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PART 2

YMPO AUDIT CHECKLIST NO. 89-7-01

N-QA-044
12/88

(1) Organization LANL

(3) AUDIT ITEM NO.	(4) QUALITY ELEMENT & REFERENCE	(5) STANDARD QUALITY REQUIREMENTS AUDIT GUIDELINES	(6) RESULTS S, X, N/A	(7) SUMMARY OF INVESTIGATION	(8) PERSON CONTACTED
	TWS-QAS-QP-16.2, Rev. 0 Paras. 5.2 and 6.1	Verify that the QA support group generates trending data on a quarterly basis, beginning in January and delivers these data to the QAPL.			
	TWS-QAS-QP-16.2, Rev. 0 Para. 6.3	Verify that the QA Project Leader: a. Reviews and approves the trending report b. Issues CARs based on the trending report as warranted and CARs issued are tracked, verified and closed per QP-16.1. c. Initiates management action for those items that may not require a corrective action but may warrant further assessment.			

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18-1	QAP/88-9, Rev. 2, Sect. XVIII, Paras. 1.1.2 and 1.2	Each Participating Organization shall conduct internal (covering their entire QAPP, on an annual basis) and external (direct subcontractor) audits of activities under its direct control. These audits will be scheduled, planned, conducted, and reported as described in their respective QAPPs. External and internal audit schedules, dates, and changes thereto, shall be sent to the SAIC/T&MSS Project QA Department (QA Verification Division Manager). Audit schedules shall identify the date of the audit, the activities to be audited, and the requirements to which the activities are to be audited. Audits shall be scheduled at a frequency commensurate with the status and importance of the activity and shall be initiated early enough to assure effective QA. Each NNWSI Project Participant shall perform or arrange for annual evaluations of suppliers. This evaluation shall be documented.			
	TWS-QAS-QP-18.1, Rev. 1, Para. 6.1	1. Verify that applicable sections of the QAPP have been audited annually. 2. Verify that audit schedules have been developed, revised as required and copies of them have been sent to the YMPO. 3. Verify that annual evaluations of suppliers have been made and documented.			

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18-2	QAP/88-9, Rev. 2, Sect. XVIII, Para. 1.3.1	The auditing organization shall develop and document an audit plan for each audit. This plan shall identify the audit scope, requirements, audit personnel, activities to be audited, organizations to be notified, applicable documents, schedule, and written procedures or checklists.			
	TWS-QAS-QP-18.1, Rev. 1, Paras. 6.2 and 6.2.1	1. Verify that audit plan(s) developed contain the above requirements plus procedure requirements.			

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18-3	QAP/88-9, Rev. 2, Sect. XVIII, Para. 1.4	Audits shall be performed in accordance with written procedures using checklists as early in the life of the activity as practical and shall be continued at intervals consistent with the schedule for accomplishing the activity. Elements that have been selected for audit shall be evaluated against specified requirements including a review of corrective actions taken on deficiencies in the area being audited that were identified during previous audits. Objective evidence shall be examined to the depth necessary to determine if these elements are adequate for effective control and to determine whether or not they are being implemented effectively.			
	TWS-QAS-QP-18.1, Rev. 1, Paras. 6.4.1 through 6.4.5	1. Verify the use of checklists during audits performed and type of documented evidence reviewed. 2. Verify evaluation of corrective actions of deficiencies identified during previous audits.			

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18-4	QAPP/88-9, Rev. 2, Sect. XVIII, Para. 1.5	The audit report shall be signed by the audit team leader and should be issued within 30 calendar days. This report shall include the following information, as appropriate: o Description of the audit scope. o Identification of the auditors. o Identification of persons contacted during audit activities. o Summary of audit results, including a statement of the effectiveness of the QA program elements that were audited. o Description of each reported adverse audit finding in sufficient detail to enable corrective action to be taken by the audited organization.			
	TWS-QAS-QP-18.1, Rev. 1, Para. 6.5	1. Verify that audit report is issued within time limits, contained in above requirements. 2. Verify copies of audit report have been sent to the TPO and Records Processing Center (RPC).			

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18-5	QAP/88-9, Rev. 2, Sec. XVIII, Para. 1.6	Management of the audited organization or activity shall investigate adverse audit findings; determine root cause; schedule corrective action, including measures to prevent recurrence; and, within thirty calendar days of receipt of the audit report, notify the appropriate organizations in writing of action taken or planned. The adequacy of audit responses shall be evaluated by or for the auditing organization.			
	TWS-QAS-QP-18.1, Rev. 1, Paras. 6.6.1 and 6.6.2	1. Verify that audit responses to adverse audit findings are sent back to QA within time limits. 2. Verify that those responses address the above requirements. 3. Verify that copies of the accepted responses are sent to the TPO and the RPC.			

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18-6	QAP/88-9, Rev. 2, Sect. XVIII, Paras. 1.7 & 1.0	Follow-up action shall be taken to determine whether or not corrective action has been accomplished as schedules and shall be verified by the auditing organization. An analysis of audit results shall be performed by the QA organization to identify quality trends. The results of the analysis shall be reported to responsible management for review, assessment, and appropriate action.			
	TWS-QAS-QP-18.1, Rev. 1, Para. 6.7.1 and 6.7.2	1. Verify that the auditing organization performs follow-up of audit finding(s). 2. Verify that the implementation of corrective action for potential quality problems (observations) is checked. 3. Verify that trend analysis of audit results are performed by QA and reported to appropriate management.			
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18-7	QAP/88-9, Rev. 2, Sect. XVIII, Para. 1.8.1 and 1.8.2	As a minimum, audit records shall include the following: o Identification of the organization(s), activities, or items audited and the individual(s) contacted during the audit(s). o Description of any deficiencies, nonconformances, and potential quality problems identified. o Audit plans, audit reports, written replies, and the record of completion of corrective action, and close-out of the audit. Records of personnel qualifications for Auditors and Lead Auditors performing audits shall be established and maintained by the employer. Records for each Lead Auditor shall be maintained and updated annually.			
	TWS-QAS-QP-18.1, Rev. 1, Para. 7.1 and 7.3	1. Verify that audit records are maintained. 2. Verify that Auditors and Lead Auditors records are maintained and updated annually.			

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18-8	QAP/88-9, Rev. 2, Section XVIII, Paras. 2.0 and 2.1	The NNWSI Project audit program shall be supplemented by independent surveillance activities. The purpose of a surveillance is to monitor or observe items or activities to verify conformance to specified requirements. These surveillances shall be conducted by LANL and shall be either scheduled or implemented on a random basis. Surveillances are to be performed to written checklists or surveillance plans whenever practical. The documentation shall identify characteristics, methods and acceptance criteria shall provide for recording objective evidence of results, and accurancy of the equipment necessary to perform surveillance.			
	TWS-QAS-QP-18.2, Rev. 0, Paras. 6.1 through 6.3	1. Verify surveillances are scheduled. 2. Verify the use of checklists plus recording objective evidence on them. 3. Verify that accuracy of the equipment used during the surveillance is recorded.			
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18-9	QAP/88-9, Rev. 2, Sect. XVIII, Paras. 2.0 and 2.3	All deficiencies, nonconformances, and potential quality problems identified during surveillances are to be documented and monitored until verification of effective corrective action is made. As a minimum, surveillance records shall identify the following: o Item or activity. o Date of surveillance. o Name of individual performing the surveillance. o Identification of the organization(s), activities, or items surveilled, including the name or names of personnel contacted. o Description of any deficiencies, nonconformances, and potential quality problems identified during the surveillance. Nonconformances shall be handled in accordance with the requirements of Section XV or XVI, as applicable. o Surveillance criteria. o Equipment used during the surveillance. o Results. o Acceptance statement.			
	TWS-QAS-QP-18.2, Rev. 0 Paras. 6.4 and 6.6	1. Verify that discrepant items are monitored until corrective action is made. 2. Verify that surveillance records do contain the above requirements.			

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18-10	QAP/88-9, Rev. 2, App. F, Para. 1.2.2	Prospective Lead Auditors shall have training to the extent necessary to ensure their competence in auditing skills. Training in the following areas shall be given based upon management evaluation of the particular needs of each prospective Lead Auditor: o Knowledge and understanding of this document, 10 CFR Part 60, and other nuclear and/or DOE related codes, standards, regulations, and regulatory guides, as applicable to the NNWSI Project. o General structure of Quality Assurances programs and applicable elements as defined in this document. o Auditing techniques of examining, questioning, evaluating, and reporting; methods of identifying and following up on corrective action items; and closing out audit findings. o Audit planning in the functions related to quality for the following activities; site characterization (scientific investigations), design, purchasing, fabrication, handling, shipping, storage, cleaning, erection, installation, inspection, testing, statistics, nondestructive examination, maintenance, repair, operation, modification of nuclear facilities or associated components, and safety aspects of the nuclear facility. o On-the-job training to include applicable elements of the audit program.			
	TWS-QAS-QP-18.3, Rev. 1, Para. 6.1.3	1. Verify training in accordance with above requirements is performed and documented.			
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18-11	QAP/88-9, Rev. 2, App. F, Paras. 1.2.3, 1.2.4 and 1.4.2	The prospective Lead Auditor shall have participated in a minimum of five Quality Assurance audits within a period of time not to exceed three years prior to the date of qualification. One of the audits shall be a nuclear Quality Assurance audit that shall be made within the year prior to qualification. The prospective Lead Auditor shall pass an examination that shall evaluate his comprehension of and ability to apply the body of knowledge identified in Item 18-10. The test may be oral, written, practical, or any combination of the the three types. If any portion of the examination is oral, written documentation of the oral examination questions/ content shall be maintained. Copies of the objective evidence regarding the type or types and content of the examination or examinations shall be retained by the employer.			
	TWS-QAS-QP-18.3, Rev. 1, Paras. 6.2 and 6.3.3	1. Verify that LA are qualified based on amount of audits as described above. 2. Verify that LA have been evaluated through an examination. 3. Verify that documented evidence of such examination is available.			
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18-12	QAP/88-9, Rev. 2, App. F, Paras. 1.3.1 and 1.5	Lead Auditors shall maintain their proficiency through regular and active participation in the audit process; review and study of codes, standards, procedures, instructions, and other documents related to quality assurance program and program auditing; and participation in training programs. Based on annual assessment, management may extend the qualification, require retraining, or require requalification. These evaluations shall be documented. Each Lead Auditor shall be certified by his employer as being qualified to lead audits. As a minimum, this certification shall document the following: o Employer's name. o Lead Auditor's name. o Date of certification or recertification. o Basis of qualification (i.e., education, experience, communication skills, training, examination, etc.). o Signature of employer's designated representative who is responsible for such certification.			
	TWS-QAS-QP-18.3, Rev. 1, Paras. 6.5 and 7.2	1. Verify that LA maintain their proficiency as described above. 2. Verify LA certification(s).			

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	DOW DAVIDSON				
	General				
T-1		In light of the overall lack of YMP core at the USGS Core Library, what is the LANL researchers approach to the use of these existing samples? The QALAs that are the subject of this audit are quality level I activities and therefore necessitate the use of quality level I samples. What will be done if it is determined that the existing core can not be certified as level I?			
T-2		What procedures exist that control field sampling activities. Sample Management Facility procedures control the identification, handling, storage and disposition of core but what procedures exist for the collection, identification and control of outcrop, shaft, and drift samples collected by LANL researchers?			
T-3		How is the receipt and acceptance of Yucca Mountain Project samples documented upon their arrival at LANL?			

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T-4		Can receiving documents for specific intervals of YMP core be retreived in a timely manner?			

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	TWS-QAS-QP-08.1, Rev. 0				
T-5		Have specific requirements for YMP Project sample storage and preservation been established? Are specific protective environments utilized in YMP Project sample storage areas?			
T-6		Is a system of identification marking in effect for all YMP Project samples located at LANL? Are actual physical samples marked as well as their containers?			
T-7		Where are YMP samples stored at LANL? Are the storage areas controlled to limit access to only authorized personnel? Are storage locations normally locked. Does each group that uses samples have a separate storage area, or is there a single storage for all YMP samples?			

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T-8		Have documents been prepared that specify storage location, and protection requirements for all YMP Project samples to be taken?			
T-9		Is each division working on YMP samples required to develop sub-tier procedures for control of samples that are specific to their physical plant and particular procedures?			
T-10	TWS-ESS-DP-101, Rev. 1	Is a system of identification marking in effect for all YMP Project samples located at EES? Are actual physical samples marked as well as their containers?			

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T-11		Where are YMP samples stored in EES? Are the storage areas controlled to limit access to only authorized personnel? Are storage locations normally locked?			
T-12		Have documents been prepared that specify storage location, and protection requirements for all YMP Project samples to be taken?			
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	TWS-QAS-QP-03.5, Rev. 0				
T-13		Do experimenters document sample identification and history while YMP Project samples are in their possession?			
T-14		Is there a central records management filing system that receives copies of all documentation relative to YMP Project sample traceability from the time the samples are received until final sample disposition?			
	TWS-MSTQA-QP-14, Rev. 1				
T-15		Is there a computerized data base that tracks the status and history of all YMP Project samples within LANL?			

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T-16	TWS-INC-DP-05, Rev. 1	Do samples processed with the use of this procedure require the documentation of the analysis and results in a notebook controlled (i.e., numbered) and issued from a central point such as QA? Is this sample data recorded in this notebook entered into a central records management file?			
T-17	TWS-INC-DP-35, Rev. 1	What system is in place to control the data input into the DATATRIEVE data base file? How is data input verified? Is a documented system of program and data controls in place?			
T-18	TWS-ESS-DP-01, Rev. 0	Relevant sample identification and processing data is recorded on a prepared form. Are these data transferred to a centralized YMP Project records management file system?			

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T-19	TWS-ESS-DP-03, Rev. 3	What documentation is prepared to maintain sample traceability from the time the LANL geologist selects core intervals at the Sample Management Facility until the time the core is analyzed by LANL?			
T-20	TWS-ESS-DP-04, Rev. 5	Demonstrate traceability for a randomly selected YMP Project thin section in the Thin Section Laboratory through processing and final storage or shipping.			
T-21	TWS-ESS-DP-07, Rev. 3	Is a system in place that ensures that questionable or erroneous analytical results are reported to researchers who have been previous users of the probe?			

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	TWS-ESS-DR-25, Rev. 3				
T-22		This procedure requries the labeling of the sample container side and top. What information is included on the labels?			
T-23		Do samples processed with the use of LANL Detailed Procedures (DPs) require the documentation of the analysis and results in a notebook controlled (i.e., numbered) and isssued from a central point such as QA? Is this sample data recorded in this notebook entered into a central records management file?			
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	CAROLYN RUTLAND SCP Study 8.3.1.3.2.1 Mineralogy, Petrology, and Chemistry of Transport Pathways				
T-24		Where called for in a technical procedure for SCP Study 8.3.1.3.2.1, are the required records being kept? (This question will not be asked for every procedure.)			
T-25		What is the present status of the study plan and technical procedures for this study?			
T-26		What plans exist for qualifying data that is to be used for licensing and that was collected before Project QA assignments were made and approved procedures were in place?			
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T-27		What is the present stage of development of computerized image analysis of thin sections?			
T-28		What is the present stage of operator (petrographer) variance tests?			
T-29		What is the present stage of development of electron-microprobe methods for the analysis of minerals on open fracture surfaces (on both polished epoxy mounts and natural surfaces)?			

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T-30		Have you performed prototype tests for sample collection for fracture studies in the exploratory shaft and drifts? If so, with what results?			
T-31		What aspects of the chemical compositions of the host rock will this statistical evaluation address?			
T-32		What is the present status of the work on manganese oxide minerals (monthly reports mention work on samples from UE25 b1h and from USW G-4)?			
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T-33		Have you been able to examine fracture-coating minerals in the Topopah Spring Member in USW G-1, USW G-2, and USW GU-3? If so, with what results?			
	SCP Study 8.3.1.3.2.2 History of Mineralogic and Geochemical Alteration of Yucca Mountain				
T-34		Where called for in a technical procedure for SCP Study 8.3.1.3.2.2, are the required records being kept? (This question will not be asked for every procedure.)			
T-35		Are all of the required technical procedures for this study approved and in place?			

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T-36		Are any of the approved technical procedures for this study being revised or updated?			
T-37		What plans exist for qualifying data that is to be used in licensing and that was collected before Project QA assignments were made and approved procedures were in place?			
T-38		What petrographic features enable one to determine information about the relative timing of zeolitic alteration?			

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T-39		How do you plan to approach the accuracy of ESR ages of calcite?			
T-40		What is a quadrupole mass specromter (to be used for analysis of fluid inclusion gas)?			
T-41		What sort of special handling does a sample of natural gel require? If any gels are found during site characterization, do you anticipate any problems with this aspect of studying them?			
T-42		Do you have any working physical models to describe the dehydration/rehydration process for zeolites, smectites, and glass as a function of temperature and water vapor for a given?			

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T-43		Do you plan to sponsor fission-track annealing studies of Yucca Mountain samples to complement the illite-smectite transformation studies of paleothermal gradients.			
T-44		What is the present status of the SEM study of fault breccia textures? What is the present status of the SEM study of fault breccia compositon?			
	SCP Study 8.3.1.3.3.2 Kinetics and Thermodynamics of Mineral Evolution				
T-45		What is the present status of the study plan and technical procedures for this study?			

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T-46		How do you plan to deal with the Project-wide problem of traceability of standards? What potential impact might this problem have on the planned study?			
T-47		What is the importance of the smectite/illite transition in this study?			
T-48		What is the importance of the kinetics of the cristobalite-to-quartz transition in this study? What is the significance of the large dependence of rate on pressure in this transition?			

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	SCP Study 8.3.1.8.1.1. Probability of a Volcanic Eruption Penetrating the Repository				
T-49		What is the present status of the study plan and technical procedures for this study?			
T-50		Have any data been generated from this study that will have to be qualified, for whatever reason? If so, what plans do you have for data qualification?			
T-51		In the March 1989 project status report you mention collection of samples for potassium-argon (K-Ar) age determinations from the northern of the two Sleeping Butte volcanic centers. What is the present status of that work?			
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T-52		In the March 1989 project status report you mention collection of samples for uranium-thorium (U-Th) age determinations from three locations at the Lathrop Wells volcanic center. What is the present status of that work?			
T-53		How is the effort to date lava flows at the Lathrop Wells volcanic center using the thermoluminescence technique progressing?			
T-54		You did field work (geologic mapping and paleomagnetic studies) this summer at the Cima volcanic field and the Sleeping Butte site; what were some of the results?			

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	SCP Study 8.3.1.8.1.2 Effects of a Volcanic Eruption Penetrating the Repository				
T-55		What is the present status of the study plan and technical procedures for this study?			
T-56		Have any data been generated from this study that will have to be qualified, for whatever reason? If so, what plans do you have for data qualifications?			
T-57		How will noble gas isotopic data obtained for ground water permit evaluation of whether there are any indications of the presence of magma bodies of indications of the operation of magmatic processes in the crust beneath Yucca Mountain?			

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T-58		What work have you done so far in the activity of evaluating the time/space patterns of the distribution of basaltic centers in the Yucca Mountain region and assessing possible structural controls on the locations of the centers?			
	SCP Study 8.3.1.2.3.1.7 Testing of C-Hole Sites with Reactive Tracers				
T-59		What plans exit for qualifying data that are to be used for licensing and that were collected before Project QA assignments were made and approved procedures were in place?			
T-60		What is the present status of the study plan and technical procedures for this study?			

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T-61		Where called for in a technical procedure for this activity, are the required records being kept? (This question will not be asked for every procedure.)			
T-62		What new experiments have you planned for the coming months (ref. 5/89 monthly report)?			
T-63		(ref. 6/89 monthly report) What is the present stage of your efforts to develop the capability to adjust parameter values of the sorption expression for various conditions (i.e., in the field) based on laboratory data?			
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	DEAN EPPLER SCP Study 8.3.1.8.5.1, Dating of Rock-varnished Geomorphic Surfaces				
T-64		Criterion 5, in Section 3.1.2 on Sample Collection, indicates that clasts, "possessing large, gently sloping surfaces" are preferred as samples because rock varnish coat accretes more readily to such surfaces. This implies that two different samples possessing different surface geometries from the same geomorphic surface could yield anamolously different surface exposure ages because of non-uniform varnish accumulation. What steps will be taken to ensure eliminate or minimize the effects of that a non-uniform varnish coating thickness could have in biasing or confusing the rock-varnish dating?			

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T-65		Implicit within this technique is the assumption that varnish accumulation is constant through time; consequently, the thickness of a given varnish coat is a function of the time of exposure of the sample at the surface. Is there any way of independently verifying the validity of this assumption? Is there a way of detecting and correcting for variations in the rate of varnish accumulation to avoid measuring anamolous exposure ages?			
T-66		The study plan indicates that, "when VCRs for a geomorphic surface are variable, the lower VCR values are selected as the most representative of the age of the surface." Given that the one of the underlying purposes of volcanic studies on the Yucca Mountain Project is to date the youngest possible age of volcanism at the site, and that lower VCR values correlate to older surfaces, it would seem more prudent to select the higher VCR values as representative of the age of the surface, not the lower values. Why are the lower VCR values being used?			

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T-67		Natural rock varnish surfaces are likely to be significantly rougher than the surfaces of samples normally analysed using X-ray analysis, such as polished thin sections or the smooth surfaces of glassy pyroclasts. Will this result in production of X-rays that are dissimilar to standard samples? What, if any, corrections need to be made to the analytical results that will compensate for this increase in surface roughness?			
T-68		What is the status of preparation, review and approval for the detailed technical procedures that govern this activity?			
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	SCP Study 8.3.1.8.1.1 Probability of a Volcanic Eruption Penetrating the Repository, and 8.3.1.8.5.1 Characteristics of Volcanic Features				
T-69		In the April 1989 LANL Monthly Project Status Report, the possibility of the existence of a previously unreported U-Th series age determination on a caliche zone in basaltic scoria at the Lathrop Wells volcanic center. What progress, if any, has been made on tracking down information on the date? If information has been found, does the sample have a good enough pedigree to be used in your study?			
	TWS-QAS-QP-07, Rev. 2				
T-70		Check documentation on the sample collection information for samples collected for U-Th age determination from oldest and youngest flow units at the Lathrop Wells Volcanic Center, and from the unoxidized interior of the main cone. The collection of these samples was reported in the March 1989 LANL Monthly Project Status Report. Also, check documentation of samples collected for paleomagnetic studies from the Lathrop Wells volcanic center, the Sleeping Butte Cones, and basalts of the Crater Flat and Black Cone centers as reported in June 1989 LANL Monthly Project Status Report.			

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	PAUL CLOKE Study Plan YMP-LANL-SP 8.3.1.3.4.1, R0 and 8.3.1.3.4.3, R0; Study Plan for Sorption				
T-71		To what issue does this study apply?			
T-72		What radionuclides will be studied?			
T-73		Why are other radionuclides, notably tritium and C-14, not included? Is there any documentation to support this decision?			

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T-74		How is it planned to assure that the tuff test material used will be representative of the units sampled? Examine any existing procedures for sampling.			
T-75		Recent monthly status reports have indicated that the observed dependence of sorption on the water/rock ratio appears to be related to the presence of colloids. Have determinations been made, e.g. by nephelometry, that different concentrations of colloids are present following ultracentrifugation as compared to ultrafiltration? Examine laboratory notebooks if such determinations were made.			
T-76		What technical/scientific acceptance criteria, e.g. purity, crystal size and habit, and structural state, were used for the acquisition of the pure mineral samples? Coordinate with criteria 7 and 13 auditors to confirm compliance.			

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T-77		Section 3.1.4 of the Study Plan states that measurements will be made "using minerals of compositions that bound those of Yucca Mountain tuffs". The feldspars selected, as noted in the March, 1989, Project Status Report from LANL possess low temperature structural states (and presumably at least the microcline and labradorite exhibit exsolution phenomena), but most feldspars in the tuffs exhibit high temperature structural states (and presumably no exsolution). What is the justification for the use of the purchased feldspars as bounds? Where is this justification documented? Examine any documentation for Project acceptance.			
T-78		Under what procedure were the ultrapure reagents referred to in the April 1989, LANL Project Status Report prepared? What reagents were prepared? Examine procedure or laboratory notebook.			
T-79		Under what procedure was the purification of clinoptilolite, referred to in recent Project Status Reports, performed? Examine procedure or laboratory notebook.			

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T-80		Inasmuch as cryptomelane is a barium mineral, it is surprising that this element was not specified for analysis, as noted in the April 1989, LANL Project Status Report. Other elements that seem likely to be present in cryptomelane in solid solution are Pb, Cr, and V. The absence of calcium from the analyses is also surprising in view of its common presence in montmorillonite. What criteria were used to determine what analyses are needed? Coordinate document examination with auditor for criterion 7 for procurement and acceptance from John Husler, Univ. of New Mexico.			
T-81		What acceptance criteria were specified for analyses from John Husler, Univ. of New Mexico? Coordinate with the auditor for criterion 7.			
T-82		What procedure is being used for the conditioning of J-13 water through a column of zeolitic tuff? Examine procedure or laboratory notebook.			

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T-83		Does the report on the sorption of Ni and Np in tuff permit tracing data back laboratory notebooks or other original data sources? Check data in the final report against original data.			
T-84		Spot check laboratory notebooks for legibility and required signatures by investigators and supervisors.			
T-85		What practices are followed to assure that laboratory data will not be lost through accidental damage or loss of notebooks or other recording media? Check to verify implementation.			
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	WBS 1.2.3.4.1.4. (WBS Dictionary, LANL Monthly Status Reports, and results of YMPO Audit 88-08 used as basis for checklist.)				
T-86		To what issue does this study apply?			
T-87		What radionuclides will be studied?			
T-88		How, e.g. under what procedure, was the final analysis of Np sorption on goethite using the X-ray absorption spectrum performed? Examine procedure or laboratory notebook and the results of the analysis.			

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T-89		Under what controls are/were the photothermal and photoacoustic spectroscopy systems built and calibrated? Examine records to verify that these controls were followed. Coordinate with auditors for criteria 7, 12, and 13.			
T-90		Does the report on colloid stability permit tracing back to data in laboratory notebooks or other original data sources? Check data in the final report against original data.			
T-91		Spot check laboratory notebooks for legibility and required signatures by investigators and supervisors.			

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T-92		What practices are followed to assure that laboratory data will not be lost through accidental damage or loss of notebooks or other recording media? Check to verify implementation.			
T-93		Are periodic checks made to confirm calibration of the output voltage used by the Applied Research program, HEADSTART? Check records to confirm implementation.			
T-94		Has AP-5.19Q, Interface Control, been implemented to control interfaces among LANL, LBL, and LLNL in respect to the solubility task? Examine any relevant documents.			

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T-95		Confirm that the detailed procedure (DP) for sample identification and handling is being followed.			
T-96		Confirm that the DP for purification of colloidal Plutonium (IV) by centrifugation and ion exchange (YMP-INC-DP-80) is being followed.			
T-97		What is the status of DP TWS-INC-DP-78? Verify that it is being followed, if implemented.			

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	Study Plan YMP-LANL-SP 8.3.1.3.4.2, R1; WBS 1.2.3.4.1.9; Study Plan for Biological Sorption and Transport				
T-98		To what issue does this study apply?			
T-99		Will any radionuclides other than plutonium be studied? If not, what is the rationale for excluding the others? Where is this documented (examine)?			
T-100		How will the connection between the application of short term disruptive forces (sonication, surfactants, grinding, agitation) and centuries long stability of agglomerates be made? Cite any available references that support that the approach will work.			

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T-101		Please clarify whether, under section 3.3 of the Study Plan, experiments using crushed tuff columns will be performed. If so, what DP will be used?			
T-102		In connection with the High-Pressure Liquid Chromatography has more than one kind of siderophore been found in the spent medium? Examine laboratory notebooks or records to verify character of the spectra.			
T-103		Check on documentation to support the conclusion that it is not necessasry to run a control along with the inoculated flasks. Does this check support the conclusion?			

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T-104		Check on the capability of the image analysis system to differentiate between bacterial cells and colloidal particles. Does the system permit a clear distinction?			
T-105		Check on results of the colloidal agglomeration tests. Are the results highly reproducible, thereby providing a definitive determination of the rates, or rather scattered, requiring a statistical analysis to derive the rate? Examine laboratory records to confirm.			

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T-106		How are interfaces with other site characterization studies controlled? Examine documentation that procedures are followed.			
T-107		What procedure is used for the on-going work for the production and purification of siderophores? Examine records to assure that it was followed.			

