5	29.5	28.9	25.3	24.7	30.4	36.6	323.06
819Y16	USGS Property Management	24.1	20.5	27.0	23.4	20.2	32.5	29.5	28.9	25.3	24.7	30.4	36.6	323.06
1.5.01.06	Project Support - Information Manag	50.6	46.0	50.6	50.6	44.9	51.8	61.7	54.5	53.4	52.0	63.0	67.0	646.13
1.5.01		**50.6**	**46.0**	**50.6**	**50.6**	**44.9**	**51.8**	**61.7**	**54.5**	**53.4**	**52.0**	**63.0**	**67.0**	**646.13**
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	54.5	59.9	400.97
819Y41	USGS Water Resources Monitoring	16.8	32.5	26.7	22.2	31.1	3.6	75.2	19.9	29.9	28.7	54.5	59.9	400.97
4568-9U062	Safety	9.1	9.4	9.3	9.3	9.8	8.9	8.3	7.0	10.2	9.9	13.0	11.2	115.24

U.S. GEOLOGICAL SURVEY
ESTIMATED COSTS FOR October 1, 2002 - September 30, 2003
10/9/2003 10:15:20 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
819Y51	USGS Safety	9.1	9.4	9.3	9.3	9.8	8.9	8.3	7.0	10.2	9.9	13.0	11.2	115.24
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	67.5	71.1	516.21
1.5.01		**25.9**	**41.9**	**35.9**	**31.5**	**40.9**	**12.4**	**83.5**	**26.9**	**40.1**	**38.6**	**67.5**	**71.1**	**516.21**
4568-9U011	Reports Specialists	18.0	18.5	18.5	20.1	17.4	17.3	18.3	13.7	14.8	19.5	14.3	9.0	199.23
4568-9U012	Data Management	49.3	30.9	31.3	35.4	33.8	33.7	34.5	34.7	34.9	22.9	36.2	46.0	423.68
4568-9U013	Records Support	22.2	2.8	4.5	5.7	21.5	-9.1	6.1	7.0	7.1	4.5	5.3	4.7	82.21
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	55.8	59.7	757.89
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	40.1	-100.6	324.18
4568-9U022	Facilities Management	0.0	0.0	0.2	10.8	43.0	55.2	218.1	87.4	42.8	122.1	44.6	41.6	665.78
819Y13	USGS Administration & Facilities	33.2	34.8	34.3	78.3	69.0	131.0	233.1	105.6	69.0	175.9	84.6	-59.1	989.96
4568-9U023	Training	15.8	17.2	25.4	18.5	6.9	13.7	15.8	12.4	8.3	7.1	9.1	13.4	163.45
819Y14	USGS Training	15.8	17.2	25.4	18.5	6.9	13.7	15.8	12.4	8.3	7.1	9.1	13.4	163.45
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	149.5	14.1	1,911.29
1.5.01		**145.5**	**110.6**	**121.2**	**170.5**	**178.2**	**164.8**	**314.4**	**180.0**	**134.3**	**228.3**	**149.5**	**14.1**	**1,911.29**
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	5.0	0.0	60.64
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	16.3	44.1	282.89
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	18.6	7.6	249.12
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	51.5	60.1	277.14
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	2.2	0.0	53.62
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	93.5	111.9	923.41
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	14.1	12.6	134.93
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	4.3	16.0	137.69
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	27.1	1.0	278.09
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	3.3	8.7	69.04
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	22.4	19.9	188.71
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	71.2	58.1	808.46
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	2.7	17.7	118.43