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T-108		What specifications were stipulated for the iron-59 ordered from New England Chemicals? Coordinate with criteria 7 and 13 auditors to confirm compliance.			
T-109		What procedures are used to prepare the columns for the sephadex C-25 and biorad P-2 columns? Confirm that the procedures were followed.			
T-110		Spot check laboratory notebooks for legibility and required signatures by investigators and supervisors.			
T-111		What practices are followed to assure that laboratory data will not be lost through accidental damage or loss of notebooks or other recording media? Check to verify implementation.			
				(9) Auditor Signature	(10) Date

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WBS #1.2.9.3
"QA"

JAN 05 1989

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YUCCA MOUNTAIN PROJECT OFFICE (PROJECT OFFICE) QUALITY ASSURANCE (QA) AUDIT 88-08 OF LOS ALAMOS NATIONAL LABORATORY SUPPORT OF THE YUCCA MOUNTAIN PROJECT (NN1-1989-0820)

Reference: Letter, Blaylock to Oakley, dtd. 11/22/88

Enclosed is the report of QA Audit 88-08, which was conducted by the Project Office in Los Alamos, New Mexico, October 3, 1988, through October 7, 1988.

During the course of the audit, the audit team generated 18 Standard Deficiency Reports (SDRs), Nos. 204 through 214 and 216 through 222, 18 observations and 17 recommendations.

The SDRs were previously transmitted under a separate cover letter (see referenced letter). Written responses to the 18 observations contained within this report are required. These responses are due within 20 working days of the transmittal date of this report. Please address your responses to me and concurrently send a copy of each observation response to Nita J. Brogan, Science Applications International Corporation (SAIC), Las Vegas, Nevada.

If you have any questions, please contact Wendell B. Mansel of my staff at FTS 544-7945 or William H. Camp of SAIC at FTS 544-7166.

James Blaylock
James Blaylock
Project Quality Manager
Yucca Mountain Project Office

YMP:JB-1371

Enclosure:
Audit Report 88-08

cc w/encl:
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L. H. Barrett, HQ (RW-3) FORS
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YUCCA MOUNTAIN PROJECT OFFICE QUALITY ASSURANCE AUDIT REPORT

OF

LOS ALAMOS NATIONAL LABORATORY

AUDIT NUMBER 88-08

CONDUCTED: OCTOBER 3 - 7, 1988

PREPARED BY: Wendell B. Mansel DATE: 11/30/88 11/27/88
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APPROVED BY: H. H. Caldwell DATE: 30 Nov 88
HENRY H. CALDWELL
DIVISION MANAGER, AUDITS

APPROVED BY: James Blaylock DATE: 1/5/89
JAMES BLAYLOCK
PROJECT QUALITY MANAGER

EXECUTIVE SUMMARY

PROJECT OFFICE AUDIT REPORT NO. 88-08
LOS ALAMOS NATIONAL LABORATORIES

OCTOBER 3 THROUGH OCTOBER 7, 1988

In the opinion of the Yucca Mountain Project Office (Project Office) Audit Team, the Los Alamos National Laboratory (Los Alamos) Quality Assurance (QA) Program is ineffective. The program is neither complete nor effectively implemented; only 4 of the 14 applicable QA programmatic elements are considered adequately implemented and controlled.

This audit was performed to requirements of NNWSI QAP-NVO-196-17, Revision 5, effective 3/3/87, which has been superseded since 5/19/88. The fact that Los Alamos has not effectively implemented the superseded program indicates that Los Alamos may have extreme difficulty meeting the schedule for a fully qualified QA program based on the more stringent requirements of NNWSI/88-9, Revision 2.

As a result of the audit, 18 deficiencies were documented as SDRs, along with 18 observations and 17 recommendations. Major areas of concern are the lack of a structured QA training program, lack of sufficient QA procedures to effectively implement the QA program, inadequacy of existing QA procedures, misuse of Correct Action Reports (CARs), and document control activities. In addition, the software QA program effectiveness is indeterminate due to lack of procedures covering development of existing software. It was also observed that the QA department was understaffed and was frequently unable to respond to the inquiries of the audit team during the course of the audit.

The audit team found that, despite the lack of planned and systematic controls to implement an effective QA program on technical activities, the present technical staff at Los Alamos were aware of the requirements for QA and were adhering to self-imposed good scientific practices in the performance of investigations. These efforts are resulting in well-documented scientific data in logbooks. The technical staff and laboratory management exhibited a cooperative environment that should be conducive to aggressive correction of recognized problems.

1.0 INTRODUCTION

This report contains the results of a Quality Assurance (QA) audit of the Los Alamos National Laboratory (Los Alamos) support of the Yucca Mountain Project. The audit was conducted at the Los Alamos facilities in Los Alamos, NM, on October 3-7, 1988. The audit was conducted in accordance with the requirements of the Yucca Mountain Project QA plan, NVO-196-17, Rev. 5, and Quality Management Procedure (QMP)-18-01, Rev. 3, "Audit System for the Waste Management Project Office."

2.0 AUDIT SCOPE

The purpose of this audit was to evaluate the effectiveness of the Los Alamos QA program through verification of the implementation of the Los Alamos Quality Assurance Program Plan (QAPP), Rev. 2, its implementing procedures, and technical activities.

3.0 AUDIT TEAM PERSONNEL

This audit team consisted of the following members:

William Camp	Audit Team Leader	SAIC, Las Vegas, NV
Wendell Mansel	Lead Auditor	YMP, Las Vegas, NV
Mae Cotter	Auditor	SAIC, Las Vegas, NV
John Friend	Auditor	SAIC, Las Vegas, NV
Everett Bryant	Auditor	SAIC, Las Vegas, NV
Fredrick Ruth	Auditor	SAIC, Las Vegas, NV
James Ulseth	Auditor	SAIC, Las Vegas, NV
Catherine Hampton	Auditor Trainee	YMP, Las Vegas, NV
Dean Eppler	Lead Technical Specialist	SAIC, Las Vegas, NV
Dwayne Chesnut	Technical Specialist	SAIC, Las Vegas, NV
Paul Cloke	Technical Specialist	SAIC, Las Vegas, NV
Steven Mattson	Technical Specialist	SAIC, Las Vegas, NV
Carolyn Rutland	Technical Specialist	SAIC, Las Vegas, NV
Keith Schwartztrauber	Technical Specialist	SAIC, Las Vegas, NV
Royce Monks	Observer	YMP, Las Vegas, NV
Roxanne Edwards	Observer	YMP, Las Vegas, NV
Susan Zimmerman	Observer	State of NV
Frank Dickson	Observer	State of NV
Maurice Morganstein	Observer	State of NV
John Gilray	Observer	NRC, Las Vegas, NV
James Donnelly	Observer	NRC, Washington, DC
Thomas Trbovich	Observer	NRC, Washington, DC
John Bradbury	Observer	NRC, Washington, DC
Kathleen Mihm	Observer	OCRWM, Washington, DC
Jane Hadden	Observer	OCRWM, Washington, DC
Scott VanCamp	Observer	OCRWM, Washington, DC

4.0 SUMMARY OF AUDIT RESULTS

4.1 Statement of Program Effectiveness

1. The Project Office Audit Team has concluded after investigation and evaluation, that the QA program implementation at Los Alamos is ineffective to support the scientific activities being performed.

   Existing deficiencies of major concern are follows:

   - The QA program is ineffective in the areas of management assessment, personnel training, and position descriptions.

   - Los Alamos has been developing software for the Yucca Mountain Project since 1985 without procedures in place to control software requirements , design, documentation, verification, and configuration.

   - Since the effective date of the LANL QAPP Rev. 2, 4/25/88, Los Alamos has not identifed the necessary QA procedures that are required to support an adequate QA program.

   - The Document Control System: The current implementing procedure does not fulfill the requirements of the QAPP Rev. 2. A great deal of confusion exists between the Document Control System and the Records Management System throughout the procedure.

   - The Records Management System: The required procedures were either not up-to-date or not released for implementation.

   - The Corrective Action System: The program is being misused, (i.e., minor conditions with no apparent effect on quality are being addressed on CARs.

   - The audit process has been determined to be ineffective. The audit schedule has not provided complete coverage of all QA program elements. The audits are of minimal scope and duration.

4.0 SUMMARY OF AUDIT RESULTS

4.1 Statement of Program Effectiveness (continued)

2. Assessment of the technical program at Los Alamos:

   The audit team found that the scientific staff at Los Alamos involved in the Yucca Mountain Project were aware of the requirements of a QA program, and were carrying out, for the most part, an effective technical program with adherence to good scientific practices. These efforts of the various principal investigators resulted in careful documentation for procedures and scientific data that will continue to be useful in the future of the preparation and defense of project positions. The concerns discovered were recognized as legitimate by both the technical staff and the laboratory management, and an attitude conducive to aggressive correction of recognized problems was exhibited by both the principal investigators and laboratory management.

   In many cases the efforts of the technical staff go beyond the minimum required, and these people deserve recognition from the Project Office for an exemplary effort.

   In summary, the technical work appears to be effective, and conducted utilizing good scientific practices. However, without an effective QA program, the technical results may be questionable during Nuclear Regulatory Commission (NRC) licensing.

A total of 18 SDRs and 18 observations were identified as the result of this audit. In addition, the audit team generated 17 recommendations for the consideration of the Los Alamos staff. A synopsis of the SDRs and observations and the actual recommendations are contained in Section 6.0 of this report.

Deficiencies identified by the Project Office are qualified by severity level, which is related to the significance of the deficiency. A discussion of severity levels is provided in Enclosure 1.

4.2 Audit Summary

The following program elements were deemed to be in compliance with the requirements of the Los Alamos QAPP, Rev. 2, and are being effectively implemented:

1.0 Organization
4.0 Procurement Document Control
7.0 Control of Purchased Material, Equipment, and Services
12.0 Control of Measuring and Test Equipment

4.0 SUMMARY OF AUDIT RESULTS

4.2 Audit Summary (continued)

Program elements in which the audit team identified deficiencies were:

2.0 Quality Assurance Program
3.0 Scientific Investigation Control and Design Control
5.0 Instructions, Procedures, and Drawings
6.0 Document Control
8.0 Identification and Control of Samples and Data
13.0 Handling, Shipping, and Storage
15.0 Control of Nonconformances
16.0 Corrective Action
17.0 Quality Assurance Records
18.0 Audits

The following programmatic elements were not within the scope of this audit:

9.0 Control of Processes
10.0 Inspection
11.0 Testing
14.0 Inspection, Test, and Operating Status of Engineered Items

During the audit planning phase, the audit team did perform a preaudit investigation of the Los Alamos QA program to confirm that the above programmatic elements are not applicable to the present scope of work at Los Alamos.

The following technical activities were reviewed as part of this audit:

SCP Sections	Activity
8.3.1.3.3.3	Hydrothermal Geochemistry
8.3.1.3.4.2	Biological Sorption Transport
8.3.1.3.4.3	Sorption
8.3.1.3.5.1	Solubility Determination
8.3.1.3.6.1	Dynamic Transport Process
8.3.1.3.7.1	Retardation Sensitivity Analysis
8.3.1.2.3.1	Reactive Tracer Testing

5.0 AUDIT MEETINGS

5.1 Preaudit Conference

A preaudit conference was held with the Los Alamos Technical Project Officer (TPO) and his staff at 10:00 a.m. on October 3, 1988. The purpose, scope, and proposed agenda for the audit were presented. A list of attendees for this meeting is provided in Enclosure 2.

5.2 Audit Status Meeting

Audit status meetings were held with the Los Alamos TPO and his staff at 8:45 a.m. on October 4-6, 1988. A list of those persons contacted during the audit is provided in Enclosure 2.

5.3 Postaudit Conference

A postaudit conference was held at 10:00 a.m. on October 7, 1988. A synopsis of the preliminary SDRs identified during the course of the audit was presented to the TPO and his staff. A list of attendees for this meeting is also provided in Enclosure 2.

6.0 SYNOPSES OF SDRS AND OBSERVATIONS

6.1 Standard Deficiency Reports (SDRs)

1. Audit 87-01, Observation No. 10. Corrective Action procedure has not been revised. Refer to SDR No. 204, Severity Level 2.

2. No interface control procedures are in existence for scientific investigations. Refer to SDR No. 205, Severity Level 2.

3. Milestone Report No. R718, 10/7/87, "Formation, Characterization, and Stability of Plutonium (IV) Colloid" is not traceable to the source of primary data. Refer to SDR No. 206, Severity Level 2.

4. Isotope and Nuclear Chemistry Laboratory Notebooks do not reflect the sample number of J-13 water used in the conduct of experiments. Refer to SDR No. 207, Severity Level 2.

5. Audit personnel are to be trained to NNWSI-SOP-02-01. Contrary to the requirement, audit personnel training has not been completed. Refer to SDR No. 208, Severity Level 2.

6.0 **SYNOPSES OF SDRS AND OBSERVATIONS**

6.1 Standard Deficiency Reports (SDRs) (continued)

6. TWS-QAS-12.1, R1, requires that the procedure by which the Measuring & Test Equipment (M&TE) was calibrated be entered in Section 9 of the form. Contrary to the requirement, four calibration records did not have the procedure by which the M&TE was calibrated entered on the form. Refer to SDR No. 209, Severity Level 3.

7. There is no training program established at this time that states the minimum training requirements for the QA staff. Refer to SDR No. 210, Severity Level 2.

8. Audit 87-01, Observation No. 2. Los Alamos committed to remove procedures TWS-CNC-DP-17 and TWS-CNC-DP-30 from controlled distribution. At this time, noted procedures are still in the system as controlled documents. Refer to SDR No. 211, Severity Level 3.

9. There is no Stop Work Order procedure in place nor are there established channels at this time to stop unsatisfactory work. Refer to SDR No. 212, Severity Level 2.

10. Corrective Action Reports are not being consistently reported to the TPO or copies distributed to other organizations as required per TWS-QAS-OP-21, R0. Refer to SDR No. 213, Severity Level 2.

11. The method for the validation/authentication of records is not identified, list of persons authorized to authenticate records is not maintained, and verification of validation/authentication is not being conducted. Refer to SDR No. 214, Severity Level 2.

12. In evaluating the Los Alamos Audit Schedule, the activities identified were all technical in matter. There is no objective evidence that the applicable elements of the QAPP have been reviewed to indicate proper implementation. Refer to SDR 216, Severity Level 1.

13. Los Alamos has not prepared any position descriptions for personnel performing or verifying activities that affect quality. Refer to SDR No. 217, Severity Level 2.

14. Audit 87-01, Observation No. 5, regarding counting methodologies, was not fully implemented. The deficiency is an untimely response to audit Corrective Action Requirements. Refer to SDR No. 218, Severity Level 3.

6.0 SYNOPSIS OF SDRS AND OBSERVATIONS

6.1 Standard Deficiency Reports (SDRs) (continued)

15. QA training files are not submitted to the Records Processing Center (RPC). Notebooks are not submitted to the RPC on a timely basis. The RPC does not have a lock on the file room door. Cabinets are left unlocked with the keys in the lock. Access control at the RPC and N5 resident files were not enforced; the files were left unattended and unlocked. Refer to SDR 219, Severity Level 2.

16. The Document Control Procedure, TWS-QAS-03, R7, is not in compliance with the existing quality program requirements. Los Alamos did not identify all the deficient requirements in the document control procedure or in the document control system. Refer to SDR No. 220, Severity Level 2.

17. The procedures are documented in the scientific notebooks; however, two components of the work being performed are not documented in accordance with procedures. Refer to SDR No. 221, Severity Level 2.

18. The quality of software development documentation activities prior to the implementation of Los Alamos procedure TWS-QAS-QP-3.1, R0, dated 9/21/88 cannot be assured. Refer to SDR No. 222, Severity Level 1.

6.2 Observations

1. During review of laboratory notebooks, it was found the measurement units "psi" and "ml" were not entered.

2. It was found that no checks were made to verify that the program HEADSTART, used to control the potentiostat, actually controlled it to the desired voltage.

3. Samples for the hydrothermal chemistry were not stored in a locked area.

4. Los Alamos Procedure TWS-QAS-QP-3.1, R0, Subsection 6.3 does not specify code indentifiers which include code revision number and associated QA level identification.

5. Los Alamos Procedure TWS-QAS-QP-3.1, R0, Section 7.2 does not provide quantitative or qualitative criteria describing how existing software will be qualified.

6.0 SYNOPSIS OF SDRS AND OBSERVATIONS

6.2 Observations (continued)

6. The Los Alamos "Affiliate Invitation Request" with Nuttall and Associates contains no scope of work for Dr. Nuttall's work, and no evidence was provided to describe his duties or define his job description.

7. Los Alamos Procedure TWS-QRS-QP-02.1 does not address whether the Quality Assurance Liaisons (QALs) have established training requirements specific to individual needs on the required forms, or how that information is transmitted to training.

8. Based on the scope of work being conducted by Los Alamos, there is not a sufficient number of dedicated QA personnel assigned to support the project at this time.

9. Several CARs written have addressed discrepancies which are minor in nature and are not significantly adverse to quality (e.g., CAR No. 011 and CAR No. 42).

10. Presently, no SIP implementing procedure has been reviewed that specifically says that signature of the Technical Reviewer means that all annotated criteria from the QAPP, R2, Para. 3.1.3, have been addressed.

11. The organizational chart identifies an upper management position as the N-Division Program Director of Nuclear Programs. His responsibilities should be addressed in the context of Section 1.0 of the QAPP but are not.

12. During the review of several records, numerous illegible documents were consistently stamped "Best Available Copy." This is a concern considering the possibility that an effort is not being made to get a legible copy

13. A review of audit plans did not clearly state the audit requirements, nor was there a heading labeled "Audit Requirements."

14. The Los Alamos NNWSI QAPP, R2, Para. 18.2.10 states that analysis of audit results is to be performed to identify quality trends. A trending procedure has not been issued to date.

15. Upon review of the implementing procedure for the Los Alamos QAPP Criterion 13, it was found that the procedure does not implement Criterion 13 for items, and equipment.

6.0 SYNOPSES OF SDRS AND OBSERVATIONS

6.2 Observations (continued)

16. Los Alamos does not have in place adequate implementing procedures to NVO-196-17, Rev. 5.

18 ~~17~~. The Dual Storage Records Facility is not adequately protected from fires.

17 ~~18~~. For the Biological Sorption Test, sample storage and sample purity needs to be addressed in a procedure.

7.0 RECOMMENDATIONS AND ADDITIONAL COMMENTS

7.1 Recommendations

1. No internal procedure exists for qualifying existing data. An appropriate procedure needs to be established. This may be something that has to be done at the project level, although a procedure is intended to be written at Los Alamos (TWS-?-?-02.4).

2. Contact with Lawrence Livermore National Laboratory (LLNL), although frequent on an informal basis, should be documented periodically or formalized in some way to demonstrate that the Project is properly integrated. Perhaps simple documentation of verbal communications which is then entered into the records management system is all that is needed.

3. The rationale for the choice of investigations for studies of actinide speciation, especially with respect to the choices for complexing ligands to be investigated, should be documented. Perhaps this has been done, although it was not commented on during the audit. Also, the rationale for the choice of actinides and other radionuclides chosen for study should be documented. This latter item was explained in the opening overview presented by Dave Hobart. Reasons for inclusion or exclusion should be given. Preferably these choices should be agreed to by a peer review panel.

4. It appears that spectrometer calibration will be handled by a new procedure, still to be written. In any case this procedure should include periodic calibration of the spectrometer against an National Bureau of Standards (NBS) or other suitable standard and verification that standard spectra are reproduced with adequate accuracy as specified in the procedure.

7.0 RECOMMENDATIONS AND ADDITIONAL COMMENTS

7.1 Recommendations (continued)

5. It is recommended that attention be devoted to the relation between retardation and sorption ratio for the probable case at Yucca Mountain and that the shape of the breakthrough curve will be time dependent. In particular, any change that may lead to more rapid transport of radionuclides than predicted by the Hiester-Vermeulen equation should be evaluated. Mathematical developments of transport differing from this equation, caused by such phenomena as non-linear adsorption isotherms or other non-constant adsorption and transport properties (i.e. essentially the suggestion made by I. Triay), coupled with dispersion effects, seem worth pursuing.

6. The assumption that colloidal clay particles will be retarded at least as much as polystyrene latex spheres should be verified. Alternatively, concurrence by a peer review group is needed.

Additional Comments

A number of concerns arose during the audit that are of broader concern than the tasks assigned to Los Alamos, or that involved work that has not yet been started. It does seem important that these items be brought to the attention of the appropriate persons and addressed in the near future; though the mechanism for doing this is not clear, they are presented here for the consideration of Los Alamos.

A. This concern involves dynamic transport on a long-term basis. The sorption of radionuclides seems in many respects to be a metastable phenomenon. Thus, in the very long-term, the minerals onto which the radionuclides are sorbed may alter to stable minerals and, in the process release the radionuclides. This is particularly true if the sorbing minerals become heated by conduction or through convection of gases or liquids. This aspect of dynamic transport, i.e. destruction of the sorbent in the thermally disturbed zone with release of radioactivity followed probably by sorption further from the heat source, does not seem to be addressed anywhere. Perhaps this is part of performance assessment, but this is not, at present, obvious.

B. There is no effort to try to define different kinds of sorption sites in any way other than by deconvolution of adsorption isotherms. Other techniques are available, such as "magic angle." These should be incorporated into the overall assessment of sorption mechanisms and constants. The State of Nevada, for example, has conducted such experiments. A way should be found to utilize these data in the Project.

7.0 **RECOMMENDATION AND ADDITIONAL COMMENTS**

7.1 Recommendations

Additional Comments (continued)

C. There does not at present appear to be any criterion to determine when the data for sorption are good enough for Project purposes. This would appear to be a task for performance assessment to address. Several audit questions are related to this issue, e.g., T132, T133, T135, T136, and T137. Whereas in some instances, some degree of agreement between different methods of estimating sorption ratios has been obtained (specifically within a factor of three), there is no definitive criterion to say that this is good enough. For many of the most critical radionuclides, namely the actinides, the agreement is rather poor. Nevertheless, even the worst (most conservative) case may be good enough. If so, much of the present and planned work at Los Alamos is not needed. In such a case resources could be shifted to other important tasks, including work that Los Alamos could perform.

7. For the Hydrothermal Geochemistry task, error analysis needs to be described where appropriate, including the method and assumptions on error analysis. Ideally, error analysis should be discussed in the study plan being developed and in future papers that will be issued concerning this work. Other technical tasks should be reviewed for description and thoroughness in reporting error analysis for YMP work.

8. For the Biological Sorption task, work was performed by an outside consultant, Dr. Myron Sasser (University of Delaware), before a QA program was in place. Because this consultant identified the biological agent his work is important to the rest of the task. The quality level of this work should be determined. Documentation and records of this work should be determined and collected. Similar situations may exist in other research areas. The QA staff should perform a review of the work being performed and determine if any other work has been performed by an external contractor that should be documented and the QA level assessed.

9. Software used in the Biological Sorption task and the Hydrothermal Geochemistry task has not been properly documented and tracked. In the Biological Sorption task the software is used to perform the high pressure liquid chromatography analysis (Waters Equipment). In the Hydrothermal Geochemistry task several programs are being used and developed by the investigator to perform model calculations. It is recommended that both of these types of software be documented and tracked in accordance with procedure TWS-QAS-QP-3.1, Rev. 0, which was issued on 9/21/88. Backup of computer codes or draft computer codes should be considered.

7.0 RECOMMENDATIONS AND ADDITIONAL COMMENTS

7.1 Recommendations (continued)

10. It is recommended that the Los Alamos QA staff routinely (during internal audits and surveillances) check investigators' scientific notebooks for documentation, completeness, and applicability when procedure TWS-MSTQA-QP-14, Rev. 1, is being used by an investigator. Research and development of work for which there is no established procedure particularly needs to be well documented.

11. It is recommended that, when work is stopped or ended on a project that utilizes calibrated M&TE, the M&TE be recalibrated to assure that the data generated from the previous calibration to the end of the project will not be suspect due to the possibility of the M&TE being out of calibration.

12. Future technical procedure revisions should include more in-depth shipping and storage requirements. Procedures should require that when samples are used up it be recorded, or they should specify whether minimum amounts of samples are to be maintained.

13. QA should develop a list of personnel who are qualified to disposition NCRs. This has been left to the decision of the Quality Assurance Implementation Manager (QAIM) in the past, but nothing was documented.

14. Implementing Procedures need to identify who is responsible to generate Conditional Releases (CRs) and the method used to document the CRs.

15. Proposed or Recommended Corrective Actions should be reviewed by appropriate levels of management of affected organizations to avoid possible action that might be inappropriate or unattainable.

16. Document identification is accomplished by a Los Alamos Terminal Waste Storage (TWS) number. This number is used in order to properly identify the document for filing, storage, and retrieval. The number is assigned by the Resident File Custodian (RFC). There are approximately 11 RFCs. The TWS numbers are not assigned in the same format by the RFCs. Although during the audit the records requested were retrieved it was a difficult problem for the Records Management personnel. It is recommended that the TWS number be standardized to provide more timely retrieval and to prevent future problems as the project grows and generates a larger volume of documents. Examples are as follows:

    TWS-N5/03-88-93
    TWS-EES-1-3/88-22
    TWS-HSE12-6/88-29
    TWS-N5/03-88-003

7.0 RECOMMENDATIONS AND ADDITIONAL COMMENTS

7.1 Recommendations (Continued)

The above examples identify the project, originator group, month and year originated, and sequential number. Procedures are identified by a different format.

17. It is recommended that the procedures regarding Records Management be considered careful with respect to the requirement documents. All methods necessary to implement requirements must be incorporated. It was noted during the audit that requirements were not understood by personnel responsible for writing or implementing procedures. It is recommended that if a requirement is not understood or interpretation is needed, proper individuals be notified. For example, the draft procedures for TWS-QAS-QP-17.1 do not adequately incorporate the requirements of the NNWSI QAPP, Rev. 1.

8.0 REQUIRED ACTION

A written response is required for each SDR delineated in Section 6.0 above. The original copies of the SDRs were forwarded to the Los Alamos TPO on 11/22/88. Responses to each SDR are due 20 working days from the date of the SDR transmittal letter. Upon response, acceptance, and satisfactory verification of all remedial and corrective actions, the SDRs will be closed and Los Alamos will be notified by letter of the closure.

A written response is required for the 18 observations contained in Enclosure A of this report. Responses are due 25 working days after the transmittal letter date of this audit report.

Written responses are not required for the recommendations contained in this audit report. The recommendations were generated by the audit team for the Los Alamos staff to consider during implementation of its QA program.

ENCLOSURE 1

Severity Levels

Severity Level 1

Significant deficiencies considered of major importance. These deficiencies require remedial, investigative, and corrective actions to prevent recurrence.

Severity Level 2

A deficiency which is not of major importance, but may also require remedial, investigative, and/or corrective action to prevent recurrence.

Severity Level 3

A minor deficiency in that only remedial action is required. These deficiencies are generally isolated in nature or have a very limited scope. In addition, the integrity of the end result of the activity is not affected nor does the deficiency affect the ability to achieve those results.

NAME	ORGANIZATION	TITLE	PREAUDIT CONFERENCE	DURING AUDIT	POSTAUDIT CONFERENCE
Hadden, Jane W.	OCRWM	QA Manager	X		X
Hampton, Catherine	YMP	QA Specialist	X		X
Herbst, R. J.	Los Alamos	Deputy Grp. Leader	X	X	X
Heranan, Larry E.	Los Alamos	Principal Investigator	X	X	X
Hobart, David E.	Los Alamos	Staff Member	X	X	X
Jerkin, Eileen	Los Alamos	Admin. Specialist			X
Kirk, William	Los Alamos	Deputy Div. Leader	X	X	X
Lopez, Loretta	Los Alamos	Records Keeper	X	X	X
Maassen, Larry	LATA	QAL	X	X	X
Mansel, Wendell	YMP	Lead Auditor	X		X
Marchand, William	OCRWM	QA Engineer	X		X
Marley, Richard	LATA	QA Staff	X	X	X
Mattson, Steven R.	SAIC	Geochemist	X	X	
McGowan, Michael	LATA	QA Staff	X	X	X
Meyer, Arenel	Los Alamos	Principal Investigator	X	X	X
Mitchell, Alan T.	Los Alamos	Tech.	X		X
Mihm, Kathy	OCRWM	Geologist	X		X
Monks, Royce E.	YMP	QA Engineer	X		X
Morgenstein, Marty	State of NV	Mineralogist	X	X	X
Morris, Wayne	Los Alamos	Group Leader	X		X
Norris, A. E.	Los Alamos	Staff Member	X	X	X
Nunes, Henry	Los Alamos	QAPL	X	X	X
Oakley, D. T.	Los Alamos	TPO	X	X	X
Ortiz, Gabriel	Los Alamos	Records Manager	X	X	X
Parsons, Mike	SAIC	Licensing Engineer	X	X	X
Pendergrass, Ann	LATA	QAS	X	X	X
Polzer, Wilfred L.	Los Alamos	Staff Member	X	X	X
Rutland, Carolyn	SAIC	Geochemist	X		X
Ruth, Fred J.	SAIC	QA Engineer	X		X
Sandoval, Lee	EG&G	Operations Mangaer	X	X	X

AUDIT REPORT 88-08
ENCLOSURE 2

NAME	ORGANIZATION	TITLE	PREAUDIT CONFERENCE	DURING AUDIT	POSTAUDIT CONFERENCE
Aldrich, James	Los Alamos	Staff Member	X		
Bradbury, John	US/NRC	Geochemist	X		X
Braxton, Dave	Los Alamos	Staff Member	X	X	X
Bryant, Everett P.	SAIC	QA Engineer	X		X
Byers, Lynn	Los Alamos	Tech. Writer	X		X
Caldwell, Henry H.	SAIC	Manager, Audits			X
Camp, William	SAIC	Audit Team Leader	X		
Canepa, Julie	Los Alamos	Staff Member	X	X	X
Carlos, Barbara	Los Alamos	Staff Member	X	X	X
Chesnut, Dwayne	SAIC	Hydrogeologist	X		X
Cisneros, Michael	Los Alamos	Chem. Tech.	X	X	X
Cloke, Paul	SAIC	Sr. Staff Scientist	X		X
Cole, Eric	Los Alamos	QAS	X		X
Cotter, Mae	SAIC	Branch Manager	X		
Curtis, David	Los Alamos	Deputy Grp. Leader	X	X	X
Daniels, William	Los Alamos	Group Leader	X	X	
Dickson, Frank	State of NV	Geochemist	X		X
Donnelly, James	US/NRC	QA Engineer	X		X
Duffy, Claire	Los Alamos	Staff Member	X	X	X
Dye, Suzanne	Los Alamos	QAL	X	X	X
Ebinger, Michael	Los Alamos	Staff Member	X	X	X
Edwards, Roxanne	YMP	Gen. Engineer	X		X
Eggert, Ken	Los Alamos	Staff Member		X	X
Eppler, Dean	SAIC	Lead Tech. Specialist	X		X
Essington, Edward	Los Alamos	Staff Member		X	X
Foster, Karen	LATA	QA Staff	X	X	X
Friend, John C.	SAIC	QA Engineer	X	X	X
George, James J.	LATA	QAS Project Manager	X	X	X
Gilray, John	US/NRC	QA Engineer	X	X	X
Guthab, Paul R.	Los Alamos	QAO	X	X	X

AUDIT REPORT 88-08
ENCLOSURE 2

NAME	ORGANIZATION	TITLE	PREAUDIT CONFERENCE	DURING AUDIT	POSTAUDIT CONFERENCE
Schwartztrauber, K.	SAIC .	QA Engineer	X		X
Springer, Everett	Los Alamos	Staff Member	X	X	X
Tillery, Patricia	LATA	QAS	X	X	X
Thomas, K. W.	Los Alamos	Project Leader	X	X	X
Trbovich, Thomas C.	US/NRC	QA Engineer	X		X
Triary, Iris R.	Los Alamos	Staff Member	X	X	X
Ulseth, James	SAIC	QA Engineer	X		X
Vam, Dave	Los Alamos	Staff Member	X	X	X
Vancamp, Scott	OCRWM	Geologist	X		X
West, Karen A.	Los Alamos	Staff Member	X	X	X
Zimmerman, Susan	State of NV	QA Manager	X		X

WMPO OBSERVATION NO. 88-08-01

N-QA-012
8/88

Completed By Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	P. L. Cloke	10/6/88
Organization: Los Alamos National Laboratory	**Person(s) Contacted:** R. Rundberg	Response Due Date is 30 Days from Date of Transmittal

Discussion:

During checking of laboratory notebooks, it was found that measurement units were not entered on two successive pages. They were corrected by entering "psi" and "ml" at the column headings for tables on these pages. However, these notebooks need to be checked thoroughly to ensure that all units have been recorded.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV [illegible]

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-02

N-QA-012
8/88

Noted During:	Identified By:	Date:
QA Audit 88-08	P. L. Cloke	10/5/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	D. Hobart	

Completed by Originating QA Organization

Discussion:

During discussion of audit item T-77 it was found that no checks were made to verify that the program HEADSTART used to control the potentiostat actually controlled to the desired voltage. The program does not contain built in calibration, thus, if at any time the program should fail to function properly, this would not be known. LANL agreed to design and implement a procedure using resistors and other appropriate equipment to correct this deficiency.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-03

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	Steve Mattson	10/4/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

Samples for the Hydrothermal Chemistry work were not stored in a locked area. Only eleven samples currently exist and all these samples were obtained from hydrothermal bomb experiments (i.e., not from Yucca Mountain). A secure facility should be found for these types of samples. As work progresses and more bomb experiments are performed, sample traceability will need to be documented.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Covey	10/27/88	R A Caldwell	NOV 21 1988

Completed By Responder

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-04

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	Keith Schwartztrauber	10/4/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Mike McGowan	

Discussion:

LANL procedure TWS-QAS-QP-3.1, R0, Section 6.0 provides how code configuration will be controlled. However, Subsection 6.3 does not specify code indentifiers will include code revision number and associated quality assurance level identification. It is recommended that LANL implement code identification system which includes: code version, code revision and code quality assurance level identifiers in output.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-05

N-QA-012
8/88

Noted During:	Identified By:	Date:
QA Audit 88-08	Keith Schwartztrauber	10/4/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Mike McGowan	

Completed By Originating QA Organization

Discussion:

LANL procedure TWS-QAS-QP-3.1, R0, Section 7.2 does not provide quantitative or qualitative criteria describing how existing software will be qualified for use in YMP scientific investigations if the software has reached the coding state and does not meet the requirements for life cycle documentation. LANL should modify the procedure to include criteria for qualification of existing software beyond the coding stage.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Responder

Response:

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Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-06

N-QA-012
8/88

Noted During:	Identified By:	Date:
QA Audit 88-08	Keith Schwartztraüber	10/6/88
Organization: Los Alamos National Laboratory	**Person(s) Contacted:** Ken Eggert/Eric Nuttall (UNM)	**Response Due Date is 30 Days from Date of Transmittal**

Completed by Originating QA Organization

Discussion:

LANL has contracted with Nuttall and Associates, Inc. of Albuquerque, NM using an "Affiliate Invitation Request" whereby Dr. Nuttall provides scientific services to LANL to develop a "Colloid Transport Model" for the YMP. However, this contract agreement (AIR) contains no scope of work for Dr. Nuttalls work and no objective evidence was provided during the audit to describe his duties or define the job description for which Dr. Nuttall is fulfilling.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Cond	10/27/88	[signature]	NOV 21

Completed By Respondee

Response:

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Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-07

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	F. J. Ruth	10/4/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

Provide objective evidence the following concerns are addressed in the revision to TWS-QAS-QP-02.1 "NNWSI Personnel Selection, Training, and Certification,"

1. Documented evidence that the QALs have established training requirements specific to individual needs on the required NNWSI Project Training Forms.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Grams	10/27/88	[signature]	NOV 21 1988

Completed By Responder

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

Observation No. 7 (cont'd)

2. How is the information transmitted to training? Who evaluates when completed for effectiveness? How does training know what training to conduct?

3. Is this NNWSI Project Training Form or equivalent re-evaluated annually?

WMPO OBSERVATION NO. 88-08-08

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	F. J. Ruth	10/4/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

Based on the scope of work being conducted by LANL, there is not sufficient dedicated QA personnel assigned to support Yucca Mountain Project activities at this time.

Serious consideration should be given to adding additional full time trained QA staff to LATA and LANL.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Craus	10/27/88	[signature]	NOV 21 1988

Completed By Responder

Response:

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Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

N-QA-012
8/88

WMPO OBSERVATION NO. 88-08-09

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	J. C. Friend	10/5/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	H. Nunes	

Discussion:

LANL recently implemented a change in their QA Program which allows for any nonconforming condition (except for those affecting hardware items) to be identified by use of a Corrective Action Report. Subsequently 28 CARs have been issued since 8/26/88. Several CARs written have addressed discrepancies which are minor in nature and are not significantly adverse to quality (e.g., CAR #011, issued 4/22/88 for a misnumbered quality report and CAR #42 issued for a notebook reviewer not attending a scheduled quarterly review.)

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

Observation No. 9 (cont'd)

The NNWSI QA Plan defines a corrective action system as one which shall ensure that significant conditions adverse or potentially adverse to quality are identified promptly and corrected as soon as practical.

If the LANL present corrective action system is continued, the intent of the NNWSI QA Plan will not be met and the meaningfulness of the CAR will be reduced as an effective management tool. LANL should only use CARs when significant conditions adverse to quality are identified. Minor discrepancies should be handled under a separate system. Excessive and unwarranted CARs will effectively degrade the meaning of the program. LANL's response to this observation should consider:

1. Means/methods for bringing the current CAR system into line with the original (traditional) intent.
2. Timing for bringing the system in line with the above.

WMPO OBSERVATION NO. 88-08-10

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	E. P. Bryant	10/3/88
Organization: Los Alamos National Laboratory	**Person(s) Contacted:** H. Nunes/L. Maassen	Response Due Date is 20 Days from Date of Transmittal

Discussion:

Presently no SIP implementing procedure has been reviewed that specifically says that signature of Technical Reviewer means that all annotated criteria from QAPP, R2, para. 3.1.3 have been addressed.

In the absence of any mandate to retain review documentation-other that determination of QA Levels-the intent and responsibility of the signature should be delineated.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

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Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-11

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	F. J. Ruth	10/3/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

The organizational chart identifies an upper management position as the N-Division Program Director of Nuclear Programs. His responsibilities should be addressed in the context of Section 1.0 of the QAPP but are not.

The next revision to the QAPP should describe his responsibilities.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

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Signature: **Date:**

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Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-12

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	M. Cotter	10/5/88
Organization: Los Alamos National Laboratory	**Person(s) Contacted:** G. Ortiz/P. Tillery	Response Due Date is 30 Days from Date of Transmittal

Discussion:

LANL NNWSI QAPP, Rev. 2, Para. 17.4 requires those documents designated to become records must be legible. Para. 17.8 requires a method for verifying that the records received are legible.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

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Signature: **Date:**

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Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

Observation No. 12 (cont'd)

The method established by LANL requires the personnel in the Records Processing Center (RPC) to scan each record for legibility. If unacceptable records are identified, RPC personnel calls the Resident Files to obtain a complete or more legible copy. A rejection form has also been established in an effort to obtain legible records. If a better copy can not be produced, the record is then stamped "Best Available Copy". This method is in the process of being proceduralized under the new records management system (ARS).

During the review of several records, numerous illegible documents were consistently stamped "Best Available Copy". This is a concern considering the possibility that an effort is not being placed on getting a legible copy. It appeared that part of the problem was that careful attention was not placed on copies being reproduced (Xeroxed). Examples of the documents were raw data records, notebooks, etc...that could be traced back to the Resident Files or record source where a legible copy could be maintained.

WMPO OBSERVATION NO. 88-08-13

N-QA-012 8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	J. A. Ulseth	10/5/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

Reference: LANL NNWSI QAPP, R2, Para. 18.2.5

The Ref. Para. states that the audit plan shall include audit requirements. A review of audit plans for LANL audits 88-02 (UTEP), 88-04 (EG&G) and 88-10 (ESS-4) did not clearly state the audit requirements nor was there a heading labeled audit requirements. A discussion with the contact indicated that audit requirements are not well defined for LANL audits.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

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Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

N-QA-012
8/88

WMPO OBSERVATION NO. 88-08-14

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	J. A. Ulseth	10/5/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

Reference: LANL NNWSI QAPP, R2 Para. 18.2.10 states that analysis of audit results is to be performed to identify quality trends. Discussion with contact, stated that a trending procedure has not been issued to date.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

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Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-15

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	J. A. Ulseth	10/6/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Mike McGowan	

Discussion:

Reference: TWS-QAS-QP-13.1, R0 Review of the implementing procedure for the LANL QAPP Criterion 13 and also by discussion with the contact, it was found that the Ref. Procedure does not implement Criterion 13 for Item, Equipment.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondent

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-16

N-QA-012
8/88

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	W. H. Camp	10/5/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 30 Days from Date of Transmittal**
Los Alamos National Laboratory	Henry Nunes	

Discussion:

Observation No. 16

Activities affecting quality have been performed without the utilization of adequate or existing quality procedures. Los Alamos does not have in place, adequate implementing procedures to NVO-196-17, Rev. 5.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

N-QA-012
8/88

WMPO OBSERVATION NO. 88-08-17

Completed by Originating QA Organization

Noted During:	Identified By:	Date:
QA Audit 88-08	D. Chesnut	10/4/88
Organization:	**Person(s) Contacted:**	**Response Due Date is 20 Days from Date of Transmittal**
Los Alamos National Laboratory	H. Nunes	

Discussion:

For the Biological Sorption Task, sample storage and biological sample purity needs to be addressed in a procedure and/or perhaps described in a "report".

The report should contain the rational and method of sample storage and sample purity. Secondary, backup storage locations of the bacteria being analyzed should also be discussed.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Carp	10/27/88	R. A. Caldwell	

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

WMPO OBSERVATION NO. 88-08-18

N-QA-012
8/86

Noted During:	Identified By:	Date:
QA Audit 88-08	M. Cotter	10/4/88
Organization: Los Alamos National Laboratory	**Person(s) Contacted:** H. Nunes	Response Due Date is 30 Days from Date of Transmittal

Completed by Originating QA Organization

Discussion:
LANL NNWSI QAP, Rev. 2, Section 17.0 requires, "Records and documents are stored in dual facilities constructed and maintained in a manner that minimizes risk of damage or destruction from natural disasters such as...fires. At one record storage area, the only fire protection afforded was a heat activated water sprinkler system. In another area, the only fire protection noted was a fire extinguisher mounted near the trailer entrance, approximately 40 feet from the records storage area.

QAE/Lead Auditor	Date	Branch Manager	Date
William H. Camp	10/27/88	[signature]	NOV 21 1988

Completed By Respondee

Response:

INFORMATION COPY

Signature: **Date:**

Completed By QA Org.

Response Receipt Verified/Closed ☐

QAE/Lead Auditor	Date	Branch Manager	Date

Remarks:

Caldwell
T: S. Klein

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 2 2 1988

Mr. Ralph Stein, Associate Director
Office of Systems Integration and Regulations
Office of Civilian Radioactive Waste Management
U. S. Department of Energy RW-24
Washington, D. C. 20545

Dear Mr. Stein:

The purpose of this letter is to transmit an observation audit report by members of the Nuclear Regulatory Commission (NRC) staff on a recently conducted Department of Energy/Yucca Mountain Project Office (DOE/YMPO) audit of Los Alamos National Laboratory (LANL). The staff believes that the audit team performed an acceptable audit which resulted in identifying significant weaknesses in LANL's QA program. However, some weaknesses in the audit process were identified by the staff and are addressed in the body of this report. These weaknesses should not be misconstrued as major findings but rather of sufficient importance to merit corrective measures which, when implemented, should improve even further the effectiveness of future audits.

DOE/YMPO should review the staff observations and provide a response within 30 days of the date of this letter describing how these will be considered in future audits. If you cannot meet this date, please inform the staff of the DOE schedule for responding within ten days of the date of this letter.

If you have any questions please call Mr. John Gilray on FTS 598-6125 or Mr. Joe Holonich on FTS 492-3403.

Sincerely,

John J. Linehan

John J. Linehan, Director
Repository Licensing and Quality
Assurance Project Directorate
Division of High-Level Waste Management

Enclosure: As stated

cc: C. Gertz, DOE
R. Loux, State of Nevada

ACTION: DOBSON
CC: GERTZ/WILMOT
CC: DUEK/BJERSTEDT
CC: CRAWLEY
CC: LEVICH
CC: BLANCHARD
CC: GIORA-SALY
CC: BLAYLOCK/KRIVANEK
CC: MANSE
CC: BACA/~~DOBSON~~ EDWARDS MACTEC
REC'D IN WMPO

8812?7.000?

U. S. NUCLEAR REGULATORY COMMISSION

OBSERVATION AUDIT REPORT

FOR THE

YUCCA MOUNTAIN PROJECT OFFICE

AUDIT NO. 88-08 OF

LOS ALAMOS NATIONAL LABORATORY

Joe Holonich 11/22/88
Joe Holonich, Project Manager
Repository Licensing Project Directorate
Division of High-Level Waste Management

11/23/88
James Kennedy, Section Leader
Repository Licensing Project Directorate
Division of High-Level Waste Management

James Donnelly for 11/22/88
John W. Gilray, Team Leader
Repository Licensing Project Directorate
Division of High-Level Waste Management

NRC OBSERVATION REPORT OF DOE/YMPO
AUDIT OF LANL (#88-08)

Summary

From October 3, 1988 through October 7, 1988 the Nuclear Regulatory Commission (NRC) staff participated as observers of the Department of Energy/Yucca Mountain Project Office (DOE/YMPO) audit (#88-08) of Los Alamos National Laboratory (LANL). The purpose of this observation was to evaluate the effectiveness of the YMPO audit and to determine whether DOE and its contractor are properly reviewing and implementing their quality assurance (QA) programs. The NRC staff based their conclusions on direct observations of the auditors, discussions with the audit team, and review of the pertinent audit information (e.g., the audit plan and checklist).

The staff has concluded that the overall audit was acceptable in that it resulted in identifying significant weaknesses in LANL's QA program. In particular, the LANL QA program lacked clear procedures of how to implement the QA program and lacked a well defined QA training program. As a consequence, the QA program was not being effectively implemented. The NRC staff believes that the deficiencies identified in this audit are of such a magnitude that a follow-up audit of LANL should be performed soon after they have corrected these deficiencies and have upgraded their QA program to meet the DOE/YMPO 88-9 requirements document. The NRC staff has identified some shortcomings in the audit process (noted in the report) that should be corrected in order to enhance the effectiveness of future audits.

1.0 Introduction

From October 3, 1988 through October 7, 1988 the Nuclear Regulatory Commission (NRC) staff participated as observers in the Department of Energy/Yucca Mountain Project Office (DOE/YMPO) quality assurance (QA) audit of Los Alamos National Laboratory (LANL). LANL is the prime contractor responsible for nuclide migration, geochemistry, mineralogy, and petrology studies. LANL also acts as the lead technical organization for the coordination and scheduling of the exploratory shaft testing program.

The DOE/YMPO audit (#88-08) was conducted at LANL, Los Alamos, New Mexico, to determine the effectiveness of LANL's QA program in meeting the requirements of NNWSI NVO-196-17, Revision 5 and to verify implementation of this QA program as it relates to the Yucca Mountain Project. The remainder of this report will address the adequacy of the DOE/YMPO audit (#88-08). The NRC staff's evaluation of the DOE/YMPO audit team is based on direct observations of the auditors, discussions with the audit team, and review of the audit plan, checklist and background material.

2.0 Scope and Purpose of NRC Staff Participation

The purpose of the staff observation was to evaluate the effectiveness of the YMPO audit and to determine whether DOE and its contractor are properly reviewing and implementing their QA programs in accordance with DOE requirements and 10 CFR Part 50, Appendix B. Observation audits enable the staff to provide recommendations to DOE on their audit program and the implementation of their contractor's QA programs. These observations of DOE/YMPO audits and the subsequent recommendations should assist DOE in meeting the NRC's QA requirements.

3.0 Audit Team Members

The DOE/YMPO audit team members, the NRC observers, and other observers are listed below.

NRC

John Bradbury	Observer	
James Donnelly	Observer	
John Gilray	Observer	
Thomas Trbovich	Observer	Center for Nuclear Waste Regulatory Analysis, San Antonio, Texas

DOE

William Camp	Audit Team Leader	SAIC, Las Vegas, Nevada
Wendell Mansel	Lead Auditor	YMP ~~SAIC~~, Las Vegas, Nevada
Mae Cotter	Auditor	SAIC, Las Vegas, Nevada
John Friend	Auditor	SAIC, Las Vegas, Nevada
Fredrick Ruth	Auditor	SAIC, Las Vegas, Nevada

James Ulseth	Auditor	SAIC, Las Vegas, Nevada
Everett Bryant	Auditor	SAIC, Las Vegas, Nevada
Catherine Hampton	Auditor Trainee	YMP, Las Vegas, Nevada
Dean Eppler	Lead Technical Specialist	SAIC, Las Vegas, Nevada
Duane Chesnut	Technical Specialist	SAIC, Las Vegas, Nevada
Paul Cloke	Technical Specialist	SAIC, Las Vegas, Nevada
Steven Mattson	Technical Specialist	SAIC, Las Vegas, Nevada
Carolyn Rutland	Technical Specialist	SAIC, Las Vegas, Nevada
Keith Schwartztrauber	Technical Specialist	SAIC, Las Vegas, Neveda
Royce Monks	Observer	YMP, Las Vegas, Nevada
Robert Waters	Observer	YMP, Las Vegas, Nevada
Roxanne Edwards	Observer	YMP, Las Vegas, Nevada
Jay Jones	Observer	OCRWM, Washington, DC
Kathleen Mihm	Observer	OCRWM, Washington, DC
Karl Sommer	Observer	OCRWM, Washington, DC

<u>State Observers</u>

Susan Zimmerman	Observer	State of Nevada, Reno, Nevada
Frank Dickson	Observer	State of Nevada, Reno, Nevada
Maurice Morganstein	Observer	State of Nevada, Reno, Nevada

4.0 Staff Observations

As observers, the NRC staff evaluated the effectiveness of the audit and audit team. The audit areas that were observed and evaluated included:

(1) scope of the audit;
(2) timing of the audit;
(3) technical products;
(4) conduct of the audit;
(5) qualification of the auditors;
(6) audit team preparation
(7) conduct of meetings; and
(8) team coordination

4.1 Scope of Audit

The NRC staff noted that the audit plan did not address the following 10 CFR Part 50, Appendix B criteria:

9.0 Control of Special Processes
10.0 Inspection
11.0 Test Control
14.0 Inspection, Test and Operating Status

When this concern was brought to the attention of the audit team leader it was explained by the audit team that these particular criteria are not applicable to LANL's scientific investigative work. Indirectly, these controls are addressed in other sections of LANL's QA program, particularly in Section 3 which pertains to scientific investigations. This policy has been previously discussed with the NRC and found acceptable. It is recommended however, that when an Appendix B criteria is not included in the audit that the audit plan specifically identify this and describe the rationale for not including the criteria in the scope of the audit.

4.2 Timing of Audit

DOE/YMPO's last audit of LANL was conducted on March 30 through April 3, 1987. As a result of the increased level of QA and technical activities at LANL and as a result of the preliminary findings from this 88-08 audit, the staff believes that this audit was essential. However, based on the number of problems identified by the audit team and the LANL QA organization, DOE/YMPO should have either increased the frequency of their audits or instituted a more effective surveillance program of the ongoing LANL QA and technical activities in order to identify and correct problems in a more timely manner.

4.3 Technical Products

The NRC technical staff witnessed portions of the audit in the following technical areas:

1) Hydrothermal Geochemistry 86/4.1.3-HG, Rev. 0
2) Biological Sorption Transport 86/4.1.5-MB, Rev. 1
3) Sorption 86/4.1.5-SP, Rev. 0
4) Solubility Determination 86/4.1.4, Rev. 0
5) Dynamic Transport Process 86/4.1.6-DTP, Rev. 0
6) Retardation Sensitivity Analysis 86/4.1.7, Rev. 0
7) Reactive Tracer Testing 86/4.1.1/C-Wells, Rev. 0

Due to the scheduling of the audit interviews concurrently, the NRC staff was not able to witness all of the technical discussions (checklist questions and responses). The NRC technical staff selected which interviews to observe based on 1) the possible significance of the area to repository performance or site characterization, 2) the familiarity of the observer with the auditor (as from previous audits), and 3) the familiarity of the observer with the technical area. The areas tracked extensively by the NRC staff were Dynamic Transport Process, Solubility Determination, and Sorption. Portions of Reactive Tracer Testing and Biological Sorption Transport interviews were observed. The interviews for Hydrothermal Geochemistry and Retardation Sensitivity Analysis were not observed.

The choice of the technical areas audited was appropriate. These technical areas are key to some of the geochemical aspects of site characterization and performance assessment. The rest of the key geochemical areas were audited in 1987.

Objectives for the technical phase of the quality assurance audit were included as part of the audit notebook. A list of questions (Appendix A) were provided to serve as a basis for the checklist questions. Not all of the objectives of the audit were met. For example, the question "Were the procedures in place technically adequate for the intended application?" was not addressed. Sorption ratios from batch experiments were not shown in this audit to be adequate for modeling the repository. Another question not addressed was "Were there sufficient technical procedures for the activity under review?" The checklist questions referred to existing procedures, not all of the alternative procedures that might be considered to characterize the site. The types of questions in Appendix A are better addressed in a peer review and not a QA Audit. The scope of the audit would be too large if these questions were considered.

The review of technical products by the DOE technical auditors was adequate. Questions from the checklist provided a basis for discussion. However, the technical auditors sometimes expanded the questioning when appropriate to determine how the activity fit into the overall site characterization program.

It was noted by the DOE technical auditors that the technical products (milestones) from certain activities are not so detailed as to allow one to track results back to specific experiments on specific samples. These details are contained in laboratory notebooks.

The auditors were thorough in their review of laboratory notebooks. They spent considerable time tracing results back through the notebooks. They noted that, in some isolated cases, portions of some laboratory notebooks were illegible. However, for the most part, laboratory notebooks were immaculate.

The DOE technical audit team members were generally prepared as indicated by the substance of some of the checklist questions and the discussions they held with the principle investigators. One exception, however, was their failure to consider the information form the NRC "mini" audit in June 1987. (Also discussed in Section 4.6.) The "mini" audit reviewed some of the same detailed procedures as contained in this audit. It was found in the "mini" audit that the detailed procedures did not contain a section on acceptance criteria as required in the LANL QA Program. The NRC technical observer did not hear any discussion of this finding by the technical auditors at this DOE audit.

The audit team appeared well-coordinated and improved through the course of the audit. For example, it was noted by the DOE programmatic auditors that J-13 groundwater had been supplied over a number of years to LANL in 55 gallon drums. Five drums had been used since the beginning of the sorption/solubility work. However, the information in the laboratory notebooks did not specify from which drum water was taken. The technical auditors looked into this possible area of concern. Discussion in the caucus concerned the effect on quality if the drums were not differentiated. Various points of view were presented and a decision was made concerning the action to be taken by the audit team.

4.4 Conduct of the Audit

Based on an overall evaluation by the NRC staff of the performance of the DOE/YMPO audit team, the NRC staff concludes that the conduct of the audit was effective and acceptable with the exception of some select areas of weakness. Both the QA and technical audit team members demonstrated the necessary skills in their investigations and evaluations of LANL's activities and QA documentation associated with the Yucca Mountain Project. As a result of this effort, numerous QA programmatic and several technical deficiencies were identified along with an effectiveness statement provided for each area audited. Of particular interest was the constructive and productive dialogue and interchange of audit findings, concerns and information that was exhibited between the QA and technical audit team members during the daily audit caucuses. Furthermore, when it appeared that the LANL staff was imposing constraints on the audit scope during the early stages of the audit, the DOE/YMPO audit team leader, through discussions with the LANL Technical Project Officer (TPO), was successful in getting a clear policy statement to members of the LANL staff that the DOE/YMPO audit teams have the freedom to audit any areas of activity pertaining to the Yucca Mountain Project. This action improved the cooperation of the LANL staff.

The staff observed in one instance that an auditor did not adequately follow-up a concern when it was observed by the staff that one of the LANL employees apparently lacked basic knowledge of their own QA manual. The NRC staff is concerned since this individual is one of the more experienced QA professionals for the LANL/YMPO and should have been thoroughly familiar with the QA manual which they developed. In this specific instance, the auditor was unaware of the apparent lack of knowledge. The NRC staff informed the audit team of this concern and noted that this problem could be an indication of other more serious problems (i.e., inadequate staff numbers, lack of or poor training, etc.) The NRC staff recommends that when such instances are encountered, that appropriate follow-up action be taken to determine if corrective action is necessary and if such concerns are symptoms of a much larger problem.

Other areas of weakness are addressed in section 4.2.1, 4.2.2, 4.2.5, and 4.2.7 of this report. Again these weaknesses should not overshadow the overall success and effectiveness of the audit but are addressed in order that corrective measures may take place to enhance the overall audit process.

4.5 Qualification of the Auditors

As part of its effort to more efficiently observe the DOE audit program, the staff has conducted a review of the SAIC QA auditors who could be used on DOE/YMPO audit teams and the procedure used to qualify them. The results of this review are contained in the staff observation report covering the DOE/YMPO audit of the U.S. Geological Survey (John J. Linehan (NRC) letter to Ralph Stein (DOE) dated August 22, 1988). Based on this review, the staff concluded that the DOE/YMPO QA auditors available for audits were acceptably qualified to perform QA audits. In addition, as a result of its review of QMP-02-02, "Qualification of Quality Assurance Program Audit Personnel," the staff concluded any new auditors qualified using this procedure would also be acceptable. Since the qualifications of the auditors on the team were reviewed by the staff or were qualified using QMP-02-02, the staff finds the team qualified.

The qualifications of the technical auditors were reviewed by the NRC technical observer. Those qualifications were found to be adequate for the technical areas audited. All technical auditors had PhDs in related fields and experience ranging from 3 to 30 years.