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 2002 - September 30, 2003

10/9/2003 10:15:21 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
AUZG03	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	2.7	17.7	118.43
1.5.03.03	Safety Analyses - Unsaturated Zone	152.2	149.7	188.9	190.9	143.1	198.1	149.8	172.6	196.8	-46.9	167.4	187.7	1,850.30
1.5.03		**152.2**	**149.7**	**188.9**	**190.9**	**143.1**	**198.1**	**149.8**	**172.6**	**196.8**	**-46.9**	**167.4**	**187.7**	**1,850.30**
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	-8.8	-0.8	335.98
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	14.2	18.9	202.84
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	2.7	147.72
4568-9U046	DVRFS Knowledge Exchange Protocol	0.0	0.0	0.0	0.0	0.0	0.0	37.0	23.3	9.6	2.0	-2.9	1.9	70.98
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
819Y61	USGS Death Valley Regional Flow Mod	18.5	20.7	4.5	15.0	12.3	231.5	17.7	67.4	237.4	181.0	2.6	22.7	831.30
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	16.1	15.7	235.21
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	16.8	12.2	117.54
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	1.1	22.21
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	3.6	11.3	86.77
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
ASZG01	USGS SZ Investigations	39.8	37.5	53.1	43.7	38.8	41.1	49.0	36.5	48.9	22.3	36.5	40.2	487.41
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	0.9	0.0	9.98
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	34.6	20.3	244.25
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	14.8	13.2	105.02
ASZG02	USGS SZ Isotope Hydrology	27.1	28.0	14.4	21.6	35.4	6.1	53.9	33.6	31.7	35.6	50.3	33.4	371.15
1.5.03.04	Safety Analyses - Saturated Zone Flo	85.4	86.3	72.0	80.3	86.5	278.7	120.7	137.5	318.0	238.9	89.4	96.3	1,689.87
1.5.03		**85.4**	**86.3**	**72.0**	**80.3**	**86.5**	**278.7**	**120.7**	**137.5**	**318.0**	**238.9**	**89.4**	**96.3**	**1,689.87**
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	3.4	21.3	83.68
AEBG01	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	3.4	21.3	83.68
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	8.3	10.8	50.62
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
AEBG02	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	8.3	10.8	106.72

U.S. GEOLOGICAL SURVEY

ESTIMATED COSTS FOR October 1, 2002 - September 30, 2003

10/9/2003 10:15:21 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
4568-9U068	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	10.3	5.0	307.52
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	85.2	88.2	748.07
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
AEBG03	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	95.5	93.3	1,061.52
1.5.03.07	Safety Analyses - EBS Performance	145.4	116.9	87.2	149.6	107.0	104.6	76.3	116.2	75.9	40.1	107.3	125.4	1,251.93
1.5.03		145.4	116.9	87.2	149.6	107.0	104.6	76.3	116.2	75.9	40.1	107.3	125.4	1,251.93
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	26.5	21.6	93.75
APAGD5	USGS Data Verification	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9	14.9	19.9	26.5	21.6	93.75
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
DTAG01	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
1.5.03.13	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	26.5	21.6	110.26
1.5.03		0.0	0.0	1.0	2.1	1.1	5.8	6.2	12.1	10.9	23.1	26.5	21.6	110.26
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	3.3	8.4	73.33
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	8.9	1.1	10.00
ANSG01	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	12.2	9.5	83.33
1.5.03.14	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	12.2	9.5	83.33
1.5.03		7.3	8.0	17.8	1.1	14.0	-1.9	-0.7	0.8	0.5	14.7	12.2	9.5	83.33
1.5		830.3	788.5	754.5	899.1	843.8	1,779.4	1,011.1	833.9	1,054.8	1,021.5	990.4	972.5	11,779.81
1.5 OPERATING		830.3	788.5	754.5	899.1	843.8	1,779.4	1,011.1	833.9	1,054.8	1,021.5	990.4	972.5	11,779.81
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	843.8	1,779.4	1,011.1	833.9	1,054.8	1,021.5	990.4	972.5	11,779.81
FTEs														
	FEDERAL	62.3	75.5	50.2	52.7	54.6	52.2	61.4	61.2	60.1	49.3	44.0	50.5	
	CONTRACT	34.7	26.8	27.1	29.2	26.6	29.2	33.5	34.2	30.5	30.1	28.7	32.0	
	TOTAL	97.0	102.4	77.3	81.9	81.2	81.5	94.8	95.3	90.5	79.4	72.7	82.5	