4.6 Audit Team Preparation

In general, the staff believes that although the audit team was prepared for the audit, there were areas where the team could have exhibited better preparation. The audit team was familiar with the YMPO and LANL requirements documents, had prepared an audit plan, and followed their implementing procedure QMP-18-01 in conducting audits. The audit team did not, however, insist on obtaining the LANL QA program implementing procedures for review prior to conducting the audit. LANL's rationale for not wanting to send these procedures to the audit team was that the procedures were being revised to meet the YMPO 88-09 QA requirements document. Consequently, the audit team was not familiar with the QA program implementing procedures and some audit time had to be directed to the review of these procedures while at Los Alamos. In addition, the checklists were therefore prepared against the LANL QA Program Plan during the pre-planning phase rather than against the QA program implementing procedures. As a result, some of the QA programmatic checklist questions were superficial in nature. The staff believes the audit could have been more effective if the QA program implementing procedures were available to the audit team during the preparation stage of the audit.

Also, the staff believes that insufficient attention was given to the audit findings identified by NRC in their June 1987 audit of LANL. The NRC's audit report could have been a useful aid in assisting the audit team in identifying previous weaknesses in LANL's QA program which could be reaudited to determine the extent of effective corrective action. Through discussions with the audit team members, it was apparent that some of them were not aware of the NRC audit report. For future audits, the NRC staff recommends that information of this type. be utilized by the audit team to enhance the overall effectiveness of the audit.

4.7 Conduct of Meetings

The overall conduct of the preaudit and postaudit conference by the audit team was acceptable. During the preaudit conference, the scope of the audit was clearly defined, requirements documents were identified, and questions or comments were encouraged. At the postaudit conference, the deficiencies were explained well and the LANL personnel were given the opportunity to respond. Likewise, the observers were afforded the opportunity to make comments during the preaudit, postaudit and daily caucus meetings. This is consistent with QMP-18-01 and standard auditing practice.

The daily caucuses were conducted in a very effective manner. Productive dialogue took place between the QA and technical members of the audit team. This allowed members to consider whether concerns were symptomatic of a generic or larger problem. Also, members were able to identify perceived QA weaknesses and direct their attention and evaluation in these areas. This was particularly evident in the areas of record control, traceability of test samples and data, and in the control of technical notebooks.

4.8 Audit Team Coordination

The staff found the coordination and direction of the audit team members during the first two days somewhat disorganized. For example, at the beginning of each day, the audit team was assigned several LANL staff members as escorts, At the same time and same location, LANL management was attempting to meet with the audit team leader for the daily briefing. As a result of the large number of people in one room, with different objectives, execution of assignments and utilization of resources were not very effective. The staff recommends that, in the future, the briefing meetings be conducted in a separate room away from other audit team members.

4.9 Summary of Observations

Based on the information contained in the previous sections, the NRC staff has identified areas where improvements in the overall audit process could be achieved. For each observation provided the staff has identified the report section where it is discussed in more detail. DOE/YMPO should review the NRC staff observations and provide a response describing how these will be considered in future audits.

<u>Observation 1</u>

For future audits, all elements of 10 CFR 50, Appendix B should be included and addressed in the audit plan. When certain elements of Appendix B are not part of the audit, the basis and justification for not including these in the audit should be addressed in the audit plan. (Section 4.1)

Observation 2

When the lack of necessary knowledge is detected in the audited organization's staff, this should be followed up with further investigation to determine the extent of the problem and whether the concern is symptomatic of a much larger problem. (Section 4.4)

Observation 3

The QA implementing procedures should be available and utilized by the audit team during the preparatory stages of the audit. (Section 4.6).

Observation 4

Past audit reports, regardless of the organization conducting the audit, should be available and utilized by the audit team during the preparatory stages of the audit. (Section 4.6)

Observation 5

The briefing meetings between the audited organization's management and the audit team leader should be conducted in a separate location in order to minimize distractions and lost auditing time. (Section 4.8)

5.0 Preliminary Findings of the DOE/YMPO Audit Team

As a result of the audit, the DOE/YMPO has identified 19 preliminary SDRs of which 17 are QA program related and 2 technical related; 13 preliminary observations of which 9 are QA program related and 4 technical related; and 12 recommendations of which 7 are QA program related and 5 technical related. The following is a summary of the more important preliminary SDR findings.

- Lack of QA program implementing procedures describing how to carry out the QA program controls.
- Lack of controls for computer software programs.
- Lack of timely corrective actions to identified deficiencies.
- Lack of QA training program procedures, position descriptions, and minimum training requirements not described.

APPENDIX A

Attachment 1

AUDIT PLAN 88 - 4

Rev.1,13M.

OBJECTIVES FOR THE TECHNICAL PHASE OF THE QUALITY ASSURANCE AUDIT

In order to provide a unified approch to the conduct of the technical phase a Quality Assurance audit the following questions are provided. The intenti is to have these questions serve as the basis for the questions developed in the technical checklist(XX-2).

- Were there sufficient technical procedures for the activity under review
- Were the procedures in place technically adequate for the intended application
- Did the prime or critical methodologies employed consider existing/accepted approaches and technologies
- Where controversial methodologies were employed was an adequate pee review performed
- Was the background/credentials of those individuals engaged in the task/activity appropriate to the desired/intended outcome of the activity
- Was the level of effort/rigor employed commensurate with the stated objectives of the task/activity
- Where concerns exist as to the efficacy of an activity is a further technical review indicated
- Where the interim analysis or interpretation of data supports reported results is the analysis/interpretation appropriate for the proposed activity/task
- Were the design calculations, design methods , and design analyses employed for an activity appropriate to the maturity of the design

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for the
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VOLUME III

DETAILED PROCEDURES (DP) - (Concluded)

CHANGE REQUESTS (CR)

September 5, 1989

W.B.S. 1.2.9.3.A
QA

TWS-EES-13-09-89-

Mr. Carl P. Gertz
Yucca Mountain Project Office
U. S. Department of Energy
P. O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: TRANSITION FROM OLD SCIENTIFIC INVESTIGATION PLANNING (SIP), QUALITY ASSURANCE LEVEL ASSIGNMENTS (QALA) SYSTEM TO THE NEW SIP/STUDY PLAN, QALA, GRADING PACKAGE SYSTEM

Reference: Letter, Wilmot & Gertz to Herbst, dated July 24, 1989

A review of the on-going Los Alamos scientific investigations against the requests contained in the letter leads to the following conclusions:

1. Los Alamos has a total of 17 study plans for which a new QA level assignment must be made and a grading package prepared.

2. 13 study plans have been revised and submitted to the Project Office for their review and approval. These study plans contained the old QA level assignment, QA Level I, and an initial 18 criteria selection. No QA level assignment or grading package have been submitted, in accordance with the Project Office APQs.

3. Of the remaining four study plans, three are for new studies and one represents ongoing work and needs to be completed.

The Los Alamos staff has not yet implemented a QA level assignment and grading procedure that properly implements the Project Office APQ requirements. The grading report that the staff submitted for the IDS design effort, resulted in its rejection by the Project Office. Our internal grading procedure, used to prepare the IDS QA Grading Report, has been withdrawn from use and is being redrafted. We will incorporate the needed Project Office requirements as soon as the project office reissues its revised APQs for QA Level

Assignments and Program Grading. When the Project Office completes its upper tier QA Level Assignments for quality activities, we expect that Geochemistry will remain on the Quality Activity List and be a Quality Level I assignment. This is reflected in the study plans that are currently submitted for Project Office approval. The preparation of the needed new QA level assignments and the grading reports will take 120 calendar days to prepare and a 30 day review upon issue of the Project Office APQs.

Attached is a status report for each study plan that Los Alamos has issued or plans to issue as part of its Yucca Mountain Project research efforts. If you have any questions, please contact Henry Nunes at (FTS) 843-8039 or myself at (FTS) 843-9286.

Sincerely,

R. J. Herbst

HPN/rv

Attachment: a/s

xc: E. Wilmot, DOE/YMP, Las Vegas, NV
H. Kalia, EES-1/LV, MS J900/527
R. Morley, EES-1/LV, MS J900/527
L. Maassen, EES-1, MS D462
E. Cole, LATA, MS M321
A. Pendergrass, LATA, MS M321
H. Nunes, EES-13, MS J521
C. Watson, EES-5, MS F665
J. Canepa, EES-13, MS J521
E. Norris, INC-7, MS J514
B. Crowe, EES-13/LV, MS J900/527
M. Ebinger, EES-15, MS J495
C. Duffy, INC-7, MS J514
D. Hobart, INC-11, MS G739
A. Meijer, INC-7, MS J514
I. Triay, INC-11, MS J514
R. Rundberg, INC-11, MS J514
K. Eggert, EES-5, MS F665
T. Morgan, INC-7, MS J519
E. Springer, EES-5, MS J495
L. Hersman, LS-2, MS M880
B. Carlos, EES-1, MS D462

S. Levy, EES-1, MS D462
D. Vaniman, EES-1, MS D462
G. Ortiz, EES-13, MS J521
QAS file, MS M321
TWS-EES-13 file, MS J521
TWS-EES-13 file (2), MS M321
CRM-4 (2), MS 150

ATTACHMENT
STUDY PLAN STATUS

SCP 8.3.1.8.5.1 Characterization of Volcanic Features

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.8.1.1 Probability of Volcanic Eruption Penetrating the Repository

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.8.1.2 Effects of Volcanic Eruption Penetrating the Repository

STATUS: The study plan has not been written. This is new work and it has yet to begin.

SCP 8.3.1.3.1.1.1 Groundwater Chemistry

STATUS: The study plan has not been written. This is new work and it has yet to begin.

SCP 8.3.1.2.2.2 Water Movement Test, ESF Study

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.3.2 Kinetics and Thermodynamics of Mineral Evolution and
SCP 8.3.1.3.3.3 Conceptual Model of Mineral Evolution

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.5.1 Solubility Determination

STATUS: This is current on-going work. No study plan has been submitted to the Project Office for their approval. This work is considered to be QA level I and subject to the full spectrum of the Los Alamos QA Program Plan and associated procedures.

SCP 8.3.1.3.4.1 Sorption
SCP 8.3.1.3.4.3

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.6.1 Dynamic Transport Column Experiments

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP.8.3.1.3.6.2 Diffusion

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.7.1 Retardation Sensitivity Analysis

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.2.3.1.7 Testing of the C-Hole Sites with Reactive Tracers

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.4.2 Biological Sorption and Transport

SCP 8.3.1.3.2.1 Mineralogy, Petrology, and Chemistry of Transport Pathways

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.2.2 History of Mineralogic and Geochemical Alteration of Yucca Mountain

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.2.2.5 Diffusion Test in the ESF

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

STATUS: The study plan for the above investigation has been completed and submitted to the Project Office for their approval. The plan contains the quality level assignment of QA level I and the basic QA requirements selection. No detailed grading report has been submitted.

SCP 8.3.1.3.7.2 Geochemical Field Tests for Validation

STATUS: The study plan is currently being drafted. No work has begun.

RECEIVED JUL 2 7 1989

TWS-N5-07-89-086

Department of Energy
Nevada Operations Office
P. O. Box 98518
Las Vegas, NV 89193-8518

JUL 24 1989

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"QA"

Copy: JAC
KAW } F41
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TRANSITION FROM OLD SCIENTIFIC INVESTIGATION PLANNING (SIP), QUALITY ASSURANCE LEVEL ASSIGNMENTS (QALA) SYSTEM TO THE NEW SIP/STUDY PLAN, QALA, GRADING PACKAGE SYSTEM

Reference: Letter, Gertz to Distribution, dtd. 5/16/89

As a result of a Project Office QA evaluation which is documented per the enclosure to this letter, it is necessary to clarify the Yucca Mountain Project Office (Project Office) position for the transition from the old SIP, QALA system to the new Study Plan/SIP, QALA, and grading system as outlined in NNWSI/88-9, Revision 2, and the new quality related Administrative Procedures for ongoing, interrupted, and new scientific activities that was discussed in the referenced letter. This project position is needed to ensure that the participants understand what they will be responsible for during the upcoming U.S. Department of Energy (DOE) audit (e.g., to show the methods that they are implementing to control new, ongoing, and interrupted scientific activities in compliance with NNWSI/88-9, Revision 2).

The following is the Project Office position on transition from the old system to the new system:

For any new or interrupted site characterization activities and any new non-site characterization activities, full compliance with the new study plan (site characterization)/SIP (non-site characterization), QALA, grading package, and other areas of NNWSI/88-9, Revision 2, is required prior to implementation of any aspect of the study plan or SIP.

For any aspects of ongoing site characterization or non-site characterization activities that create ground disturbance, a study plan/SIP, QALA, and grading package will be completed prior to disturbance of the ground or prior to August 31, 1989. In addition, the participant shall perform a surveillance prior to the DOE audit and identify areas that are not in compliance with NNWSI/88-9, Revision 2. A documented analysis of the deficiencies shall be made by the participant to determine any technical impact on the adequacy and validity of the ongoing activity. Where technical impact is determined, the output product of the activity will have to be processed through the methods outlined in NUREG-1298/AP 5.9Q prior to submittal to the Reference Information Base (RIB) or Project Data Base for future project use. Corrective action documentation generated as a result of the surveillance will identify, as a minimum, the deficiency, analysis for technical impact, corrective action for compliance to NNWSI/88-9, Revision 2, and a schedule for completion of the corrective actions; the above information should be completed prior to the DOE/Project Office audit. In addition, all corrective actions should be completed prior to September 30, 1989.

For ongoing site characterization and ongoing non-site characterization activities that do not create ground disturbance and have an approved SIP and QALA to the previous system, work may proceed. However, new study plan/SIP, QALA, and grading packages shall be required to be completed by August 31, 1989, or upon an identified need for revision to the system documentation (whichever comes first). In addition, the participant shall perform a surveillance prior to the DOE audit and identify areas that are not in compliance with NNWSI/88-9, Revision 2. A documented analysis of the deficiencies shall be made by the participant to determine any technical impact on the adequacy and validity of the ongoing activity. Where technical impact is determined, the output product of the activity will have to be processed through the methods outlined in NUREG-1298/AP 5.9Q prior to submittal to the RIB or Project Data Base for future project use. Corrective action documentation generated as a result of the surveillance will identify, as a minimum, the deficiency, analysis for technical impact, corrective action for compliance to NNWSI/88-9, Revision 2, and a schedule for completion of the corrective actions. The above information should be completed prior to the audit. In addition, all corrective actions should be completed prior to September 30, 1989.

The participants are requested to evaluate the dates indicated in the above position. A response to the Project Office is required within one week from the date of this letter indicating acceptance of the dates or providing alternative dates when the actions will be completed. Alternative dates will be evaluated by the Project Office for acceptance.

If you have any questions, please call Nancy A. Voltura of my staff at (702) 794-7972 or FTS 544-7972, or Edwin L. Wilmot at (702) 794-7137 or FTS 544-7137.

Edwin L. Wilmot, Acting Director
Quality Assurance Division
Yucca Mountain Project Office

Carl P. Gertz, Project Manager
Yucca Mountain Project Office

YMP:NAV-4984

Enclosure:
Project Office QA Evaluation

cc w/encl:
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Dwight Shelor, HQ (RW-3) FORS
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S. R. Dana, SAIC, Las Vegas, NV, 517/T-06
H. H. Caldwell, SAIC, Las Vegas, NV, 517/T-06
W. H. Camp, SAIC, Las Vegas, NV, 517/T-06
R. J. Bahorich, W, Las Vegas, NV, 517/T-12

PROJECT OFFICE QA EVALUATION OF LETTER

YMP:DCD-282, DATED 5/16/89

Background

The intent of the 5/16/89 letter was to establish a project position for the transition from the old SIP, QALA system to the new study plan/SIP, QALA, and grading system as outlined in 88-9, Revision 2, and the new APQs for ongoing, interrupted, and new scientific activities. This project position was needed to ensure that the participants understand what they will be responsible for during the upcoming DOE audit (e.g., to show the methods that they are implementing to control new, ongoing, and interrupted scientific activities in compliance with 88-9, Revision 2).

The Yucca Mountain Project QA Plan, 88-9, Revision 2, and AP 1.10Q identify several noteworthy requirements for the review/approval and implementation of scientific activities that should be mentioned. The QA Plan requires that study plans be reviewed and approved by the Project Office for technical content, QA, and management (Section III, Paragraph 1.1.1). It also requires that Office of Civilian Radioactive Waste Management (OCRWM) review and approve the study plans. The Project Office and OCRWM review and approval are required prior to implementation of the study plan. In addition to the Project Office and OCRWM review and approval, AP 1.10Q requires a review and comment resolution by the NRC (this requirement is not in 88-9, Revision 2). The sequencing for the NRC review (prior to implementation) is not mentioned.

Evaluation

The letter is clear on the transition requirements for new site characterization activities and interrupted site characterization activities in that study plans, QALAs, and grading packages must be accomplished with the new APQs in addition to the other requirements of 88-9, Revision 2. Where the letter is not clear due to omission is that AP 1.10Q requires review and approval of study plans by the Project Office and OCRWM prior to implementation (a requirement in 88-9, Revision 2). On page 2 of the letter, the last sentence of the second paragraph could be interpreted that after Project Office approval of a study plan, procurement and procedure development may occur. This sentence should be clarified as it would be in violation of 88-9, Revision 2 (e.g., not having OCRWM approval of the study plan prior to implementation). Further discussion with OCRWM is in progress to determine their position on this topic.

There is no requirement in 88-9, Revision 2, concerning NRC review although AP 1.10Q outlines an NRC review and comment resolution process. The Project Office allowance of implementation of a study plan prior to NRC review would still be in compliance with 88-9, Revision 2.

In regard to ongoing site characterization activities the letter identifies two classifications of ongoing activities:

1. Those that "initiate ground disturbing activities at the site" (i.e., trenching or drilling) (reference page 2, 5th paragraph).

2. All other ongoing activities.

For ground disturbing activities the letter indicates that an appropriate study plan and a QA program consistent with 88-9, Revision 2, must be in place. This implies that a study plan, QALA, and grading package to the new APQs must be completed prior to implementation.

For the non-ground disturbing activities (classification 2) the activity can proceed under the old system of SIPs and QALAs if prior approval by the Project Office was obtained. The letter does not require a time frame when these ongoing activities should conform to the new system.

With regard to non-site characterization activities, the letter states that the following is required (reference top of page 3):

1. A Project Office approved SIP.

2. QALA and grading package in accordance with AP 5.4Q and AP 5.17Q.

3. Full compliance with 88-9, Revision 2.

Any new non-site characterization activities would have to comply with the above prior to implementation. The letter implies (reference page 3, 1st paragraph) that ongoing non-site characterization activities should be reviewed to the requirement of 88-9, Revision 2, AP 5.4Q, and AP 5.17Q and submitted to the Project Office as soon as possible.

The letter indicates that the participants should perform a surveillance on <u>all</u> scientific activities to identify areas which are not in compliance with 88-9, Revision 2 (reference page 3, 3rd paragraph). This is an important action in order to demonstrate during the audit that the participant is in control (i.e., knowledgeable of deficient areas that do not have a technical impact on the work) of all the ongoing scientific activities. The letter uses the word "should" in respect to conducting a surveillance, which could be interpreted as optional. For the ongoing activities the surveillance is not optional. This needs clarification.

<u>Recommendations</u>

A letter should be issued to the participants and Project Office directors clarifying QA's position on the transition of scientific activities to compliance with 88-9, Revision 2. The letter should identify what actions are expected by the participants to demonstrate compliance with 88-9, Revision 2, and the target timing for these actions. The following are three points that the letter should clarify.

1. For any new or interrupted site characterization activities and any new non-site characterization activities, full compliance with the new study plan (site characterization)/(non-site characterization) SIP, QALA, grading package, and other areas of 88-9, Revision 2, is required prior to implementation of any aspect of the study plan or SIP.

2. For any aspects of ongoing site characterization or non-site characterization activities that create ground disturbance a study plan/SIP, QALA, and grading package will be completed prior to disturbance of the ground or prior to 8/31/89. In addition, the participant shall perform a surveillance prior to the DOE audit and identify areas that are not in compliance with 88-9, Revision 2. A documented analysis of the deficiencies shall be made by the participant to determine any technical impact on the adequacy and validity of the ongoing activity. Where technical impact is determined, the output product of the activity will have to be processed through the methods outlined in NUREG-1298/AP 5.9Q prior to submittal to the RIB or Project Data Base for future project use. Corrective action documentation generated as a result of the surveillance will identify, as a minimum, the deficiency, analysis for technical impact, corrective action for compliance to 88-9, Revision 2, and a schedule for completion of the corrective actions. The above information should be completed prior to the DOE audit. In addition, all corrective actions should be completed prior to 9/30/89.

3. For ongoing site characterization and ongoing non-site characterization activities that do not create ground disturbance and have an approved SIP and QALA to the old system, work may proceed. However, new study plan/SIP, QALA, and grading packages shall be required to be completed by 8/31/89 or upon an identified need for revision to the system documentation (whichever comes first). In addition, the participant shall perform a surveillance prior to the DOE audit and identify areas that are not in compliance with 88-9, Revision 2. A documented analysis of the deficiencies shall be made by the participant to determine any technical impact on the adequacy and validity of the ongoing activity. Where technical impact is determined, the output product of the activity will have to be processed through the methods outlined in NUREG-1298/AP 5.9Q prior to submittal to the RIB or Project Data Base for future project use. Corrective action documentation generated as a result of the surveillance will identify, as a minimum, the deficiency, analysis for technical impact, corrective action for compliance to 88-9, Revision 2, and a schedule for completion of the corrective actions. The above information should be completed prior to the audit. In addition, all corrective actions should be completed prior to 9/30/89.

With issuance of the clarification letter identifying the actions and timing for completion of the actions, the project can demonstrate that they have all scientific activities under control even if not presently in compliance with 88-9, Revision 2.

Los Alamos

Los Alamos National Laboratory
Los Alamos,New Mexico 87545

WBS #: 1.2.9.3.A
QA:

July 18, 1989

TWS-N5-07-89-039

Mr. Ed Wilmot
Yucca Mountain Project Office
U. S. Department of Energy
P. O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Wilmot:

SUBJECT: **PROJECT OFFICE ADMINISTRATIVE PROCEDURES AND PARTICIPANT IMPLEMENTATION**

As requested during the June 13 Project Quality Committee Meeting, the LANL staff has reviewed the list of Project Office administrative procedures (APQs). This review heightened our concern regarding the imposition of all or part of Project Office APQs over day to day activities at LANL, which we believe would have an undesirable effect on our efforts to complete our work. Must we modify our internal procedures to reflect the APQ requirements or merely reflect the intent embodied within our revised QPs? It is our intention to directly implement Project Office APQs when the LANL Test Manager's Office (TMO), Las Vegas, performs tasks at the Project Office's direction.

APQs currently being prepared by the Project Office consistently reflect the Project Office's day to day implementation needs. However, we feel that when specific implementing methods are prescribed, no consideration is given to a participant's ability to operate in the specified manner and that APQs now constitute an additional layer of requirements. Requirements should be passed on to the participants in an appropriate plan or directive, not embodied within another procedure. Failure to issue requirements in an unambiguous manner only results in confusion and improper implementation of Project-level requirements.

Our review of the current list of issued APQs results in the conclusion that none of the current APQs should be applied directly to the LANL efforts with the exception of AP 5.19Q, Interface Control. This APQ reflecting interfaces between the Project Office and a participant should be retained and directly implemented by the participant.

Attached for your information are our review comments for each APQ and a determination regarding its applicability to LANL research and the Test Manager's Office efforts. If you have any questions, please call Henry Nunes at (FTS) 843-8039.

Sincerely,

H. P. Nunes

HPN/em

Attachment: a/s

Cy w/attach:
W. B. Mansel, YMP/DOE, Las Vegas, NV
J. Kirk, SAIC, Las Vegas, NV
S. H. Klein, SAIC, Las Vegas, NV
E. M. Cole, LATA, MS M321
K. L. Foster, LATA, MS M321
A. M. Pendergrass, LATA, MS M321
L. W. Maassen, ESS-1, MS D462
E. S. Patera, INC-DO, MS J514
T. Morgan, INC-DO, MS J514
C. A. Watson, ESS-5, MS F665
E. P. Springer, HSE-12, MS J495
J. A. Canepa, N-5, MS J521
R. A. Morley, ESS-1/LV, MS J900/527
H. N. Kalia, ESS-1/LV, MS J900/527
R. J. Herbst, N-5, MS J521
TWS-N5 file, MS J521
RPC file (2), MS M321
QAS file, MS M321

Cy w/o Attach:
CRM-4 (2), MS A150

ATTACHMENT
LANL APQ REVIEW RESULTS

APQ No. TITLE
COMMENTS

1.1Q Administrative Procedure preparation
This procedure applies only to the Project Office.

1.3Q Publication Review and Approval
This procedure applies only to the Project Office.

1.5Q Issuance and Maintenance of Controlled Documents
This procedure applies only to the Project Office. Of note is that the QA Plan requirements for master lists, control of releases prior to verification, and coordination of interface documents have not been addresses in the APQ.

1.6Q Release of Unpublished Information
This procedure applies only to the Project Office and participant responsibilities should be transferred to AP 5.19Q, Interface Control.

1.7Q Records Management
Participant responsibilities should be in the project QA Plan or AP 5.19Q, Interface Control. The remainder of the procedure would then be specific to the Project Office.

1.10Q Preparation, Review, and Approval of SCP Study Plans
The TPO responsibilities should be transferred to AP 5.19Q, Interface Control. Appendix K of the QA Plan already contains a major portion of this APQ. This procedure should be deleted by the Project Office.

3.3Q Change Control Process
Interparticipant change control should be addressed in AP 5.19Q, Interface Control. The QA Plan is currently adequate to address participant change control requirements. This AP should apply only to the Project Office.

3.6Q Configuration Management
This AP should apply only to the Project Office. Any participant responsibilities should be assigned in AP 5.19Q, Interface Control. Implementation of these requirements at the participant level could result in significant costs.

4.1Q Procurement
This AP should apply only to the Project Office.

4.2 Supplier Qualification and Surveillances (in preparation)
Because participant responsibilities are clearly stated in the QA Plan, this AP is not needed at the participant level.

5.2Q Technical Information Flow To And From The Site Data Base
TPO responsibilities should be clearly stated in AP 5.19Q, Interface Control.

5.3Q Information Flow into the Reference Information Base
This APQ should apply only to the Project Office.

5.4Q Assignment of Quality Assurance Levels
As currently structured, this AP does not apply to the participants.

5.9Q Qualification of Data or Data Analyses not Developed Under the Yucca Mountain Project Quality Assurance Plan
Participant requirements should be incorporated into the QA Plan or AP 5.19Q, Interface Control. Then, the procedure would be only applicable to the Project Office.

5.10Q Use of NTS Contractors on the NNWSI Project
Participant requirements should become part of AP 5.19Q, Interface Control.

5.13Q Readiness Review
This procedure should apply only to the Project Office or used only for Project Office directed reviews.

5.14Q Design Review
This procedure should apply only to the Project Office or used only for Project Office directed design reviews.

5.17Q Application of Graded Quality Assurance
As currently structured, this procedure is unusable by the LANL staff. The procedure is applicable only to the Project Office.

5.18Q ESF Design Control
The procedure requirements should be placed in the appropriate plans: QA Plan, Systems Engineering Plan, and the Configuration Management Plan.

5.19Q Interface Control
This AP should be the only procedure applied to the participants for their use. The AP needs to establish the conflict resolution mechanism for quality related issues.

5.20Q Hold Control
Participant requirements should be made a part of Interface Control, AP-5.19Q.

6.2Q Management and Operation of Sample Handling Activities at Borehole Sites
Interface requirements should be moved to AP 5.19Q, Interface Control.

6.3Q Interaction of Participants and Outside Interests with Yucca Mountain Project Sample Management
Interface requirements should be moved into AP 5.19Q, Interface Control.

6.6Q Field Collection, Documentation, and Specimen Removal of Exploratory Shaft and Drift Rock
Interface requirements should be moved to AP 5.19Q, Interface Control.

6.8Q Identification of Items Important to Waste Isolation
Interface requirements should be moved to AP 5.19Q, Interface Control.

6.9Q Identification of Items and Activities Subject to the Quality Level Assignment Process
Interface requirements should be moved to AP 5.19Q, Interface Control.

6.10Q Identification of Items Important to Safety
Interface requirements should be moved to AP 5.19Q, Interface Control.

6.11Q Identification of Activities to be Placed on the Quality Activities List
Interface requirements should be moved to AP 5.19Q, Interface Control.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

SEP 21 11 56 AM '89

WBS: 1.2.9
QA: N/A

September 18, 1989

TWS-EES-13-09-89-037

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
US Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: AUGUST PROJECT STATUS REPORT

Attached is the August Project Status Report for Los Alamos' participation in the Yucca Mountain Project.

Sincerely,

R. J. Herbst

ABC/em

Attachment: a/s

Cy w/attachment:

R. Bullock, FSN, Las Vegas, NV
J. C. Calovini, H&N, Las Vegas, NV
V. J. Cassella, HQ/Washington, DC
C. Garvin, SAIC, Las Vegas, NV
L. Hayes, USGS, Denver, CO
T. Hunter, SNL, Albuquerque, NM
T. Jackson, SAIC, Las Vegas, NV
R. F. Pritchett, REECo, Las Vegas, NV
L. Jardine, LLNL, Livermore, CA
A. M. Sastry, MACTEC, Las Vegas, NV
J. Nelson, SAIC, Las Vegas, NV
T. Petrie, DOE/YMPO, Las Vegas, NV
M. Cloninger, DOE/YMPO, Las Vegas, NV
U. Clanton, DOE/YMPO, Las Vegas, NV
D. Dobson, DOE/YMPO, Las Vegas, NV
J. Robson, DOE/YMPO, Las Vegas, NV
V. Iorii, DOE/YMPO, Las Vegas, NV
J. Waddell, SAIC, Las Vegas, NV
J. Peck, SAIC, Las Vegas, NV
K. Beall, SAIC, Las Vegas, NV
J. Younker, SAIC, Las Vegas, NV
I. Cottle, SAIC, Las Vegas, NV
J. Treadwell, SAIC, Las Vegas, NV
A. B. Caughran, IS-11, MS J521
R. J. Herbst, EES-13, MS J521
J. A. Canepa, EES-13, MS J521
W. Meyers, EES-DO, MS D446
H. N. Kalia, EES-1/LV, MS J900/527
K. A. West, EES-13, MS J521
H. P. Nunes, EES-13, MS J521
B. M. Crowe, EES-13/LV, MS J900/527
A. R. Pratt, FIN-10, MS J521
RPC File (2), MS J521
EES-13 Library, MS J521
TWS-EES13, MS J521
CRM-4 (2), MS A150

MONTHLY STATUS REPORT -- AUGUST 1989

1.2.1 Systems

No action to report this month.

1.2.3.2 Geology

MAJOR ACCOMPLISHMENTS:

The final scoria samples for the Lathrop Wells volcanic center were crushed and submitted for x-ray fluorescence analysis. This completes sampling and sample preparation for the first phase of study of the geochemistry of scoria sequences at the Lathrop Wells center.

A thermoluminescence dating technique has been applied to soil and sediment samples in support of the volcanism task. Preliminary studies indicate that the technique is suitable for determination of the chronology of eruptive events at young (< 100 ka) volcanic centers.

Major element x-ray fluorescence data collection for Topopah Spring Member samples in support of the prototype mineralogy and petrology tests were completed. The data on major element chemistry from 104 samples show little variation throughout the sampled section. A mean value of major chemical composition for the Topopah Spring Member's lower lithophysal, upper nonlithophysal and upper lithophysal zones were obtained.

Natural radiation dosimeters were emplaced in bedrock at Trench 14 and Busted Butte, the two NTS sites for which the YMP had obtained access approval. Dosimeter emplacement is part of the electron spin resonance dating technique being applied to secondary mineral alteration. Access to a third proposed site in the Calico Hills had been denied due to the perceived threat to archaeological remains because of the approximately 25 cm in length and 1 inch diameter hole needed to be drilled to emplace the dosimeter.

Samples from Trench 14 have been analyzed by scanning electron microscope (SEM) image analysis, and by electron microprobe. The purpose of these studies is to determine the major modes of calcium, silicon, and magnesium and other elemental distributions resulting from authigenic mineral growth in the hydrogenic deposits of Trench 14. Minor elements, in particular Al, K, and Na, were also analyzed.

SEM work on fracture coatings in the Tiva Member in USW G-4 is complete. Determination of the chemistry of manganese oxides in this interval by microprobe is planned.

SIGNIFICANT MEETINGS:

The volcanism task leader attended a meeting between DOE and the NRC where staff of the NRC presented tectonic concerns from their review of the Site Characterization Plan. A brief presentation on volcanism studies was presented by the task leader in response to the NRC concerns on volcanism at the Yucca Mountain site.

A meeting was held at Los Alamos with members of the mineralogy task and YMP representatives to discuss core qualification.

PLANNED WORK:

Prepare a report on the smectite/illite transition.

The comment resolution meeting on Study Plan 8.3.1.8.1.1, Probability of a Volcanic Eruption Penetrating the Repository, is scheduled for September 14 in Las Vegas.

The revised draft of Study Plan 8.3.1.8.5.1, Characterization of Volcanic Features, will be sent to coauthors for review. New sections will be writing on paleomagnetic and thermoluminescence dating and soils analysis.

Develop the Exploratory Shaft Sampling Plan using data from the Solitario Canyon outcrop.

Evaluate revised x-ray diffraction data using multivariate methods.

Simulate spacial distribution of compositional data for use in transport models such as TRACRN.

PROBLEM AREAS:

None.

1.2.3.3 Hydrology

MAJOR ACCOMPLISHMENTS:

Prototype testing of core sectioning techniques and feasibility in support of the diffusion test in the exploratory shaft were completed.

SIGNIFICANT MEETINGS:

None.

PLANNED WORK:

Initiate laboratory experiments using individual minerals to determine solution composition with no tracer added, which are in support of the reactive tracer testing in the C-wells.

PROBLEM AREAS:

None.

1.2.3.4 Geochemistry

MAJOR ACCOMPLISHMENTS:

The study of americium (Am) and technetium (Tc) sorptive behavior on pure minerals continues. Chemical separation of twelve Am samples for mass spectrometric analysis was completed. Experiments were initiated to study Tc sorption and desorption. The first experimental step involving equilibration of the sorbing material and a buffer solution was completed.

Solid rock column experiments are ongoing to study the natural filtration of Yucca Mountain tuffs of particulate material. Polystyrene fluorescent sols (colloids) were injected and have been continuously monitored. Preliminary results indicate a maximum in the concentration of the colloid in the eluate, when it was not expected. The results are being evaluated to determine if this observation is due to desorption of the colloid from the solid material in the columns or is due to destruction of the fluorescent colloid resulting in release of the fluorescent material which is subsequently analyzed with the fluorometric technique.

Well water from the J-13 well was collected in six 55 gallon drums. This water will be used for experiments in the radionuclide dynamic transport, sorption and speciation tasks.

The solubility experiments of plutonium-239 in UE-25 P#1 water at 25 degrees C and pH values of 6, 7, and 8.5 are completed. At all pH values, the dominant oxidation state is Pu(V)!

The 3-D forward transport calculation using TRACRN simulating transport from the repository to below the water table was complete. This work will be presented at the FOCUS 89 meeting in Las Vegas in September.

A draft of a problem description for field scale testing in the Calico Hills was completed. This includes rationale, objectives and background information for the proposed test. This description will contribute to the study plan for geochemistry field tests. A draft summary of hydrologic characteristics of the tuffaceous beds of the Calico Hills unit was completed. This summary will be reviewed and contributed to the Calico Hills risk assessment committee.

SIGNIFICANT MEETINGS:

None.

PLANNED WORK:

Design a set of experiments to address the question of the effect of rock crushing on values obtained for the sorption coefficients for the actinide element neptunium.

PROBLEM AREAS:

None.

1.2.5 Regulatory and Institutional

No action on the SCP occurred this month.

STUDY PLANS:

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Project Office 1/6/89. Approved by Project Office and DOE/HQ; sent to NRC and State of Nevada.

Diffusion Test in the Exploratory Shaft, R0 (8.3.1.2.2.5). Submitted to Project office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/HQ 4/18/89. Abstract and SCP-based network submitted to Project Office 5/25/89 and to DOE/HQ 6/30/89.

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Revision 1 was sent to DOE/HQ 5/2/89. Project Office AP-1.10Q review comments were received 5/10/89. Revision 2, which incorporates DOE/HQ and Project Office comments, was submitted to the Project Office 6/27/89.

Mineralogy, Petrology, and Chemistry of Transport Pathways, R3 (8.3.1.3.2.1). Revision 3, which incorporates Project Office AP-1.10Q review comments, was submitted to the Project Office 5/25/89.
Study Plan was approved by the Project Office and transmitted to DOE/HQ on 6/16/89. A Study Plan Assessment was developed for this study and transmitted to DOE/HQ on 6/22/89.

History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). Project Office and DOE/HQ comments were received 5/25/89. A comment resolution meeting was held on May 31, 1989, for DOE/HQ comments.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Study plan submitted to DOE/HQ for review 3/14/89. Project Office AP-1.10Q review comments were received 6/1/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R1 (8.3.1.3.4.2). Revision 1, which incorporates screening review comments, was submitted to the Project Office 5/26/89. Undergoing Project Office AP-1.10Q review (6/16/89).

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP3.2 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Submitted to Project Office 7/24/89.

Diffusion, R0 (8.3.1.6.2). Submitted to Project Office 7/24/89.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of Volcanic Features, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (1/25/89). Project Office AP-1.10Q comments received 6/9/89. A Comment Resolution Meeting for Project Office and DOE/HQ comments was held July 11-12, 1989.

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of the abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89. Project Office AP-1.10Q comments received 6/28/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

1.2.6.1 Management and Integration

MAJOR ACCOMPLISHMENTS:

A draft of the Exploratory Shaft Test Descriptions Document (TDD) was completed. The TDD will supplant the ESF Test Plan and serve as the ES test baseline for the purposes of test planning, management, change control, scheduling, and budgeting. The draft has been provided to Golder Associates for review. The draft is also undergoing internal review in compliance with our QA requirements for the review and approval of technical information products.

We reviewed a proposal submitted to the Project Office by U. S. Bureau of Mines (USBM) (Denver). We recommended the proposed work not be supported by the Project.

With the USBM (Minneapolis and Pittsburgh), we completed a drilling equipment development and prototype testing proposal. The proposal has been provided to the Project Office.

Abstracts were prepared for presentations at the Waste Management 90 and Unusual Underground Construction Conferences.

A schedule for prototype testing was developed in cooperation with FSN, and the ESF test schedules were updated. An integrated, construction-and-testing schedule was developed for the Main Test Level of the ESF.

SIGNIFICANT MEETINGS:

None.

PLANNED WORK:

The prerequisite requirements for each ESF test will be identified to enable planning and scheduling the related activities and facilitate readiness review.

The TDD reviews by Golder Associates and Los Alamos will be completed and comment resolution will begin.

Prototype test readiness reviews will be done.

A draft Preliminary Safety Assessment Report (PSAR) covering ESF test operations will be provided the T&MSS for compilation in a single volume ESF PSAR.

PROBLEM AREAS:

None.

1.2.6.9 Testing

MAJOR ACCOMPLISHMENTS:

The EG&G Quality Assurance Program Plan (QAPP) covering work in support of the Integrated Data System (IDS) design and supply was completed by EG&G. We completed review and comment on the EG&G QAPP.

Computer Applications Group completed preparation of a Functional Requirements Document (FRD) draft for the ESF IDS. The draft is undergoing internal review prior to transmittal to EG&G.

The status of our efforts to prepare for the start of the IDS Tile II design phase was reported by letter to the Project Office.

Preliminary specifications for the IDS cabling in the ESF were developed and supplied to H&N. The specifications were based on the Title I design.

A revised statement of work regarding the IDS design and supply was provided to EG&G.

SIGNIFICANT MEETINGS:

None.

PLANNED WORK:

Issue the IDS FRD.

Review and approve or revise the EG&G QAPP.

Perform a readiness review of EG&G's preparations for start of Title II design of the IDS.

PROBLEM AREAS:

None.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WBS #: 1.2.9
QA: N/A

August 10, 1989

TWS-EES-13-08-89-051

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
US Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: JULY PROJECT STATUS REPORT

Attached are the July Project Status Report for Los Alamos' participation in the Yucca Mountain Project, the Technical Data Management System Submittal Record, and the Monthly Milestone Status Report. A list of outstanding policy reviews and other documents is also included. Documents checked on that list have been at the Project Office for at least two months; the authors are very eager to have those documents approved.

Sincerely,

R. J. Herbst

R. J. Herbst

ABC/em

Attachment: a/s

Cy w/attachment:

R. Bullock, FSN, Las Vegas, NV
J. C. Calovini, H&N, Las Vegas, NV
V. J. Cassella, HQ/Washington, DC
C. Garvin, SAIC, Las Vegas, NV
L. Hayes, USGS, Denver, CO
T. Hunter, SNL, Albuquerque, NM
T. Jackson, SAIC, Las Vegas, NV
R. F. Pritchett, REECo, Las Vegas, NV
L. Jardine, LLNL, Livermore, CA
A. M. Sastry, MACTEC, Las Vegas, NV
J. Nelson, SAIC, Las Vegas, NV
T. Petrie, DOE/YMPO, Las Vegas, NV
M. Cloninger, DOE/YMPO, Las Vegas, NV
U. Clanton, DOE/YMPO, Las Vegas, NV
D. Dobson, DOE/YMPO, Las Vegas, NV
J. Robson, DOE/YMPO, Las Vegas, NV
V. Iorii, DOE/YMPO, Las Vegas, NV
J. Waddell, SAIC, Las Vegas, NV
J. Peck, SAIC, Las Vegas, NV
K. Beall, SAIC, Las Vegas, NV
J. Younker, SAIC, Las Vegas, NV
I. Cottle, SAIC, Las Vegas, NV
J. Treadwell, SAIC, Las Vegas, NV
A. B. Caughran, IS-11, MS J521
R. J. Herbst, EES-13, MS J521
J. A. Canepa, EES-13, MS J521
W. Meyers, EES-DO, MS D446
H. N. Kalia, EES-1/LV, MS J900/527
K. A. West, EES-13, MS J521
H. P. Nunes, EES-13, MS J521
B. M. Crowe, EES-13/LV, MS J900/527
A. R. Pratt, FIN-10, MS J521
RPC File (2), MS J521
EES-13 Library, MS J521
TWS-EES-13, MS J521
CRM-4 (2), MS A150

1.2.1 Systems

No action to report this month.

1.2.3.2 Geology

MAJOR ACCOMPLISHMENTS:

Samples were collected at the Lathrop Wells volcanic center and the "A" cone in the Cima volcanic field for testing the feasibility of dating volcanic events at these sites using the thermoluminescence dating technique. Also, thirteen samples of lava and scoria were collected from the Lathrop Wells volcanic center for geochemical analysis. Nine additional scoria and lava samples from the Lathrop Wells center and from the "A" cone were collected for x-ray fluorescence analysis.

A report on the probability of volcanic activity at Yucca Mountain was received from the Nuclear Regulatory Commission. The report was reviewed and summary comments were provided to the Department of Energy at Las Vegas.

Heavy mineral separates have been analyzed by XRD in support of the sorption task. The phases separated are dominated by hematite, magnetite, and ilmentite.

We are preparing a report describing the smectite/illite transitions. Preliminary results indicate that the activity of $SiO_2(aq)$ may be a primary variable controlling smectite/illite transformation.

PLANNED WORK:

Continue ongoing surface-based tests (non-disturbing) in mineralogy, petrology, stability of minerals, and volcanism.

Revise Characterization of Volcanic Features, R0 (8.3.1.8.5.1).

Examination and analysis of fracture-coating minerals in the Topopah Spring Member in USE G-1, G-2, and GU-3 will continue as time and sample availability allow.

PROBLEM AREAS:

None.

1.2.3.3 Hydrology

MAJOR ACCOMPLISHMENTS:

The verification of the computer code SORBEQ has been completed for both the forward and inverse modes of operation. This work is in support of the reactive tracer testing in the C-holes. Verification of the code FEHMN continues.

PLANNED WORK:

Initiate laboratory tracer experiments using single minerals.

Begin documenting SORBEQ.

PROBLEM AREAS:

None.

1.2.3.4 Geochemistry

MAJOR ACCOMPLISHMENTS:

Permits for collecting water samples from the J-13 well and rock samples from the Busted Butte and Calico Hills areas have been approved.

All components of the photoacoustic spectrometer system have been configured and tested. This system supports and will significantly enhance the radionuclide solubility and speciation tasks.

Milestone report R343, "Preliminary Geochemical/Geophysical Model of Yucca Mountain," was approved by the Project Office on 7/10/89.

SIGNIFICANT MEETINGS:

An information exchange meeting with the investigators of the Retention Task of the Swedish Nuclear Fuel and Waste Management Co. was held. Discussions centered on dynamic transport processes (such as dispersion, diffusion, fracture flow, and colloid transport), solubility and speciation, radiocolloid formation, and sorption processes. Several areas of common interest where collaborations can be established were identified, including modeling fracture flow and studying colloid transport.

PLANNED WORK:

Simulation of spatial distribution of compositional data for use in transport models such as TRACR3D.

Continue transport work with pure minerals.

PROBLEM AREAS:

None.

1.2.5 Regulatory and Institutional

No action on the SCP occurred this month.

MAJOR ACCOMPLISHMENTS:

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Project Office 1/6/89. Approved by Project Office and DOE/HQ; sent to NRC and State of Nevada.

Diffusion Test in the Exploratory Shaft, R0 (8.3.1.2.2.5). Submitted to Project office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/HQ 4/18/89. Abstract and SCP-based network submitted to Project Office 5/25/89 and to DOE/HQ 6/30/89.

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Revision 1 was sent to DOE/HQ 5/2/89. Project Office AP-1.10Q review comments were received 5/10/89. Revision 2, which incorporates DOE/HQ and Project Office comments, was submitted to the Project Office 6/27/89.

Mineralogy, Petrology, and Chemistry of Transport Pathways, R3 (8.3.1.3.2.1). Revision 3, which incorporates Project Office AP-1.10Q review comments, was submitted to the Project Office 5/25/89. Study Plan was approved by the Project Office and transmitted to DOE/HQ on 6/16/89. A Study Plan Assessment was developed for this study and transmitted to DOE/HQ on 6/22/89.

History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). Project Office and DOE/HQ comments were received 5/25/89. A comment resolution meeting was held on May 31, 1989, for DOE/HQ comments.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Study plan submitted to DOE/HQ for review 3/14/89. Project Office AP-1.10Q review comments were received 6/1/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R1 (8.3.1.3.4.2). Revision 1, which incorporates screening review comments, was submitted to the Project Office 5/26/89. Undergoing Project Office AP-1.10Q review (6/16/89).

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP3.2 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Submitted to Project Office 7/24/89.

Diffusion, R0 (8.3.1.6.2). Submitted to Project Office 7/24/89.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of Volcanic Features, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (1/25/89). Project Office AP-1.10Q comments received 6/9/89. A Comment Resolution Meeting for Project Office and DOE/HQ comments was held July 11-12, 1989.

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of the abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89. Project Office AP-1.10Q comments received 6/28/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

PROBLEM AREAS:

None.

1.2.6 Exploratory Shaft

MAJOR ACCOMPLISHMENTS:

Prepared a response to a DOE/HQ request on the status of prototype testing, and reviewed the feasibility report for the Prototype shaft. Initiated drilling for Phase II of the prototype intact fracture tests, and continued and completed perched water drilling.

Initiated preparation of information to be used by the Project Office to define the role of the US Bureau of Mines' Pittsburgh and Minneapolis centers.

Developed work sheets for critical path test durations to be used by DOE/HQ to develop Long Range Plans.

Reviewed IDS grading report. A survey was performed by T&MSS on the existing procedures for design control.

Contract document was revised and reissued defining Los Alamos and EG&G responsibilities. EG&G has provided comments to modify the document.

PLANNED WORK:

Develop IDS Title II Design Initiation Readiness Review Plan; complete IDS procedures; develop ID network to completion of ESF testing and integrate this network with ESF design and construction network and the testing network; and identify IDS operational requirements, including resources and budgets.

PROBLEM AREAS:

None.

1.2.9 Project Management

MAJOR ACCOMPLISHMENTS:

The Records Processing Center was relocated from LANL to Los Alamos Technical Associates.

SIGNIFICANT MEETINGS:

Staff were interviewed by a Government Accounting Office auditor for two days.

PROBLEM AREAS:

None.

LOS ALAMOS NATIONAL LABORATORY
OUTSTANDING PROJECT OFFICE ACTION ITEMS
July 31, 1989

Policy Reviews

1. Milestone R743 report: resubmitted 12/7/88 with response to Project Office review.

2. Milestone R749 report: resubmitted 12/12/88 with response to Project Office review.

3. Milestone P379 report: resubmitted 1/18/89.

4. Milestone T404 report: resubmitted 2/28/89 with response to Project Office review.

5. Milestone R346 report: resubmitted 4/4/89; responded to Project Office comments 5/23/89.

6. Milestone M367 report: resubmitted 4/11/89 with response to Project Office review.

7. Milestone T415 report: submitted 5/9/89.

8. Milestone T421 report: resubmitted 6/2/89 with response to Project Office review.

9. Milestone T422 report: submitted 6/2/89.

10. Milestone T414 report: resubmitted 6/27/89 with response to Project Office review.

11. Milestone T419 report: resubmitted 6/28/89 with response to Project Office review.

12. Book contributions: B. Crowe, "GSA Field Trip Segment: Lathrop Wells Volcanic Center" and "GSA Field Trip Segment: Crater Flats": submitted 4/27/89.

13. Abstract: A. E. Norris, "^{36}Cl Studies at Yucca Mountain": submitted 7/28/89.

14. Abstract: A. E. Norris, "^{36}Cl Studies for a Nuclear Waste Repository in Nevada": submitted 7/28/89.

TECHNICAL DATA MANAGEMENT SYSTEM SUBMITTAL RECORD

H AD 035
11/86

TITLE OF DOCUMENT	DESCRIPTION OF DATA OR INFORMATION	AUTHOR OR PRINCIPAL INVESTIGATOR	DATE PUBLISHED	QUALITY ASSURANCE LEVEL	TECHNICAL DATA MANAGEMENT SYSTEM COMPONENT (INDICATE BY "X") TRC	SEPDB	IGIS	RIB	DATE OF SUBMITTAL
NO DATA WERE SUBMITTED THIS MONTH									

ATTACHMENT 1
08/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

FY89 Milestones - Level 1 Completed as of August 01, 1989

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
NONE					

FY89 Milestones - Level 2 Completed as of August 01, 1989

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T478	12/15/84		12311A	N-5	Prototype Test Plans, Volume 2 (FY-89 Funded Tests) This milestone is the other part of milestone T435 (Volume 1). The This milestone schedulers are incorrectly using M253 for Volume 2. This milestone should not be confused with M105, which is the submission of the prototype test plans for review. M105 is completed. The report entitled 'Prototype Test Plans, Volume 2 (FY-89 Funded Tests)' was completed and sent to the Project Office for policy review on 12/15/88, ref. TWS-N5-12-88-034.
T404	09/28/88		1232312A	ESS-1	Progress Report on Rock-Varnish Work Report entitled 'Progress Report on Rock-Varnish Work' was completed and sent to the Project Office for policy review on 11/16/88, ref. TWS-N5-10-88-046.
T414	02/28/89		123363A	ESS-1	Final Dust Hazard Assessment Report Report entitled 'Evaluation of Dust-Related Health Hazards Associated with Air Coring at G-Tunnel, Nevada Test Site' was completed and sent to the Project Office for review on 04/14/89, ref. TWS-N5-04-89-055.
T415	12/16/88		123363A	ESS-1	Final Drilling and Technology Report The final report draft of the Prototype Air Coring Test was completed and sent to the Project Office on 01/17/89, ref. TWS-ESS-1-1/89-11. Report entitled 'The Yucca Mountain Project Prototype Air-Coring Test, U12g Tunnel, Nevada Test Site' was sent to the Project Office for policy review on 05/09/89, ref. TWS-N5-89-045.
M367	11/17/88		123414A	INC-11	Interim Progress Report on Colloid Stability Interim Progress Report on Colloid Stability: Report entitled 'Interim Progress Report on Colloid Stability: Voltammetric Studies of the Redox Reactivity of Plutonium (IV) Colloid' was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-033.
P379	11/17/88		123414A	INC-11	Progress Report: Photoacoustic Spectroscopy Methodology (PAS) Report entitled 'Photoacoustic Spectroscopy Methodology' was completed and submitted to the Project Office for policy review on 01/18/89, ref. TWS-N5-01-89-058.

ATTACHMENT 1
08/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T418	11/30/88		123414A	INC-11	Letter Report: Progress Report on Solubility Measurements Report entitled 'Letter Report: Progress Report on Solubility Measurements' was completed and sent to the Project Office for policy review on 11/28/88, ref. TWS-N5-11-88-069. The report was approved for publication by the Project Office on 05/09/89, ref. TWS-N5-05-89-047.
R505	11/25/88		123415A	INC-7	Summary Report: Sorption of Nickel and Neptunium in Tuff Using Groundwaters of Different Composition Milestone completed on 10/21/88 and the report entitled 'Sorption of Nickel and Neptunium in Tuff using Groundwaters of Various Compositions' was sent to the Project Office, ref. TWS-N5-10-88-050.
R720	11/01/88		123415A	INC-7	Issue Report on Deconvolution of Ion-Exchange Isotherms Report entitled 'Deconvolution of Ion-Exchange Isotherms' was reviewed, and a copy of the revised paper was sent to the Project Office on 02/17/89, ref. TWS-N5-02-89-058.
T421	12/15/88		123417A	ESS-5	TRACR3D Documentation for Baselined Version Report entitled 'TRACRN 1.0: A Model of Flow and Transport in Porous Media for the Yucca Mountain Project - Model Description and User's Manual' was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-032.
T424	02/28/89		123417A	ESS-5	Interim Report: Letter Report on Particulate Transport Report entitled 'Interim Report on Particle Transport' was completed and sent to the Project Office for policy review on 02/24/89, ref. TWS-N5-02-89-072. The report was approved for publication by the Project Office on 05/09/89, ref. TWS-N5-89-048.
T426	11/25/88		123418A	ESS-4	FRACNET - Fracture Network Model For Water Flow and Solute Transport Milestone completed on 10/25/88. A policy review conducted on report entitled 'FRACNET - Fracture Network Model for Water Flow and Solute Transport' was sent to the Project Office, ref. TWS-N5-10-88-059.
T207	11/30/88		123422A	ESS-1	Dating Zeolitization at Yucca Mountain with Tectonic and Structural Data Report entitled 'Dating Zeolitization at Yucca Mountain with Tectonic and Structural Data' was completed and sent to the Project Office for policy review on 12/01/88, ref. TWS-N5-12-88-003.
T095	11/30/88		123423A	ESS-1	Issue Report: Statistical Test of Repeatability and Operator Variance on Modal Analysis Report entitled 'Status of Image Analysis Methods to Delineate Stratigraphic Position in the Topopah Spring Member of the Paintbrush Tuff, Yucca Mountain, Nye County, Nevada' was completed and sent to the Project Office for policy review on 12/23/88, ref. TWS-N5-12-88-072. The report was approved for publication by the Project Office on 5/25/89, ref. TWS-N5-05-89-140.

ATTACHMENT 1
08/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T469	02/28/89		123423A	ESS-1	Issue Report on Erionite Abundances at Yucca Mountain. Report entitled 'The Occurrence and Distribution of Erionite at Yucca Mountain, Nevada' was completed and sent to the Project Office for policy review on 02/14/89, ref. TWS-N5-02-89-045.
R321	12/23/88		123431A	WX-4	Complete Design of the Exploratory Shaft Water Tracer System Demonstrated to H&N use of the equipment and provided drawings to H&N. No further action is required. This milestone was completed on 03/09/89, ref. TWS-ESS-LV-1-03-89-17.
T163	11/30/88		12611A	WX-4	Revised NNWSI 'White Paper' on 'ES Fluids and Materials Usage' Delivered to WMPO. Report entitled 'Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility and Materials Evaluation' was completed and sent to the Project Office on 12/15/88, ref. TWS-N5-12/88/043.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments

FY89 Level 1 Open Milestone List

NONE

FY89 Level 2 Open Milestone List

New WBS Number 1.2.3

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
M287	09/01/89		1231	ESS1/WX	Compile Draft ES Test Procedures (Construction Phase) Precursor to M651.
N160	07/31/89		1234	N-5	SCP Progress Report: Results of Geochemistry Investigations All geochemistry input to the progress report (SPR) has been submitted to the DOE/YMP for review. The action for this milestone is concluded. This milestone N160 is completed.
R705	06/30/89		1232122	INC-7	Issue Letter Report: Thermodynamics and Kinetics of Phases Important to Silica Activity at Yucca Mountain
T535	04/17/89		123411	HSE-12	Study Plan Approved (Ground Water Chemistry Model)

New WBS Number 1.2.5

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
T001	03/15/89		12522	N-5	Submit draft ongoing Geochemistry Test Program Study Plans to YMPO for review. Will be completed when all study plans are submitted to the Project Office.

New WBS Number 1.2.6

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
M667	02/24/89		12684	WX-4	IDS Phase 1 Final Design Issued Review completed.
T062	01/10/89		12684	WX-4	IDS Phase 2 Final Design Issued. Delayed due to fully qualified QA program effort.
T436	06/08/88		12684	WX-4	IDS Development System - Status Report #1
T437	06/10/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #1

ATTACHMENT 1
08/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
T438	10/17/88		12684	WX-4	IDS Phase 1 & 2 Facilities - Detailed Requirements
T439	10/17/88		12684	WX-4	IDS Phase 1 Hardware - Interim Design Report
T440	10/17/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #2
T443	02/01/89		12684	WX-4	IDS Phase 2 Hardware - Interim Design Report
T444	02/01/89		12684	WX-4	IDS Development System - Status Report #2
T445	05/01/89		12684	WX-4	IDS Phase 1 Software - Validation and Verification Report
T446	05/01/89		12684	WX-4	IDS Phase 1 Hardware - Acceptance Test Report
T447	05/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #1
T448	09/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #2

ASSUMPTIONS:
ES start date 11/89
WBS Structure baseline 7/22/86
Prep: 08/01/89
A. Pratt

DISTRIBUTION:
J.A. Canepa, N-5, J521
H.N. Kalia, ESS-1, J900/527
R.L. Byers, N-5, J521
D.T. Oakley, N-5, J521
K.A. West, N-5 , J521

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: LANL
31 July 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: LANL
31 July 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

JULY PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: LANL
31 July 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.3.1.1.A							
Compile Draft ES Test Procedure (Construction Phase)	Girdley	2	M287 (P)	29 Sep 89		87/169	MAY BE DELAYED DUE TO THE DELAY IN THE START OF THE ES
WBS: 1.2.3.4							
Submit Draft Geochemistry Test Program Study Plans to YMPO for Review	Blanchard.	2	T001 (P)	25 Aug 89			ON SCHEDULE
WBS: 1.2.3.4.3.1.A							
Complete Design of the Exploratory Shaft Water Tracer System	Robson	2	R321 (P)	29 Sep 89			ON SCHEDULE
WBS: 1.2.6.8.2.3.A							
IDS Phase 1 Final Design Issued	Waters	2	M667 (P)	30 Sep 89		87/171	UNDER REVIEW, MAY BE DE[illegible] FROM THE BASELINE

NO. MILESTONES IN THIS SECTION: 4

YUCCA MOU...IN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: T&MSS/LAN
31 July 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: T&MSS/LAN
31 July 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOU..AIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: T&MSS/LAN
31 July 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.9.3							
Project Completes LANL QA Program Qualification Audit	Blaylock	1	T499 (P)	01 Sep 89	15 Sep 89		Delayed Due To Scheduling Constraints

NO. MILESTONES IN THIS SECTION: 1

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: YMP/LANL
31 July 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: YMP/LANL
31 July 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JULY 1989
RESPONSIBILITY CODE: YMP/LANL
31 July 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WBS #: 1.2.9
QA: N/A

July 27, 1989

TWS-EES-13-07-89-075

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
US Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: JUNE PROJECT STATUS REPORT

Attached are the June Project Status Report for Los Alamos' participation in the Yucca Mountain Project, the Technical Data Management System Submittal Record, and the Monthly Milestone Status Report. A list of outstanding policy reviews and other documents is also included. Documents checked on that list have been at the Project Office for at least two months; the authors are very eager to have those documents approved.

Sincerely,

R. J. Herbst

R. J. Herbst

ABC/rv

Attachment: a/s

X

Cy w/attachment:

R. Bullock, F&S, Las Vegas, NV
J. C. Calovini, H&N, Las Vegas, NV
V. J. Cassella, HQ/Washington, DC
D. Eppler, SAIC, Las Vegas, NV
C. Garvin, SAIC, Las Vegas, NV
L. Hayes, USGS, Denver, CO
J. Steigler, SNL, Albuquerque, NM
T. Jackson, SAIC, Las Vegas, NV
R. F. Pritchett, REECo, Las Vegas, NV
L. Ballou, LLNL, Livermore, CA
A. M. Sastry, MACTEC, Las Vegas, NV
N. Carter, SAIC, Las Vegas, NV
A. B. Caughran, IS-11, MS J521
EES-1 Distribution, MS D462
EES-13 Distribution, MS J521
K. G. Eggert, EES-5, MS F665
M. Stevenson, ADET, MS A107
H. N. Kalia, EES-1/LV, MS J900/527
T. J. Merson, WX-4, MS G787
E. C. Roybal, INC-7, MS J514
R. A. Morley, EES-1/LV, MS J900/527
A. R. Pratt, FIN-10, MS J521
RPC File (2), MS M321
EES-13 Library, MS J521
TWS-EES-13, MS J521
CRM-4 (2), MS A150

Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
June 1989

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Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
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WBS: 2.1.2.4.A
Project Title: Systems Engineering Integration
Principal Investigator: R. Herbst

The objective of this task is to integrate Yucca Mountain Project technical work through the application of systems engineering techniques.

ACTIVITIES AND ACCOMPLISHMENTS:

No activity to report this month.

WBS: 2.3.2.3.1.A
Project Title: Tectonics and Volcanism
Principal Investigators: B. Crowe and F. Perry

The objective of these volcanism studies is to determine the hazards of future volcanic activities with respect to siting a high-level radioactive waste repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

Samples were collected in the Yucca Mountain region for paleomagnetic studies. Sampling locations include a second population of samples from the Lathrop Wells volcanic center, the two cones of Sleeping Butte (Little Black Peak center and Sleeping Butte center), and sites in the 3.7 Ma basalt of Crater Flat and Black Cone center.

A paper entitled "Volcanic Hazard Studies for the Yucca Mountain Project" was published in Waste Management 89 (Volume I, p. 485-491). An oral paper presenting evidence for the polycyclic eruptive patterns of small volume basalt centers of the southern Great Basin was presented at a conference in Santa Fe, New Mexico, sponsored by the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).

Final editing was completed of personnel certifications for personnel involved in the volcanism studies. A management diagram of the volcanism project was also completed, and the package was assembled and submitted to the N-5 office in Los Alamos.

Talks on volcanism studies were presented during the meeting session in Las Vegas and on site at Yucca Mountain for the program review by the National Technical Waste Review board.

Mineral separations for the U-Th studies were completed. Magnetite separated from the north lava flows of the Lathrop Wells center may be altered and is possibly unsuitable for analysis.

Thirty basalt samples from the "A" cone in the Cima volcanic field and the Lathrop Wells center were crushed and submitted for x-ray fluorescence analysis.

The rough draft of a manuscript on the results of proton microprobe studies of basaltic ash in trenches of the Yucca Mountain area was completed. The manuscript will be edited by coauthors and prepared as a Level III milestone report.

PLANNED WORK:

Sampling of deposits for thermoluminescence age determinations by S. Forman of the University of Colorado will take place during the first week of July. Samples will be collected from the Lathrop Wells volcanic center and the "A" cone at the Cima volcanic center.

A meeting to review comments on the Study Plan "Characterization of Volcanic Features" will take place at Las Vegas during the second week of July.

Mass spectrometry instrumentation time for the first U-Th measurements of basalt samples is scheduled for August.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Crowe, LANL Harrington, Perry, UNM Wells, McFadden, USGS UCB Renault, Turrin, USGS and Champion USGS Menlo Park	Volcanic Hazard Studies for the Yucca Mountain Project	Paper for Waste Management 89	Published.
Turrin, Crowe, and Fleck	K-Ar Determinations of Lava Flow Units at the Lathrop Wells Volcanic Center	Journal article (to be determined)	In review.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
T404	9/30/88	Progress Report on Rock Varnish Work	Revision sent to Project Office 2/28/89.

WBS: 2.3.4.1.1.A
Project Title: Groundwater Chemistry
Principal Investigator: M. H. Ebinger

The goal of this investigation is to provide conceptual and mathematical models of the groundwater chemistry at Yucca Mountain. These models will explain the present groundwater composition in relation to interactions of minerals and groundwater and will be used to predict groundwater compositions as a result of anticipated and unanticipated environments.

ACTIVITIES AND ACCOMPLISHMENTS:

Investigation 8.3.1.3.1.1 was split into two activities. Activity 8.3.1.3.1.1.1 will be concerned with development of a conceptual model of groundwater chemistry, and the mathematical model of groundwater chemistry will be developed in Activity 8.3.1.3.1.1.2, which will begin after the conceptual model is developed.

The draft of the Study Plan for Activity 8.3.1.3.1.1.1 (Conceptual Model of Groundwater Chemistry) will be completed and submitted for internal review in July 1989.

PLANNED WORK:

Continue development of Study Plan for Activity 8.3.1.3.1.1.1, and circulate draft for internal LANL review.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

No milestones scheduled in the next three months.

WBS: 2.3.4.1.2.A
Project Title: Natural Isotope Chemistry
Principal Investigator: A. E. Norris

The objective of the natural isotope chemistry task is to determine the distribution of naturally occurring radioactive elements at Yucca Mountain as part of the work to characterize the infiltration of precipitation, the velocity of water movement through the unsaturated zone, and the retardation of radionuclide transport relative to water velocity.

ACTIVITIES AND ACCOMPLISHMENTS:

The ^{36}Cl analyses of Yucca Mountain Project samples performed this year at the University of Rochester's accelerator mass spectrometer indicated a strong dependence of the $^{36}Cl/Cl$ ratio on the particle size of the tuff being analyzed. These results led to the hypothesis that there are two ^{36}Cl components in the tuff: one associated with chloride of meteoric origin, and the second associated with subsurface production of ^{36}Cl. Work this month concentrated on analyses of the chloride and bromide contents of Yucca Mountain tuffs.

and soils to determine whether the Cl/Br ratio will be useful for deconvoluting the ^{36}Cl data. The Cl/Br ratio was measured for 24 USW UZ-1 samples, 8 USW UZ-N43 samples, and 10 trench 14 samples, and the data were used to perform an end-member analysis. The Cl/Br ratio for the meteoric component appears to be ~150, while the ratio for the hypogene component is ~500. The bromide concentrations are so low in the deeper samples (~5 ppb) that they are near the limit of detection of the ion chromatograph used for the analyses. The interpretation of the data is still in progress.

On June 14, samples of dust from three locations in G-Tunnel were collected to determine the ^{36}Cl background. One sample was collected in the experiment drift, where high values of ^{36}Cl have been observed in drill hole cuttings, and the other samples were collected in drift CFE 3&4 and in drift CFE 2. A sample of cuttings from drift CFE 3&4 is being processed for ^{36}Cl analysis. Additional analyses of ^{36}Cl in cuttings from air-cored hole AC-1 will help define the western extent of the bomb pulse observed in the experiment drift. For this work, J. Ray released 147 kg of AC-1 cuttings that were collected from the G-Tunnel portal by A. Norris and shipped this month to Hydro Geo Chem.

The quality assurance procedures for this task were discussed with Project personnel in Nevada. Los Alamos procedures will be written to govern collection of cuttings for Los Alamos work and water samples for ^{36}Cl analyses. Other procedures will be written as the needs are identified.

A total volume of 10 liters is required for ^{36}Cl analyses of water from dry-drilled holes at Yucca Mountain. Fenix & Scisson suggested using a 6-in.-diam bailer constructed for another project, which Dresser-Atlas personnel helped locate at the Nevada Test Site. Its capacity was determined to be 67 liters: the convenience of using a smaller water collector might well justify the cost of constructing one specifically for this task. The design of such a sampler was initiated by WX-4 personnel.

PLANNED WORK:

The full text of the paper "The Use of Chlorine Isotope Measurements to Trace Water Movements at Yucca Mountain" will be prepared for publication in the proceedings of the DOE/American Nuclear Society meeting "Focus '89" to be held in Las Vegas, Nevada, in September.

MILESTONE PROGRESS:

No level II milestones are scheduled this fiscal year.

WBS 2.3.4.1.3.A
Project Title: Hydrothermal Geochemistry
Principal Investigator: C. Duffy

The objective of the hydrothermal geochemistry task is to produce a model for past and future mineral alteration in Yucca Mountain. The model is intended to explain 1) natural mineral evolution resulting from the transformation of metastable mineral assemblages to more stable assemblages and 2) the effects of a repository emplacement.

ACTIVITIES AND ACCOMPLISHMENTS:

We continue to prepare detailed technical procedures and review quality assurance (QA) procedures. We are continuing to make progress on the data acquisition system for the flexible-cell hydrothermal system.

We are also continuing scoping studies on the kinetics of the cristobalite-to-quartz transition. Our major effort, however, is directed toward the preparation of a milestone report on the smectite/illite transition.

Assuming that smectite/illite can be represented by a solid solution of Ca-smectite, Na-smectite, and K-illite endmembers, reactions among the endmembers can be described by

$$\underset{\text{K-feldspar}}{1.9K\,AlSi_3O_8} + \underset{\text{Ca-smectite}}{Ca_{.55}(Mg,Fe)_{.9}Al_{3.3}Si_{7.8}O_{20}(OH)_4}$$

$$+ 1.1H^+ + 0.55CO_3^{2-}$$

$$\rightarrow \underset{\text{K-illite}}{K_{1.9}(Mg,Fe)_{.9}Al_{4.1}Si_7O_{20}(OH)_4} + \underset{\text{calcite}}{0.55\,CaCO_3}$$

$$+ \underset{\text{Kaolinite}}{0.28Al_4Si_4O_{10}(OH)_8} + \underset{\text{aqueous silica}}{5.38SiO_2}$$

and

$$\underset{\text{K-feldspar}}{1.9K\,AlSi_3O_8} + \underset{\text{Na-smectite}}{Na_{1.1}(Mg,Fe)_{.9}Al_{3.3}Si_{7.8}O_{20}(OH)_4} +$$

$$\rightarrow \underset{\text{K-illite}}{K_{1.9}(Mg,Fe)_{.9}Al_{4.1}Si_7O_{20}(OH)_4}$$

$$+ \underset{\text{analcime}}{1.28Na_{.86}Al_{.86}Si_{2.14}O_6} + \underset{\text{aqueous silica}}{3.76SiO_2}\ .$$

There is considerable published information relating the degree of smectite transformation to illite to temperature; however, there is considerable variation in the temperature correlated with a given amount of transformation. From the above equations, it can be seen that the amount of smectite present is also dependent on the pH, $a_{CO_3^{2-}}$, and $a_{SiO_{2,aq}}$. The water of hydration in the clays has been neglected in the above equation, but its inclusion would show that the extent of transformation is also dependent on the a_{H_2O}. One of the report's goals will be to examine possible magnitudes of the effects of each of these variables.

We have also noted that the rate of transformation of smectite to illite observed in some laboratory experiments is similar to the rate of quartz crystallization. We will therefore examine the possibility that the rate of crystallization of quartz controls the rate of the smectite/illite transformation. This seems a reasonable possibility because, if the smectite/illite transformation is maintained near equilibrium, the SiO_2 liberated by the transformation must be crystallized before further transformation can take place.

PLANNED WORK:

Work will continue as needed to achieve a fully qualified QA program. We will also continue scoping studies on the kinetics of silica polymorph transitions using cold-seal hydrothermal techniques. Most of the effort will be directed toward preparation of a milestone report on the smectite/illite transition due at the end of September.

PROBLEM AREAS:

Project-wide problems with the traceability of standards preclude the possibility of standardizing our hydrothermal lab at this time. Because of the long duration of many hydrothermal experiments, this problem could impact the milestone schedule if not corrected in the near future.

MILESTONE PROGRESS:

Work on the smectite/illite transition milestone is on schedule.

WBS: 2.3.4.1.4.A
Project Title: Solubility Determination
Principal Investigator: D. Hobart

The objective of the solubility determination task is to determine the solubilities and speciation of important waste elements under conditions characteristic of the repository and along flow paths from the repository into the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

The final draft version of the Solubility Task Study Plan was returned to us for final approval prior to technical review. We continued to center most of our effort on quality assurance (QA). Detailed procedure (DP) TWS-INC-DP-78 (Preparation of Pure Oxidation States of Neptunium, Plutonium, and Americium) has been returned with the reviewer's comments addressed. H. Nitsche has addressed the reviewer's comments and made revisions on DPs YMP-LBL-DP-05 (Sodium Concentration Determination in Radionuclide Solutions) and YMP-LBL-DP-07, which has been returned to Los Alamos, and YMP-LBL-DP-02 is currently under revision.

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H. Nitsche reports that the remaining neptunium experiments in UE 25#1 have been completed. Measurements on the supernatant show solution species of NpO^{2+} and NpO_2CO_3 at pH 7. At pH 8.5, the solution species were exclusively neptunium carbonate complexes. The ^{241}Am solubility experiments at pH 8.5 have reached steady state and will be finished next month. The pH 6 and 7 solutions are still being monitored.

Work continued on assembling and testing the integrated photoacoustic/photothermal deflection spectroscopy system. For the present testing phase, we are confining ourselves to signal detection by photoacoustic (PAS) methods using lead-zirconate-titanate (PZT) transducers. Preliminary versions of the interface routines for the laser power meter, the dye laser wavelength controller, the boxcar averager, and the digital oscilloscope have been completed and are undergoing testing. Plans have been completed for the in-house construction of high sensitivity/low noise preamplifiers for PAS signal processing. These preamplifiers are critical components for ultratrace PAS work, and construction work on them should begin in next month. Preliminary photoacoustic spectra have been obtained on the existing system (using single-stage amplification) for Nd^{3+} in several different aqueous media. The spectral ranges probed for Nd^{3+} transitions include both the 560 - 585 nm region (using Rhodamine 590 as a dye-laser medium) and the 490 - 540 nm region (using Coumarin 500 as the laser medium). In all cases, the spectral band fidelity for the

Nd^{3+} transitions has been excellent. We have also begun investigating signal-to-noise optimization and noise minimization for both acoustic and electronic noise sources. We have found that both the laser dye circulator and the laser power supply are sources of significant acoustic noise, and we have taken steps to acoustically isolate the cell holder/PZT housing from these noise sources.

The following DP's are in progress:

- Determining UV-VIS-IR Absorption and Diffuse Reflectance Spectra.
- X-Ray Powder Diffraction Analysis for Solubility (YMP-LBL-DP- 03).
- Sodium Concentration Determination in Radionuclide Solutions (YMP-LBL-DP-05).

Completed and submitted DPs include the following:

- The Preparation of Solutions of Pure Oxidation States of Neptunium, Plutonium, and Americium (TWS-INC-DP-78) (It should be noted that the DP for preparation of pure oxidation states of neptunium, plutonium, and americium is a joint effort by LANL and LBL and will be revised with LBL additions soon.)
- Eh (Oxidation--Reduction) Potential Measurements (YMP-LBL-DP-06).
- Sample Identification and Handling.
- Purification of Colloidal Plutonium(IV) by Centrifugation and Ion Exchange (YMP-INC-DP-80).
- Calibration of Low Energy Gamma Counters (YMP-LBL-DP-02).
- Trace Element Characterization by Atomic Emission Spectroscopy (YMP-LBL-DP-04).

PLANNED WORK:

We will continue work on a number of DPs that are due this fiscal year.

We will continue to work with the present spectroscopy system until the preamplifiers are constructed. Work will focus on determining detection limits (principally for the Nd^{3+} test system) with the existing single-stage amplification system and on PAS signal properties as a function of system variables such as beam focus, beam-to-PZT distance, etc. We will also begin to explore more sophisticated mathematical means of PAS waveform analysis.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
M367	11/17/88	Progress Report on Colloid Stability	Revision sent to Project Office 4/11/89.
P379	11/17/88	Photoacoustic Spectroscopy Methodology	Sent to Project Office 1/18/89.
T418	11/30/88	Solubility Measurements	Revision sent to Project Office 3/27/89.

WBS: 2.3.4.1.5.A
Project Title: Sorption
Principal Investigator: A. Meijer

The objective of the sorption and precipitation task is to provide sorption coefficients for elements of interest in order to be able to predict radionuclide movements from the repository to the accessible environment.

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ACTIVITIES AND ACCOMPLISHMENTS:

Investigation of the effects of water/rock ratios on sorption coefficients has continued. We have investigated the causes for the increases in sorption ratios for Ba, Cs, and Sr with increasing water/rock ratios observed in simple batch experiments on a zeolitic tuff (G4-1502). Imperfect separation of liquid from solid material in the experiments was identified as one cause, and differences in background electrolyte composition due to solid dissolution was suspected as a secondary cause. Analysis of the waters from the batch experiments were initiated this month. Concentrations of the major cations are similar in each of the solutions showing variations within a factor of two, and analysis of the other major constituents are under way. Full evaluation of this potential cause for variations in the sorption ratio must await the availability of complete analyses.

We have continued the study of Am sorptive behavior using natural and synthetic groundwaters and pure minerals. This month, we completed the pre-equilibration step and started the batch sorption equilibration using Am solutions with a concentration of 10^{-11} M. Two teflon containers are being equilibrated with a solution of Am in J-13 water. The following samples are being equilibrated with a solution of Am in a 7.4 sodium bicarbonate/sodium carbonate buffer: two empty teflon containers, two clinoptilolite samples in teflon containers, and two romanechite samples in teflon containers.

We completed the sorption experiment with Np and pure minerals. The Np solution used for this experiment was prepared with millipore water and buffered with sodium bicarbonate and sodium carbonate to a pH of 8.5. The results follow.

Mineral	Rd calculated from sorption experiment
synthetic calcite	2.1×10^1
calcite from Mexico	3.9×10^2
synthetic hematite	5.1×10^4
montmorillonite from AZ	7.8×10^1
cryptomelane from NM	7.8×10^3
romanechite from AZ	1.5×10^3
purified clinoptilolite from ID	3.0×10^1
synthetic goethite	5.1×10^4

These results confirm our suspicions about the potential importance of trace minerals, such as hematite and cryptomelane, to the retardation of actinides in the Yucca Mountain groundwater flow system. Further studies will investigate the sensitivity of the Np sorption ratio on these minerals to variations in water compositions and radionuclide concentrations.

The desorption experiment of Np in pure minerals was also completed this month. Desorption involved equilibrating the mineral from the sorption step with a sodium bicarbonate/sodium carbonate buffer having a pH of 8.5 and separating the phases by centrifugation. The equilibrated solutions are presently being counted.

We have started the study of Tc sorption and desorption on pure minerals. This month we expect to finish the presorption step, which involves equilibrating the pure minerals with a sodium bicarbonate/sodium carbonate buffer having a pH of 8.5. This pH is common in groundwaters extracted from wells at Yucca Mountain.

Because zeolites will likely be an important barrier to the transport of many of the important radionuclides present in nuclear waste, their sorption behavior should be well understood. One aspect that has not been investigated in detail by the YMP is the effect of variations in zeolite compositions on sorption ratios. Although rock samples (1 g) used in batch sorption experiments are typically "pre-equilibrated" with 20 ml of the groundwater to be used in the experiment, when zeolitic tuffs are used in the experiment, equilibration cannot be achieved because zeolites have high cation exchange capacities and J-13 water is quite dilute in terms of major cations. To investigate this aspect of batch experiments on zeolitic tuffs, we have "equilibrated" a 10 gram sample of zeolitic tuff (G4-1502) with 20 liters of J-13 water in a flow-thru column. The resulting sample will be analyzed for the major components and used in batch sorption experiments to determine the effect of major cation compositions of the zeolites on the sorption ratios of the important radionuclides.

The Stanford group has investigated the degree to which the uranyl ion adsorbs to various laboratory container materials to select an appropriate material for isotherm measurements. At an initial concentration of 4.2×10^{-7} M, most of the uranyl ions sorb to the walls of teflon, glass, and polycarbonate test tubes in the pH range from 6 to 6.5. This indicates that adsorption to container walls must be taken into account in batch experiments at these concentration levels. Work has also continued on the development of an analytical method for neptunium.

The status of the detailed procedures that have been rewritten according to TWS-QAS-QP 5.2, R1 follows.

PROCEDURE #	TITLE	STATUS
TWS-INC-DP-05	Sorption, Desorption Ratio Determination of Geologic Materials by a Batch Method	Submitted to the INC QAL.
TWS-INC-DP-79	Liquid Scintillation Counting of Samples	Submitted to the INC QAL.

PLANNED WORK:

Continue the study of Am, Np, and Tc sorptive behavior using synthetic and natural groundwaters and pure minerals.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Ines R. Triay and Robert S. Rundberg	Application of Deconvolution to the Analysis of Univalent Ion-Exchange Isotherms in Zeolites X and Y	Journal article	Accepted by *Zeolites*
N. Patera, D. Hobart, A. Meijer, and R. Rundberg	Chemical and Physical Processes of Radio-Nuclide Migration at Yucca Mountain, Nevada	Journal article	In internal review.

MILESTONE STATUS:

Milestone	Date Due	Description or title	Status
T419	5/15/88	Position Paper on NNWSI Sorption Studies and Data Needs	Revised after technical reviews and forwarded to Project Office on on 6/28/89.

WBS: 2.3.4.1.6.A
Project Title: Dynamic Transport Process
Principal Investigator: R. Rundberg

The objectives of the dynamic transport process task are to determine the rate of radionuclide movement along the potential flow paths to the accessible environment and to examine the effect of diffusion, adsorption, dispersion, anion exclusion, sorption kinetics, and colloid movements in the flow geometries and hydrologic conditions that are expected to exist along the flow path to the accessible environment in the scenarios to be used for performance assessment.

G4 GU3 SCP Data

ACTIVITIES AND ACCOMPLISHMENTS:

Our study using Calico Hills and Topopah solid rock columns to investigate the ability of Yucca Mountain to act as a natural filter for particulate matter continues. We utilize for these studies two columns made of the Calico Hills tuff G4-1502 and two columns made of Topopah tuff GU3-1119. This month we have initiated the elution of 0.09 micrometer fluorescing colloids through these columns. To analyze the amount of colloid eluted, we perform fluorometric analysis. Consequently, we are in the process of obtaining a calibration curve using standards with known concentrations of the 0.09 micrometer colloid.

The study of the sorption of radionuclides as a function of time using beakers made of Yucca Mountain tuffs is still in progress (see schedule given in February's monthly report).

We initiated the validation of the Autocorrelation Photon Spectroscopy technique by analyzing NBS standards. The results for the analysis of four colloids follow:

Colloid No.	Actual Size (micrometer)	Measured Size (micrometer)
1691	0.269	0.268
1690	0.895	0.903
1960	9.89	*
1961	29.64	*

*These samples could not be analyzed because they were too large.

These results seem to indicate that particles larger than one micrometer can not be analyzed with this technique. In addition we analyzed mixtures of the NBS colloids 1691 and 1690 to determine the ability of this system to analyze suspensions containing more than one size colloid. The results of these studies will be reported next month.

We have moved some of the YMP equipment at RC-1, TA-48 to a new room within RC-1. After the equipment was moved it was re-installed and checked. We will continue this process through the next few months.

PLANNED WORK:

Continue solid rock column experiments.

Continue rock beakers experiment.

Start transport work with pure minerals.

Continue to validate the Autocorrelation Photon Spectroscopy technique using NBS standards.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
A. J. Mitchell, R. S. Rundberg, M. A. Ott, and I. R. Triay	Instrumentation and Operation of an Autocorrelated Photon Spectrometer Used for Particle Size Determinations	Abstract for 198th National Meeting of the American Chemical Society, Miami, FL, September 10-15, 1989	Received Project Office approval 6/2/89; presentation cancelled.
M. A. Ott, R. S. Rundberg, and I. R. Triay	Mechanical Manipulation of Intact Tuffaceous Rock to Fabricate and Assemble Solid Rock Columns and Rock Beakers	Abstract for 198th National Meeting of American Chemical Society	Received Project Office approval 6/2/89; presentation cancelled.
I. R. Triay, R.S. Rundberg, A.J. Mitchell, and M. A. Ott	Utilization of Inversion Techniques for Particle Size Determinations Using Auto-correlation Photon Spectroscopy	Abstract for 198th National Meeting of the American Chemical Society	Received Project Office approval 6/6/89.
I. R. Triay, R. S. Rundberg, A. J. Mitchell, M. A. Ott, D. E. Hobart, and P. D. Palmer	Size Determinations of Pu Colloids Using Autocorrelation Photon Spectroscopy	Abstract for 2nd International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere, Monterey, CA, November 6-10, 1989 (Migration 89)	Submitted to Project Office 5/18/89.
R. S. Rundberg, I. R. Triay, M. A. Ott, and A. J. Mitchell	Observation of Time Dependent Dispersion in Laboratory Scale Experiments with Intact Tuff Columns	Abstract for Migration 89	Submitted to Project Office 5/16/89.
I. R. Triay, A. Meijer, M. R. Cisneros, G. G. Miller, P. D. Palmer, R. E. Perrin, and R. D. Aguilar	Sorption Behavior of Americium in Tuff Samples and Pure Minerals Using Synthetic and Natural Groundwaters	Abstract for Migration 89	Submitted to Project Office 5/19/89.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R743	8/16/88	Dynamic Transport of Colloidal Tracers through Fractured Tuff: 0.10- to 9.55-μm-Diameter Carboxylated Polystyrene Spheres	Revision sent to Project Office 12/7/88.

WBS: 2.3.4.1.7.A
Project Title: Retardation Sensitivity Analysis
Principal Investigator: K. Eggert

The objectives of the retardation sensitivity analysis task are to construct a geochemical/geophysical model of Yucca Mountain and to use this model to examine the physical and chemical controls on radionuclide transport along flow paths to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

Analysis of Physical/Chemical Processes

FEHMN/FEHMSN. Adaptive solution procedures have been developed for two-phase, two-component, non-isothermal flow. These methods should prove useful in unsaturated zone calculations. The coupled flow/stress model is implemented and undergoing testing.

Colloid Transport Modeling. Two cases for CTCN (Colloid Transport Code - Nuclear) were investigated. First, Tang's analytical solution to the filtration capture submodel was applied to Rundberg's experiment, and his results were verified. Next, the same equation was solved numerically using the MOL1D code. There were overflow and underflow problems while running the code on a SUN, and the results obtained were inaccurate: the same problem was encountered on the Cray. Repeated attempts at debugging were fruitless.

For the other case, Rundberg's experiment was modeled by an electrokinetic model. The equations obtained by neglecting diffusion in the rock matrix and in the fluid were solved, and an analytic solution was obtained. However, to model Rundberg's experiment, these effects could not be neglected. We attempted to solve the new set of equations incorporating diffusion using MOL1D. The same problems were encountered as before, and less complex models are being tested to identify the problem. The problem is most probably due to the fact that Rundberg used a step input of the tracer. Most numerical codes have problems with step input boundary conditions, but this is especially true for Method of Lines (MOL) codes. Although MOL codes can solve most problems over a wider range than most other techniques, step inputs have been seen to cause overflow/underflow problems from the ODE integrator. Work was started on extending the MOL1D code to more dimensions. Objectives at this stage are developing the 2- and 3-D versions of CTCN and trying to find a method to circumvent the problems encountered for step inputs (if possible).

H. E. Nuttall delivered a professional paper entitled "Ion versus Colloid Transport in Fracture Medium" at the 63rd ACS Colloid and Surface Science Symposium, University of Washington, Seattle, Washington, June 18-22, 1989.

Geochemical/Geophysical Model

The grid was completed to run a 3-D forward transport calculation with TRACRN. The grid is based on a 3-D model of the hydrologic stratigraphy at Yucca Mountain developed at Sandia National Laboratories (Ortiz et al. 1985) and included tilted beds and the Ghost Dance Fault. The grid information was given to K. Campbell, who will return mineralogy data based on position and sorption data based on mineralogy. Initial flow calculations are ready to be run.

QA and Programmatic

The team participated in a practice audit conducted by quality assurance support staff and R. Herbst of N-5.

Team members completed QA reading assignments and updated QA manuals.

Work was started on the software requirements and software design (SRSD) portion of the baseline manual for CTCN.

K. Eggert compiled a set of input parameters for sample transport problems. This data was sent to A. Van Luik and will be incorporated into a set of Technical Integration Group sponsored performance assessment calculations. K. Eggert is a member of the working group responsible for these problems.

Interviews are being arranged to hire a staff member to work on inverse calculations, and one candidate was interviewed in June.

PLANNED WORK:

Geochemical/Geophysical Model

Work will be continued on 3-D forward transport calculation.

Transport Models and Related Support

Coupled geochemistry will be added to FEHMN.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
G. Zyvoloski and S. Kelkar	FEHMS - A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Los Alamos National Lab document LA-UR-87-1323	

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R343	5/1/87	Preliminary Geochemical/Geophysical Model of Yucca Mountain	Revision sent to Project Office 1/9/89.
R346	3/31/87	FEHMS: A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Memo addressing review comments sent to Project Office 5/23/89.
R749	7/30/88	Results of the COVE2a Benchmarking Calculations Run with TRACR3D	Revision sent to Project Office 12/9/88.
T421	12/15/88	TRACR3D Documentation for Baseline-Review.	Revision sent to Project Office 6/2/89.

WBS: 2.3.4.1.8.A
Project Title: Reactive Tracer Testing
Principal Investigator: E. Springer

Experiments will be conducted at the C-well complex (holes UE25c#1, UE25c#2, and UE25c#3) and in other wells in the vicinity of Yucca Mountain. Reactive tracers will be used to characterize retardation and transport properties on a scale larger than that currently used in laboratory experiments.

ACTIVITIES AND ACCOMPLISHMENTS:

The study plan for this activity was revised and returned following two comments from Headquarters and 18 comments from the Project Office.

Training for detailed technical procedures (DPs) that are critical to mineral separation and preparation was completed. Efforts continue to test new equipment, the polarograph and the particle-size analyzer, so we can develop DPs for these items.

A key in linking laboratory estimates of sorption with field test results is to develop the capability to adjust parameter values of the sorption expression for various conditions based on laboratory data. Although empirical isotherms will be used in the transport models to analyze the field test, constants in these isotherms can be used to estimate thermodynamic constants to provide a basis to adjust isotherm parameters for various conditions, such as solid to liquid ratios and/or solution composition. Mathematical derivations of the relationship between parameters found in the isotherms and thermodynamic equilibrium constants have been made for the case when the Modified Freundlich isotherm represents sorption by ion exchange. Initial testing of these hypotheses can use data from individual mineral experiments. If this approach is successful, the capability to estimate parameters for conditions other than those used in the laboratory will be enhanced.

Verification of the computer code FEHMN continued. The heat conduction algorithm was tested for various geometries, and a problem was found with left-facing triangles in a mixed triangular (both right and left facing) mesh or a mixed triangular and rectangular mesh. The problem is geometric and efforts to locate the coding error are under way. Heat and fluid flow in a fracture were also tested. Final verification of the hydraulics using the Theis and dual porosity solutions was completed. The transport component is still having mass balance problems that have been traced to the implementation of a boundary condition algorithm.

PLANNED ACTIVITIES:

Continue training in DPs and develop requirements for remaining procedures.

Initiate laboratory experiments using individual minerals.

Develop approach of using isotherms to derive thermodynamic parameters.

Implement corrections to FEHMN for left-facing triangle and solute transport problems and continue verification simulations.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

Author	Title	Type of Publication	Status
B. Newman, H. Fuentes, and W. Polzer	An Evaluation of Lithium Sorption Isotherms and Their Application to Groundwater Transport	Groundwater (Journal)	In technical review.

MILESTONE PROGRESS:

No milestones are due in the next three months.

Milestone	Date Due	Description or title	Status
R397	3/31/87	Reactive Tracer Experiments in the C-Wells and Other Wells in the Yucca Mountain Vicinity	Revision submitted to Project Office (Study Plan).
T426	9/1/88	FRACNET - Fracture Network Model for Water Flow and Solute Transport	Being revised after Project Office review.

WBS 2.3.4.1.9.A
Project Title: Biological Sorption and Transport
Principal Investigator: L. Hersman

The purpose of this research is to determine whether microbial activity can influence the movement of plutonium in tuff. Because fluids are used extensively in the exploration of locations for a nuclear repository, of special interest are those microorganisms capable of utilizing drilling fluids as growth substrates.

ACTIVITIES AND ACCOMPLISHMENTS:

Work has continued on the purification of siderophore from species 11c using both sephadex C-25 and bio-rad P-2 columns. Iron 59 was ordered from New England Chemicals and will be used to determine the formation constant of the siderophore for ^{59}Fe.

Colloidal agglomeration experiments are also being conducted. We are currently enhancing the image analysis system. Although it is easy to observe the accelerated formation of colloidal agglomerates in the presence of spent medium, it has been difficult to get the image analysis system to recognize the agglomerate as one unit and to not count all the individual particles within the agglomerate. We have been working with representatives from Olympus Corporation to solve this problem and are making progress in determining the effect of microorganisms on colloidal agglomeration.

PLANNED WORK:

We will continue to study colloidal agglomeration. In addition, chelation experiments will be directed towards determining a formation constant with ^{239}Pu.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

No Level II milestone reports are due in the next three months.

WBS: 2.3.4.1.11.A
Project Title: Geochemical Field Tests for Validation
Principal Investigator: J. A. Canepa

The purpose of this activity is to test the validity of the laboratory geochemistry data generated by the Geochemistry Test Program and to test the geochemical transport modules. Five subtasks constitute this activity: 1) natural analogs, 2) large block test, 3) caisson test, 4) unsaturated zone geochemistry field test, and 5) radionuclide migration studies at the Nevada Test Site.

ACTIVITIES AND ACCOMPLISHMENTS:

Natural Analog Task

Work scope and a funding profile for the joint natural analog task with the Atomic Energy of Canada Limited (AECL) were provided to the Department of Energy (DOE).

Large Block Test

Work scope and a funding profile for the joint large block test with the AECL were provided to DOE.

Radionuclide Migration Studies at the Nevada Test Site

No action.

Caisson Tests

No action this month because of the requested efforts to support the request for problem formulation by the Performance Assessment Technical Integration Group (TIG).

Geochemistry Field Tests

The field test designs proposed by LLNL and Los Alamos/Argonne/Sandia in 1981 - 1982 for G-Tunnel tuff and climax granite transport experiments, as well as technical peer review comments of these programs, were reviewed. It was useful to read the criticism of the experiments, because their general objectives and designs are similar to the field effort we envision.

A draft of the compilation of what is known of the Calico Hills tuff below the repository is complete. This document will be formally reviewed for technical and policy concerns and will form the basis for justification of Calico Hills geochemistry field tests, as well as being a useful catalogue of hydrologic and transport properties.

We have talked to the US Geological Survey experimenters regarding details of the measurement and sampling techniques they will apply in their hydrology experiments in G-tunnel and the Exploratory Shaft Facility (ESF). They are improving their thermocouple psychrometers for pore pressure diagnostics and are developing calibration capability at the Nevada Test Site for their customized psychrometers. *In situ* fluid sampling is being approached by developing techniques to extract pore fluid from cores taken from the medium (triaxial squeezing, centrifuge, freeze drying, and displacing the pore fluid with non-aqueous liquids). Their previous *in situ* block infiltration experiment at the ESF is now planned to be a laboratory block test.

We have also set up simple TRACRN problems for parametric studies to determine scaling relationships (both flow and retardation). This work will continue for several months, eventually culminating in detailed analyses of the experiment design.

WBS: 2.3.4.2.1.A
Project Title: Fracture Mineralogy
Principal Investigator: B. Carlos

The purpose of this task is to study fracture-lining minerals and their paragenesis to (1) assess the role of fractures as transport pathways during past alteration, (2) determine the conditions under which various minerals were deposited, (3) determine the nature of fracture surfaces along possible transport pathways, and (4) evaluate the occurrence of potentially hazardous minerals in the intervals to be mined.

ACTIVITIES AND ACCOMPLISHMENTS:

Developing and implementing a qualified quality assurance (QA) program continue to be a top priority, and we are continuing writing, reviewing, and training in various QA procedures and detailed procedures.

Some additional analytical work was done on the manganese oxides in the Crater Flat tuff of USW G-4. The milestone report is written and will now undergo internal review.

Work continues on fractures in the Topopah Spring Member in USW G-1, G-2, and GU-3. Stilbite was identified from a fracture at 1517 ft in USW G-2. The fracture is in the densely welded Topopah Spring Member approximately 117 ft above the vitrophyre. This is the first stilbite identified at Yucca Mountain. It occurs with mordenite and cannot be distinguished from heulandite at 50x magnification. Heulandite and mordenite are the most common fracture-coating minerals at this stratigraphic depth in other drill holes at Yucca Mountain.

D. Broxton and B. Carlos attended the Sample Overview Committee meeting held at the Sample Management Facility on June 20. Results of the prototype drilling in Utah were presented, and the samples obtained by the various methods were examined. Reverse vacuum coring presents difficulties in operation, and the results did not meet the needs of any of the Principal Investigators (PIs) present. We therefore recommend that this method be discontinued and that future prototype coring concentrate on normal circulation dry drilling. It was also apparent that there is an acute need for integration of the surface-based investigations similar to the function performed by the integration office for the Exploratory Shaft Facility. Because the plans change often, it is difficult to keep up with the latest plan and assure that it meets the needs of the various investigations. Not all of the participants agreed on the depth, locations, or diameter of planned core holes: PIs may be planning their experiments around an obsolete drilling plan and find that the location or diameter of the hole has been changed and they cannot perform their investigation.

PLANNED WORK:

Work towards developing and implementing a qualified QA program will continue.

Examination and analysis of fracture-coating minerals in the Topopah Spring Member in USW G-1, G-2, and GU3 will continue as time and sample availability allow.

Review and revision of the Los Alamos report on manganese oxide fracture fillings in the Crater Flat tuff in USW G-4 will begin next month.

MILESTONE PROGRESS:

No Level II milestone reports are due in the next three months.

WBS: 2.3.4.2.2.A
Project Title: Alteration History
Principal Investigator: S. Levy

The objective of the alteration history task is to characterize past and present natural alteration processes that have affected the potential geologic repository and to predict future effects of natural and repository-induced alteration.

ACTIVITIES AND ACCOMPLISHMENTS:

Efforts this month were concentrated on revising the alteration history study plan following the DOE Headquarters comment resolution session on May 31.

An invited presentation by Professor Kevin Crowley, Miami University, on "Annealing of Fission Tracks in Apatite, with Applications to Geothermal History" was given here on June 6. We are looking into the possibility of sponsoring fission-track annealing studies of Yucca Mountain samples to complement the illite-smectite transformation studies of paleogeothermal gradients being done by D. Bish.

S. Levy prepared the statement of proposed mineralogy-petrology tests for the prototype shaft, with input from B. Carlos (fracture mineralogy). The principal objective of our proposed tests is to check the workability of sampling arrangements, including procedures and interfaces. The fracture mineralogy input includes the added objective of evaluating the representativeness of *in situ* and muck-pile fracture samples. Levy delivered the draft version of our proposed tests at the Exploratory Shaft Test Plan meeting in Albuquerque, New Mexico, on June 15.

Quality assurance (QA) emphasis this month has been on training for read-only quality procedures (QPs). Several draft QPs were also reviewed.

PLANNED ACTIVITIES:

Top priority will be on completion of the alteration history study plan revision. Scanning electron microscope study of fault breccia textures will continue. S. Levy will make a presentation on alteration history research at the US Geological Survey, Denver, in July. An official version of the prototype shaft test plan input will be prepared and delivered. We have been requested to provide mineralogic information to the Technical Advisement Review committee investigation of a possible fault at the Exploratory Shaft site.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

Milestone reports are delayed to redirect effort toward the QA program.

WBS: 2.3.4.2.3.A
Project Title: Mineralogy of Transport Pathways
Principal Investigator: D. Vaniman

The purpose of this activity is to define the important mineralogic and geochemical variables along transport pathways at Yucca Mountain in support of performance assessment and to evaluate the impact of repository construction on natural waste transport barriers.

ACTIVITIES AND ACCOMPLISHMENTS:

Data files of petrographic, x-ray diffraction (XRD), and INAA chemical analyses of devitrified Topopah Spring Member samples for the Exploratory Shaft mineralogy-petrology test have been completed. The data files will be used to determine the modes of stratigraphic and vapor-phase variation. The data will also be analyzed statistically to determine the sample size and sampling density necessary to adequately characterize the rock mass to be excavated during shaft and drift construction.

Four samples from UE-25a#1 were crushed and sieved to less than 75 micrometers for separation of phases with density greater than about 2.8. The samples crushed were from the devitrified Topopah Spring Member at the proposed repository elevation, from the altered zone above the basal vitrophyre, from the vitrophyre, and from zeolitized tuff of Calico Hills. Na-metatungstate heavy liquid was used, with density separation at 2.82 - 2.83. Weights recorded before and after separation show that the heavy mineral fraction accounts for about 0.05% of the devitrified and vitrophyre samples and about 0.03 to 0.05% of the zeolitized samples. The separated materials are being analyzed by XRD and will be used in mossbaüer analysis.

D. Broxton and D. Vaniman gave presentations to the Nuclear Waste Technical Review Board in the field at the NTS on June 28th.

The sample identification and control procedure for mineralogy-petrology studies has been integrated with the electronic sample-tracking database.

PLANNED WORK:

Continue work on quality assurance program development.

Development of Exploratory Shaft Sampling plan using data from the Solitario Canyon outcrop.

Evaluation of revised XRD data using multivariate methods.

Work on image analysis methods to generate porosity distribution maps and on trace-mineral analysis.

Statistical methods development, especially the development of tools for handling compositional data.

Simulation of spatial distribution of compositional data for use in transport models such as TRACRN.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

Author	Title	Type of Publication	Status
K. Campbell	Sampling for Site Characterization of a Potential Waste Repository	Journal (*Mathematical Geology*)	Being revised following internal review.
K. Campbell	Statistical Guidelines for Planning a Limited Drilling Program	Article for journal (to be determined)	In technical review.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
T433		XRD Analysis of Batch Sorption Samples	Project Office approved 6/13/89.

WBS: 2.5.2.2.A
Project Title: Regulatory and Institutional
Principal Investigator: J. A. Canepa

The purpose of this task is to coordinate the regulatory and institutional Project requirements within the Los Alamos programmatic structure. The focus of this coordination effort is on the integration of the technical work within the regulatory and institutional framework.

ACTIVITIES AND ACCOMPLISHMENTS:

Site Characterization Plan

No action required this month.

Semiannual Progress Report

No action required this month.

Study Plans

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Yucca Mountain Project Office (Project Office) 1/6/89. Approved by Project Office and Department of Energy Headquarters (DOE/HQ); sent to Nuclear Regulatory Commission (NRC) and State of Nevada.

Diffusion Test in the Exploratory Shaft, RO (8.3.1.2.2.5). Submitted to Project office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/HQ 4/18/89. Abstract and SCP-based network submitted to Project Office 5/25/89 and to DOE/HQ 6/30/89.

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Revision 1 was sent to DOE/HQ 5/2/89. Project Office AP-1.10Q review comments were received 5/10/89. Revision 2, which incorporates DOE/HQ and Project Office comments, was submitted to the Project Office 6/27/89.

Mineralogy, Petrology, and Chemistry of Transport Pathways, R3 (8.3.1.3.2.1). Revision 3, which incorporates Project Office AP- 1.10Q review comments, was submitted to the Project Office 5/25/89. Study Plan was approved by the Project Office and transmitted to DOE/HQ on 6/16/89. A Study Plan Assessment was developed for this study and transmitted to DOE/HQ on 6/22/89.

History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). Project Office and DOE/HQ comments were received 5/25/89. A comment resolution meeting was held on May 31, 1989, for DOE/HQ comments.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Study plan submitted to DOE/HQ for review 3/14/89. Project Office AP-1.10Q review comments were received 6/1/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R1 (8.3.1.3.4.2). Revision 1, which incorporates screening review comments, was submitted to the Project Office 5/26/89. Undergoing Project Office AP-1.10Q review (6/16/89).

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP3.2 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Diffusion, R0 (8.3.1.3.6.2). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of a Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (1/25/89). Project Office AP1.10-Q comments received 6/9/89. A Comment Resolution Meeting for Project Office and DOE/HQ comments will be held July 11-12, 1989.

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/89. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of the abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89. Project Office AP-1.10Q comments received 6/28/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

WBS: 2.6.A
Project Title: Exploratory Shaft Management and Planning
Principal Investigator: H. Kalia

These exploratory shaft (ES) tasks will address the issues and information needs associated with the feasibility of storing high-level nuclear waste in a geologic repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

We continued to support the updating of the Subsystems Design Requirements Documents (SDRD). Work primarily consisted of incorporating unresolved Technical Assessment Review Comments (TAR) on Bench Mark 4 of the SDRD. The effort is underway to issue Revision 1 of the SDRD and to completing this activity.

Work continued for the preparation of Test Support Requirements Document (TSRD). To date, support requirements have been determined on all of the tests in the Shaft and requirements are being developed for the tests in the main test level.

and Technical Review

Work continued to prepare the Exploratory Shaft Test Description Document (ESTD). Draft of this document is expected to be ready for Los Alamos review by the end of July.

Work continued for the preparation of project testing networks. We discussed the logic of the test networks with Sandia, Lawrence Livermore, US Geological Survey (USGS), and Los Alamos Principal Investigators.

We continued to support the WIT-4 effort and Long Range Planning Networks by providing information on testing for the network.

Work continued for the preparation of the Annual report and the Summary Report for the Prototype Testing Program. Work was initiated to obtain photographs to prepare an album for the prototype testing.

Continued to support project efforts in integrating Exploratory Shaft Facility (ESF) testing with construction and design by participating in design integration meetings.

Initiated work for the preparation of information to be used by the Project Office to define US Bureau of Mines (USBM) Pittsburgh and Minneapolis centers role.

Supported FSN effort in developing specifications to modify CMM-2 drill rig.

Participated in a meeting on water usage and in Interface Control meetings. Continued to participate in Readiness Review meetings both as a team and board member.

Work continued on *in situ* stress measurements. Problems have been encountered on overcoring because the core fragments cannot be used to obtain modules. The drilling technique has been modified to obtain overcore; however, additional funds are requested to complete this activity.

Prototype data collection continued for the Engineered Barrier Test and Drill Hole Instrumentation test. Drilling for Phase II of the Prototype Intact Fracture tests was initiated, and drilling for perched water continued during this period. We prepared input for the prototype shaft for planned testing and coordinated input with Sandia, USGS, and Los Alamos. Held a prototype budget discussion with participants and project staff to obtain the current status of the prototype budget for reaming tests and plans for FY 1990. Completed and distributed Readiness Review memorandum for Prototype Blast Effects Tests.

Participated in Exploratory Shaft Test Coordination Meeting hosted by Sandia at Albuquerque. Next meeting is scheduled for August at Denver, Colorado, to be hosted by USGS.

Work was initiated to prepare Preliminary Safety Analysis Report (PSAR) for testing. Coordinated the preparation of Project PSAR with other participants.

Participated in a workshop conducted by NTS on applicable DOE orders.

Contract to utilize Golder Associates from Seattle was finalized.

Cody Milligan was transferred from Los Alamos, NM to Los Alamos, YMP Las Vegas office. He will coordinate REECo activities, PSAR, and safety aspects of testing.

PLANNED WORK:

Work will continue to support and coordinate the prototype testing effort and to update the Prototype Testing Budget. Work will continue to plan and implement Readiness Reviews for the prototype tests.

Work will continue to update and to complete the response to DOE/HQ comments on SDRD Appendix B and C.

Work will continue to prepare Exploratory Shaft Test Descriptions Document and Test Support Requirements Documents.

Meetings will be scheduled with REECo to develop drilling time for tests.

Work will continue to develop detailed logic networks for ESF testing.

Work will continue for the preparation of the PSAR.

Work will continue to develop the scope of work for USBM effort for Dust Hazard and Drilling activities.

Work will continue to support WIT-4, LRP, and other integration activities.

PROBLEM AREAS:

Competing demand for resources is straining the capacity to maintain schedule, so work on several activities is being performed on priority basis.

WBS: 2.6.9.2.4.A
Project Title: Geochemical Testing
Principal Investigator: A. E. Norris

Two geochemical tests have been proposed as part of the site characterization work associated with the construction of the exploratory shaft (ES). One is the measurement of the rate of water movement through the unsaturated zone as traced by chlorine-36. The second is the measurement of effective diffusivity coefficients under *in situ* conditions in two of the tuffs that will be penetrated by the ES. The data from both tests will be used in assessing the suitability of the Yucca Mountain site for a nuclear waste repository.

ACTIVITIES AND ACCOMPLISHMENTS:

U. S. Bureau of Reclamation requested this month that the control panel for the prototype diffusion test in G-Tunnel's experiment drift be moved closer to the right rib to provide clearance for drilling in the headwall for the intact fracture test. On June 14, the control panel was moved, the nitrogen gas lines were replumbed, and a new solenoid was installed to replace one that failed during the move. Clearance between the drill rig for the intact fracture test and the prototype diffusion test control panel is likely to be minimal at best. A request was sent to the Test Manager to have a protective barrier built around the control panel before the drill rig is moved into position.

Cuttings from the prototype air coring test conducted at Toelle, Utah, were examined on June 20 at the Sample Management Facility. If similar cuttings are obtained from the prototype air corehole planned for the Nevada Test Site, they are likely to be satisfactory for procedure-development work.

The new motor for the ESS-1 rock saw has not solved all the problems involved in the dry sectioning of a 12-in.-diam core of welded tuff. This month, the fastest sectioning was done by making three cuts with an 18-in. blade, rather than a single cut with a 36-in. blade. Additional work will be done in an attempt to section the core more rapidly.

Revisions to the April version of the Exploratory Shaft diffusion test network were documented and sent to the Test Manager's Office.

PLANNED WORK:

Overcoring for the prototype diffusion test will be restarted as soon as the equipment is available.

MILESTONE PROGRESS:

No level II milestones are scheduled, and level III milestones are on schedule.

WBS: 2.6.9.3.A
Project Title: Exploratory Shaft Integrated Data System
Principal Investigator: H. N. Kalia

The integrated data system (IDS) is part of the supporting facilities for the Exploratory Shaft Facility (ESF). The IDS supports the data acquisition needs of the ESF test program by providing a central facility to automatically measure and control aspects of the ESF tests. The primary purpose of the IDS is to assist the principal investigators (PIs) in acquiring high-quality test data in a uniform, controlled fashion and to transfer those data to the PIs' organizations for data management and analysis.

ACTIVITIES AND ACCOMPLISHMENTS:

Work continued to prepare the IDS Quality Assurance Program Plan (QAPP) and the Basis for Design and Functional Requirements Document for the design of IDS.

Work continued for the development or the Configuration Management Plan for the IDS.

Contract document was revised and reissued defining Los Alamos and Edgertown, Germeshausen & Grier, Inc., (EG&G) responsibilities.

Continued with the preparation of the IDS network, and we provided network- related information for the integrated network.

Continue to integrate IDS with ESF design effort.

PLANNED WORK:

Work will continue to finalize IDS Functional Requirements Document (FRD) and Design Basis Document.

Work will continue to develop EG&G QAPP and procedures required to start the IDS Title II design.

Work will continue to prepare the IDS Configuration Management Plan, Data Interface Documents, and Hardware Configuration Plan.

We will seek authorization for YMP to start Title II Phase IA design of the IDS.

Continue to develop IDS network to completion of ESF testing and integrate this network with ESF design and construction network and with the testing network.

Initiate work to identify IDS operational requirements including resources and budgets.

Schedule meeting between users and designers on IDS test construction and scheduling.

PROBLEM AREAS:

Work on this activity remains behind schedule because of staffing problems at EG&G and Los Alamos; however, efforts are being made to find qualified scientists and engineers.

WBS: 2.9.1.4.A
Project Title: Records Management
Principal Investigator: G. Ortiz

The objective of this task is to manage records and documents related to the licensing of a geologic repository for the disposal of high-level radioactive waste. The requirements are to support the development, implementation, and maintenance of a comprehensive, automated, and integrated information management system.

ACTIVITIES AND ACCOMPLISHMENTS:

A records coordinators meeting was held on June 6 to discuss the new revision of Administrative Procedure AP-1.7Q. Many issues were addressed by Project participants regarding requirements imposed by the procedure, and requests were made to change some of these requirements.

The Quality Assurance staff conducted an audit of the Records Processing Center (RPC) on June 14 and 15. Two observations and six findings were made during the audit. Most of the findings addressed are, and will be, on-going activities, and we will take corrective actions for the deficiencies and appropriate steps to reduce recurrences. The audit team found that the records processing function had systems in place to process records carefully, completely, and in a logical manner.

PROBLEM AREAS:

The RPC has a responsibility of notifying the groups that their records have been microfilmed by the Central Records Facility (CRF). However, the CRF is backlogged with records to microfilm, causing a substantial delay in RPC's notification to the groups.

PLANNED WORK:

A standard form will implemented for the resident file log to give a status of the records and to maintain uniformity throughout the Project.

WBS: 2.9.3.A
Project Title: Quality Assurance
Principal Investigator: H. P. Nunes

The Quality Assurance Program provides quality assurance support to Los Alamos Yucca Mountain Project (YMP) participants. This support is designed to ensure that the YMP efforts of Los Alamos will provide admissible data and evidence for the repository licensing process.

ACTIVITIES AND ACCOMPLISHMENTS:

The biweekly Los Alamos meetings to achieve a qualified quality assurance (QA) Program were completed; however, monthly meetings will continue until the last procedures are issued. The 39 quality procedure revisions are on schedule. A total of 34 procedures are completed and issued: all of the remaining 5 are in the review-comment resolution cycle. All procedures for which formal training is required before the start of the Title II Design Efforts have been issued, and all procedures that impact the Title II effort have been completed and issued. Three formal training modules need to be prepared to support the final Los Alamos training needs for the remaining procedures currently being developed.

The effort at Edgerton, Germeshausen & Grier (EG&G) is now directed towards revising the EG&G QA Program Plan. This effort, caused by a Project Office directive to prepare a QA Plan for the IDS that was directly traceable to the YMP QA Plan/88-9, R2, is still scheduled for completion by July 10, 1989. EG&G has been directed to revise its program plan, prepare the needed revisions, and submit them with the appropriate QA Plan/88-9, R2, checklist to the QA Program Leader for review and approval. Additional direction was provided to ensure that the internal implementing procedures will be compatible with the resulting program plan.

The Los Alamos QA staff effort to review the completed quality administrative procedures to the checklists based on the approved QAPP, R4.3 has been completed. These checklists are being used to evaluate the completed implementing procedures assuring ourselves that all procedures reflect the needed requirements of the approved QAPP.

PLANNED WORK:

Continuation of Los Alamos efforts to achieve a qualified QA program that supports the start of the Title II IDS design efforts is still the first priority of the Los Alamos QA staff. Training the Los Alamos staff will be a second priority to ensure the start of the ongoing research efforts in accordance with the revised Los Alamos QAPP.

The Los Alamos QA staff will revise the existing procedures to incorporate the information derived from the checklist review of the implementing procedures against the approved QAPP, R4.3. Revisions will be issued in each case where omissions are found.

Additional staff have been assigned to track and close the outstanding standard deficiency reports, nonconformance reports, and corrective actions reports. These efforts will allow the timely closure of issues associated with the start of Title II IDS design efforts or the Los Alamos Test Manager's Office activities.

LOS ALAMOS NATIONAL LABORATORY
OUTSTANDING PROJECT OFFICE ACTION ITEMS
June 30, 1989

Policy Reviews

1. Milestone R743 report: resubmitted 12/7/88 with response to Project Office review.

2. Milestone R749 report: resubmitted 12/12/88 with response to Project Office review.

3. Milestone P379 report: resubmitted 1/18/89.

4. Milestone T404 report: resubmitted 2/28/89 with response to Project Office review.

5. Milestone R346 report: resubmitted 4/4/89; responded to Project Office comments 5/23/89.

6. Milestone M367 report: resubmitted 4/11/89 with response to Project Office review.

7. Milestone T415 report: submitted 5/9/89.

8. Milestone T427 report: submitted 5/24/89.

9. Book contributions - B. Crowe, "GSA Field Trip Segment: Lathrop Wells Volcanic Center" and "GSA Field Trip Segment: Crater Flats": submitted 4/27/89.

10. Abstract - H. Nitsche, "Solubility Studies of Transuranium Elements for Nuclear Waste Disposal: Principles and Overview": submitted 5/11/89.

11. Abstract - R. A. Rundberg et al., "Observation of Time-Dependent Dispersion in Laboratory Scale Experiments with Intact Tuff Columns": submitted 5/16/89.

12. Abstract - L. E. Hersman, "Effects of Microorganisms on the Transport of Actinide Elements": submitted 5/16/89.

13. Abstract - I. R. Triay et al., "Sorption Behavior of Americium in Tuff Samples and Pure Minerals Using Synthetic and Natural Groundwaters": submitted 5/19/89.

14. Abstract - I. R. Triay et al., "Size Determinations of Pu Colloids Using Autocorrelation Photon Spectroscopy": submitted 5/19/89.

TECHNICAL DATA MANAGEMENT SYSTEM SUBMITTAL RECORD

TITLE OF DOCUMENT	DESCRIPTION OF DATA OR INFORMATION	AUTHOR OR PRINCIPAL INVESTIGATOR	DATE PUBLISHED	QUALITY ASSURANCE LEVEL	TECHNICAL DATA MANAGEMENT SYSTEM COMPONENT (INDICATE BY "X")				DATE OF SUBMITTAL
					TRC	BEPDU	KJS	RIB	
NO DATA WER	SUBMITTED THIS MONTH								

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: LANL
30 June 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: LANL
30 June 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

JUNE PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: LANL
30 June 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.3.1.1.A Compile Draft ES Test Procedure (Construction Phase)	Girdley	2	M287 (P)	01 Sep 89	29 Sep 89		DELAYED DUE TO DELAY IN THE START OF THE ES
WBS: 1.2.3.4 Submit Draft Geochemistry Test Program Study Plans to YMPO for Review	Blanchard	2	T001 (P)	21 Jul 89	25 Aug 89		DELAYED DUE TO ADDITIONAL REVIEW PROCESS
WBS: 1.2.3.4.1.1.A Study Plan Approved (Ground Water Chemistry Model)	Clanton	2	T535 (P)	25 Aug 89	29 Dec 89		DELAYED DUE TO [illegible] STUDY PLAN REVISED
WBS: 1.2.3.4.3.1.A Complete Design of the Exploratory Shaft Water Tracer System	Robson	2	R321 (P)	28 Jul 89	29 Sep 89		DESIGN COMPLETE OPERATING MANUAL IN REVISION
WBS: 1.2.6.8.2.3.A IDS Phase 1 Final Design Issued	Waters	2	M667 (P)	30 Sep 89	*		IDS PHASE I DESIGN IS BEING REVIEWED - MAY BE DELETED FROM BASELINE.

* CURRENTLY UNDER REVIEW

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: LANL
30 June 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.9.3							
Project Completes LANL QA Program Qualification Audit	Blaylock	1	T499 (P)	15 Jul 89	1 Sept 89		Delayed due to Project office Scheduling Considerations

NO. MILESTONES IN THIS SECTION: 6

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: YMP/LANL
30 June 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: /LANL
30 June 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR JUNE 1989
RESPONSIBILITY CODE: YMP/LANL
30 June 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

ATTACHMENT
07/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments

FY89 Milestones - Level 1 Completed as of July 01, 1989

NONE

FY89 Milestones - Level 2 Completed as of July 01, 1989

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T478	12/15/84		12311A	N-5	Prototype Test Plans, Volume 2 (FY-89 Funded Tests) This milestone is the other part of milestone T435 (Volume 1). The schedulers are incorrectly using M253 for Volume 2. This milestone should not be confused with M105, which is the submission of the prototype test plans for review. M105 is completed. The report entitled 'Prototype Test Plans, Volume 2 (FY-89 Funded Tests)' was completed and sent to the Project Office for policy review on 12/15/88. ref. TWS-NS-12-88-034.
T404	09/28/88		1232312A	ESS-1	Progress Report on Rock-Varnish Work Report entitled 'Progress Report on Rock-Varnish Work' was completed and sent to the Project Office for policy review on 11/16/88. ref. TWS-NS-10-88-046.
T414	02/28/89		123363A	ESS-1	Final Dust Hazard Assessment Report Report entitled 'Evaluation of Dust-Related Health Hazards Associated with Air Coring at G-Tunnel, Nevada Test Site' was completed and sent to the Project Office for review on 04/14/89. ref. TWS-NS-04-89-055.
T415	12/16/88		123363A	ESS-1	Final Drilling and Technology Report The final report draft of the Prototype Air Coring Test was completed and sent to the Project Office on 01/17/89. ref. TWS-ESS-1-1/89-11. Report entitled 'The Yucca Mountain Project Prototype Air-Coring Test, U12g Tunnel, Nevada Test Site' was sent to the Project Office for policy review on 05/09/89. ref. TWS-NS-89-045.
M367	11/17/88		123414A	INC-11	Interim Progress Report on Colloid Stability Report entitled 'Interim Progress Report on Colloid Stability: Voltammetric Studies of the Redox Reactivity of Plutonium (IV) Colloid' was completed and sent to the Project Office for policy review on 12/12/88. ref. TWS-NS-12-88-033.
P379	11/17/88		123414A	INC-11	Progress Report: Photoacoustic Spectroscopy Methodology (PAS) Report entitled 'Photoacoustic Spectroscopy Methodology' was completed and submitted to the Project Office for policy review on 01/18/89. ref. TWS-NS-01-89-058.

ATTACHMENT 1
07/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T418	11/30/88		123414A	INC-11	Letter Report: Progress Report on Solubility Measurements Report entitled 'Letter Report: Progress Report on Solubility Measurements' was completed and sent to the Project Office for policy review on 11/28/88, ref. TWS-N5-11-88-069. The report was approved for publication by the Project Office on 05/09/89, ref. TWS-N5-05-89-047.
R505	11/25/88		123415A	INC-7	Summary Report: Sorption of Nickel and Neptunium in Tuff Using Groundwaters of Different Composition Milestone completed on 10/21/88 and the report entitled 'Sorption of Nickel and Neptunium in Tuff using Groundwaters of Various Compositions' was sent to the Project Office, ref. TWS-N5-10-88-050.
R720	11/01/88		123415A	INC-7	Issue Report on Deconvolution of Ion-Exchange Isotherms Report entitled 'Deconvolution of Ion-Exchange isotherms' was reviewed, and a copy of the revised paper was sent to the Project Office on 02/17/89, ref. TWS-N5-02-89-058.
T421	12/15/88		123417A	ESS-5	TRACR3D Documentation for Baselined Version Report entitled 'TRACRN 1.0: A Model of Flow and Transport in Porous Media for the Yucca Mountain Project - Model Description and User's Manual' was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-032.
T424	02/28/89		123417A	ESS-5	Interim Report: Letter Report on Particulate Transport Report entitled 'Interim Report on Particle Transport' was completed and sent to the Project Office for policy review on 02/24/89, ref. TWS-N5-02-89-072. The report was approved for publication by the Project Office on 05/09/89, ref. TWS-N5-89-048.
T426	11/25/88		123418A	ESS-4	FRACNET - Fracture Network Model For Water Flow and Solute Transport Milestone completed on 10/25/88. A policy review conducted on report entitled 'FRACNET - Fracture Network Model for Water Flow and Solute Transport' was sent to the Project Office, ref. TWS-N5-10-88-059.
T207	11/30/88		123422A	ESS-1	Dating Zeolitization at Yucca Mountain with Tectonic and Structural Data Report entitled 'Dating Zeolitization at Yucca Mountain with Tectonic and Structural Data' was completed and sent to the Project Office for policy review on 12/01/88, ref. TWS-N5-12-88-003.
T095	11/30/88		123423A	ESS-1	Issue Report: Statistical Test of Repeatability and Operator Variance on Modal Analysis Report entitled 'Status of Image Analysis Methods to Delineate Stratigraphic Position in the Topopah Spring Member of the Paintbrush Tuff, Yucca Mountain, Nye County, Nevada' was completed and sent to the Project Office for policy review on 12/23/88, ref. TWS-N5-12-88-072. The report was approved for publication by the Project Office on 5/25/89, ref. TWS-N5-05-89-140.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T469	02/28/89		123423A	ESS-1	Issue Report on Erionite Abundances at Yucca Mountain. Report entitled 'The Occurrence and Distribution of Erionite at Yucca Mountain, Nevada' was completed and sent to the Project Office for policy review on 02/14/89. ref. TWS-NS-02-89-045.
R321	12/23/88		123431A	WX-4	Complete Design of the Exploratory Shaft Water Tracer System Demonstrated to H&N use of the equipment and provided drawings to H&N. No further action is required. This milestone was completed on 03/09/89. ref. TWS-ESS-LV-1-03-89-17.
T163	11/30/88		12611A	WX-4	Revised NNWSI 'White Paper' on 'ES Fluids and Materials Usage' Delivered to WMPO. Report entitled 'Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility and Materials Evaluation' was completed and sent to the Project Office on 12/15/88, ref. TWS-NS-12/88/043.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
FY89 Level 1 Open Milestone List					
NONE					
FY89 Level 2 Open Milestone List					
New WBS Number 1.2.3					
M287	09/01/89		1231	ESS1/WX	Compile Draft ES Test Procedures (Construction Phase) Precursor to M651.
N160	07/31/89		1234	N-5	SCP Progress Report: Results of Geochemistry Investigations All geochemistry input to the progress report (SPR) has been submitted to the DOE/YMP for review. The action for this milestone is concluded. This milestone N160 is completed.
R705	06/30/89		1232122	INC-7	Issue Letter Report: Thermodynamics and Kinetics of Phases Important to Silica Activity at Yucca Mountain
T535	04/17/89		123411	HSE-12	Study Plan Approved (Ground Water Chemistry Model)
New WBS Number 1.2.5					
T001	03/15/89		12522	N-5	Submit draft ongoing Geochemistry Test Program Study Plans to WMPO/NV for review. Will be completed when all study plans are submitted to the Project Office.
New WBS Number 1.2.6					
M667	02/24/89		12684	WX-4	IDS Phase 1 Final Design Issued Review completed.
T062	01/10/89		12684	WX-4	IDS Phase 2 Final Design Issued. Delayed due to fully qualified QA program effort.
T436	06/08/88		12684	WX-4	IDS Development System - Status Report #1
T437	06/10/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #1

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
T438	10/17/88		12684	WX-4	IDS Phase 1 & 2 Facilities - Detailed Requirements
T439	10/17/88		12684	WX-4	IDS Phase 1 Hardware - Interim Design Report
T440	10/17/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #2
T443	02/01/89		12684	WX-4	IDS Phase 2 Hardware - Interim Design Report
T444	02/01/89		12684	WX-4	IDS Development System - Status Report #2
T445	05/01/89		12684	WX-4	IDS Phase 1 Software - Validation and Verification Report
T446	05/01/89		12684	WX-4	IDS Phase 1 Hardware - Acceptance Test Report
T447	05/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #1
T448	09/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #2

ASSUMPTIONS:
ES start date 11/89
WBS Structure baseline 7/22/86
Prep: 07/01/89
A. Pratt

DISTRIBUTION:
J.A. Canepa, N-5, J521
H.N. Kalia, ESS-1, J900/527
R.L. Byers, N-5, J521
D.T. Oakley, N-5, J521
K.A. West, N-5, J521

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WBS #: 1.2.9
QA: N/A

June 20, 1989

TWS-N5-06-89-081

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
US Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: **MAY PROJECT STATUS REPORT**

Attached are the May Project Status Report for Los Alamos' participation in the Yucca Mountain Project, the Technical Data Management System Submittal Record, and the Monthly Milestone Status Report. A list of outstanding policy reviews and other documents is also included. Documents checked on that list have been at the Project Office for at least two months; the authors are very eager to have those documents approved.

Sincerely,

R. J. Herbst

R. J. Herbst

ABC/em

Attachment: a/s

DONE

Cy w/attachment:
R. Bullock, F&S, Las Vegas, NV
J. C. Calovini, H&N, Las Vegas, NV
V. J. Cassella, HQ/Washington, DC
D. Eppler, SAIC, Las Vegas, NV
C. Garvin, SAIC, Las Vegas, NV
L. Hayes, USGS, Denver, CO
J. Steigler, SNL, Albuquerque, NM
T. Jackson, SAIC, Las Vegas, NV
R. F. Pritchett, REECo, Las Vegas, NV
L. Ballou, LLNL, Livermore, CA
A. M. Sastry, MACTEC, Las Vegas, NV
N. Carter, SAIC, Las Vegas, NV
A. B. Caughran, IS-11, MS J521
ESS-1 Distribution, MS D462
N-5 Distribution, MS J521
K. G. Eggert, ESS-5, MS F665
T. J. Hirons, N-DO, MS E561
H. N. Kalia, ESS-1, MS J900/527
T. J. Merson, WX-4, MS G787
E. C. Roybal, INC-7, MS J514
R. A. Morley, ESS-1, MS J900/527
A. R. Pratt, FIN-10, MS J521
RPC File, MS J521
N-5 Library, MS J521
TWS-N5, MS J521
TWS-N5, MS M321

Cy w/o attachment:
CRM-4 (2), MS A150

Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
May 1989

CONTENTS

Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
May 1989

WBS: 2.1.2.4.A
Project Title: Systems Engineering Integration
Principal Investigator: R. Herbst

The objective of this task is to integrate Yucca Mountain Project technical work through the application of systems engineering techniques.

ACTIVITIES AND ACCOMPLISHMENTS:

No activity to report this month.

WBS: 2.3.2.3.1.A
Project Title: Tectonics and Volcanism
Principal Investigators: B. Crowe and F. Perry

The objective of these volcanism studies is to determine the hazards of future volcanic activities with respect to siting a high-level radioactive waste repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

A five-day field trip was held with participants from the Nuclear Regulatory Commission (NRC), the State of Nevada, Department of Energy (DOE)/Las Vegas (LV), DOE/Headquarters (HQ), and Los Alamos. The purpose of the trip was to provide background information on volcanism studies for the NRC and to discuss topics of concern expressed by the State of Nevada. The first day of the trip was spent in the Lake Mead area of Nevada and Arizona. The results of ongoing field studies by participants from University of Nevada at Las Vegas, funded by the State of Nevada, were examined for a group of basalt and basaltic andesite centers that range in age from about 10 to 4.5 Ma. The second day of the trip was in the Yucca Mountain area examining field and chronology data for the Lathrop Wells center, Red Cone, and the two Quaternary centers of the Sleeping Butte site. Field relations of basaltic volcanic rocks were examined in the northern Reveille Range on the third day of the trip. This day concluded with a brief stop at the Lunar Crater volcanic field. The fourth day, we examined two other Quaternary centers of the southern Great Basin, the Ubehebe Craters, and the basalt of southern Death Valley. The final day included examination of basalts of the Cima Volcanic field and concluded with a tour of the "A" cone to establish the age control of the center and provide a discussion of the basis for a geomorphic comparison of this center with the Lathrop Wells volcanic center.

Volcanism sections of the Geological Society of America (GSA) guidebook were revised as part of final preparation of the guidebook for the Yucca Mountain area. This guidebook was a joint effort by participants from Science Applications International Corp., U.S. Geological Survey (USGS), DOE, and Los Alamos. The guidebook will be published by the GSA for their fall national meeting.

Personal certification packages were assembled for the participants in the volcanism task. They will be stored in the Las Vegas office.

We completed consulting arrangements with Steve Forman, University of Colorado, to provide thermoluminescence age determinations for the volcanism studies.

Field work continued at the Cima volcanic field. Geologic mapping was started in the lava flow sequences of the "A" cone. Three major episodes of lava extrusion were recognized with a possible age gap between two of the flow sequences. A paleomagnetic site was identified in the youngest lava flow sequence to determine if there is a difference in the magnetic field directions of the flows. Additional field work continued at the Lathrop Wells volcanic center. The Qs4 sequence was remapped at the east end of the fissure. It is possible that some of the scoria mounds of this rift may be part of the Qs5 sequence. Sites for drilling core for paleomagnetic field directions were identified to attempt to establish the unit identification of the scoria mounds.

PLANNED WORK:

Color aerial photography at a scale of 1:5000 will be obtained in July for the two Quaternary cones of the Sleeping Butte site.

Paleomagnetic studies will be conducted at the Sleeping Butte cones and the Cima volcanic field in June.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Crowe, Harrington, Perry, Wells, McFadden, Renault, Turrin, and Champion	Volcanic Hazard Studies for the Yucca Mountain Project	Paper for meeting - Waste Management '89, Tucson, Feb. 26-March 2, 1989	Project Office approved 5/8/89.
Turrin, Crowe, and Fleck	K-Ar Determinations of Lava Flow Units of the Lathrop Wells Volcanic Center	Article for journal (to be determined)	Being revised after USGS review.

MILESTONE PROGRESS:

The milestone report for the K-Ar report on the Lathrop Wells volcanic center continues to be delayed. A revised draft has been completed, and we are currently adding sections on the geomorphic relations at the center. The manuscript should be completed in June.

Milestone	Date Due	Description or title	Status
T403	5/15/89	Potassium-Argon Geochronology-Basalts of Crater Flat	Delayed; see above.
T404	9/30/88	Progress Report on Rock Varnish Work	Revision sent to Project Office 2/28/89.

WBS: 2.3.4.1.1.A
Project Title: Groundwater Chemistry
Principal Investigator: M. H. Ebinger

The goal of this investigation is to provide conceptual and mathematical models of the groundwater chemistry at Yucca Mountain. These models will explain the present groundwater composition in relation to interactions of minerals and groundwater and will be used to predict groundwater compositions as a result of anticipated and unanticipated environments.

ACTIVITIES AND ACCOMPLISHMENTS:

Investigation 8.3.1.3.1.1 was split into two activities. Activity 8.3.1.3.1.1.1 will be concerned with development of a conceptual model of groundwater chemistry. The mathematical model of groundwater chemistry will be developed in activity 8.3.1.3.1.1.2 and will begin after the conceptual model is developed.

Draft of Study Plan for Activity 8.3.1.3.1.1.1 (Conceptual Model of Groundwater Chemistry) will be completed and submitted for internal review in June 1989.

PLANNED WORK:

Continue development of study plan for activity 8.3.1.3.1.1.1 and circulate draft for internal Los Alamos review.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

No milestones are scheduled in the next three months.

WBS: 2.3.4.1.2.A
Project Title: Natural Isotope Chemistry
Principal Investigator: A. E. Norris

The objective of the natural isotope chemistry task is to determine the distribution of naturally occurring radioactive elements at Yucca Mountain as part of the work to characterize the infiltration of precipitation, the velocity of water movement through the unsaturated zone, and the retardation of radionuclide transport relative to water velocity.

ACTIVITIES AND ACCOMPLISHMENTS:

This month, nine Yucca Mountain Project samples were analyzed for ^{36}Cl at the University of Rochester's accelerator mass spectrometer. Four of the samples were from G-Tunnel material to help verify the previous single-sample observation of an unexpectedly high value of ^{36}Cl in cuttings from the experiment drift. The ^{36}Cl in two samples from core hole DH-1 cuttings confirmed the high value observed in the nearby DH-2 cuttings. The ^{36}Cl in two samples of cuttings from AC-2 indicates that the high value is present at a distance of 180- to 189-ft east of the fault visible in the experiment drift, but the sample from 232- to 242-ft east of the fault has a background value.

The other five ^{36}Cl samples came from USW UZ-1 cuttings. The purpose of these measurements is to develop a procedure to interpret the ^{36}Cl data in terms of meteoric water movement downward through the unsaturated zone at Yucca Mountain. The data analyses for these samples are being completed.

Large quantities of cuttings must be processed to prepare each sample for ^{36}Cl analysis: often 20 kg are required for a single sample. The development of the technique to trace water movements in the unsaturated zone will necessitate more samples than was previously thought. To help in this work, the U.S. Geological Survey made available an additional 1,815 kg of cuttings from USW UZ-1 and USW UZ-6. These cuttings were shipped this month from the Nevada Test Site to Hydro Geo Chem, Inc., in Tucson, Arizona.

A. E. Norris gave two presentations this month. The first was an invited seminar at the University of Rochester's Nuclear Structure Research Laboratory on May 9. The title of this seminar was, "Analyses of Chlorine-36 in Samples of Tuff from the Yucca Mountain Project." The second talk was a Yucca Mountain Project colloquium at Los Alamos on May 17 titled, "The Use of Chlorine-36 to Trace Water Movement in the Unsaturated Zone."

PLANNED WORK:

The full text of the paper titled, "The Use of Chlorine Isotope Measurements to Trace Water Movements at Yucca Mountain," will be prepared for publication in the proceedings of the DOE/American Nuclear Society meeting "Focus '89." This meeting will be held in Las Vegas, Nevada, in September.

MILESTONE PROGRESS:

No level II milestones are scheduled this fiscal year.

WBS 2.3.4.1.3.A
Project Title: Hydrothermal Geochemistry
Principal Investigator: C. Duffy

The objective of the hydrothermal geochemistry task is to produce a model for past and future mineral alteration in Yucca Mountain. The model is intended to explain 1) natural mineral evolution resulting from the transformation of metastable mineral assemblages to more stable assemblages and 2) the effects of a repository emplacement.

ACTIVITIES AND ACCOMPLISHMENTS:

Most of our effort has remained directed toward the preparation of detailed technical procedures and the review of quality assurance (QA) procedures. We are continuing to make progress on the data acquisition system for the flexible cell hydrothermal system. We are also continuing scoping studies on the kinetics of the cristobalite-to-quartz transition. We continue to confirm a rather large dependence of rate on pressure as well as temperature. We have completed two long-duration (approximately 1.5 months) experiments at 350°C and 1000 bar this month. These experiments show slightly less than 50% conversion of cristobalite to quartz and definitely confirm a much reduced rate of conversion at 1000 bar relative to 2000 bar. However, both of these experiments produced an inhomogeneous product.

In both cases, there was a volume of essentially complete conversion of cristobalite to quartz along one side of the run capsule, whereas the remainder of the run showed less than 50% conversion to quartz. We have not performed detailed temperature calibrations on these vessels because we lack an accepted means of calibrating our thermocouples for YMP work, but previous experience suggests that temperature variations over the run capsule are less than 1°C. The dominant variation would also be expected along the length of the capsule rather than across its diameter. Therefore, it seems difficult to explain this phenomenon on the basis of temperature gradients. Such inhomogeneity might also arise if quartz nucleation were a rare phenomenon in the experiments so that the quartz grew from only a few centers. However, microscopic examination revealed a very large number of small crystals in both domains.

PLANNED WORK:

Work will continue toward a fully qualified QA program. We will also continue scoping studies on the kinetics of silica transition using cold-seal hydrothermal techniques. As soon as possible, we plan to start scoping studies on the silica concentration in equilibrium with silica polymorphs using the flexible cell hydrothermal system.

We will also be increasing efforts to examine the literature on the smectite/illite transition in preparation for preparing a milestone report on the subject (due at the end of September).

PROBLEM AREAS:

Project-wide problems with the traceability of standards preclude the possibility of standardizing our hydrothermal lab at this time. Because of the long duration of many hydrothermal experiments, this problem could impact the milestone report schedule if not corrected in the near future.

MILESTONE PROGRESS:

No milestones are due in next three months.

WBS: 2.3.4.1.4.A
<u>Project Title: Solubility Determination</u>
<u>Principal Investigator: D. Hobart</u>

The objective of the solubility determination task is to determine the solubilities and speciation of important waste elements under conditions characteristic of the repository and along flow paths from the repository into the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

The final draft version of the Solubility Task study plan has been resubmitted to the Los Alamos Program Office. Most of our effort was centered on quality assurance (QA). A number of detailed technical procedures (DPs) were completed and submitted, and personnel certification forms were signed.

H. Nitsche visited Los Alamos on May 24 to complete the annual transfer of duplicate records. About 11,500 pages of records from the last 12 months were transmitted to Los Alamos-YMP records manager G. Ortiz. H. Nitsche also discussed his research directions with D. Hobart and introduced S. Carpenter.

Work continues on the solubility experiments for neptunium, plutonium, and neodymium/americium. The ^{237}Np solution in UE-25p#1 at 25°C and pH 6 has reached steady state. Spectrophotometric measurements on the supernatant solution showed that the solution species are uncomplexed NpO_2. Eh measurement gave about 680 mV (Ag/AgCl). Work continues on isolating the solid, which will then be analyzed by x-ray diffraction.

The following DPs are in progress:

- Determining UV-VIS-IR Absorption and Diffuse Reflectance Spectra.
- X-Ray Powder Diffraction Analysis for Solubility (YMP-LBL-DP03).
- Sodium Concentration Determination in Radionuclide Solutions (YMP-LBL-DP05).

Submitted DPs are as follows:

- The Preparation of Solutions of Pure Oxidation States of Neptunium, Plutonium, and Americium (TWS-INC-DP-78). [It should be noted that the DP for preparation of pure oxidation states of neptunium, plutonium, and americium is a joint effort by Los Alamos and Lawrence Berkeley Livermore (LBL) and will be revised soon with LBL additions.]
- Eh (Oxidation--Reduction) Potential Measurements (YMP-LBL-DP06).
- Sample Identification and Handling.
- Purification of Colloidal Plutonium(IV) by Centrifugation and Ion Exchange (YMP-INC-DP80).
- Calibration of Low Energy Gamma Counters (YMP-LBL-DP02).
- Trace Element Characterization by Atomic Emission Spectroscopy (YMP-LBL-DP04).

PLANNED WORK:

We will continue work on a number of DPs that are due this fiscal year.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

We are unable to report milestone due dates because we lack a fully qualified QA program; however, all milestones will be completed on time.

Milestone	Date Due	Description or title	Status
M367	11/17/88	Progress Report on Colloid Stability	Revision sent to Project Office 4/11/89.
P379	11/17/88	Photoacoustic Spectroscopy Methodology	Sent to Project Office 1/18/89.
T418	11/30/88	Solubility Measurements	Revision sent to Project Office 3/27/89.

WBS: 2.3.4.1.5.A
Project Title: Sorption
Principal Investigator: A. Meijer

The objective of the sorption and precipitation task is to provide sorption coefficients for elements of interest in order to be able to predict radionuclide movements from the repository to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

Investigation of the influence of water/rock ratios on sorption coefficients has continued. These experiments address concerns of the Nuclear Regulatory Commission about the applicability of sorption coefficients determined in the laboratory (at high water/rock ratios) to the natural environment, where water/rock ratios could be lower. The rock sample selected for these experiments is a zeolitic tuff (G4-1502), and the water/rock ratios selected are 5:1, 10:1, 20:1, and 30:1. As noted in earlier reports, the sorption coefficients for barium (Ba), cesium (Cs), and strontium (Sr) show regular increases, with increasing water/rock ratios contrary to theoretical expectation. We suspected imperfect solution-solid separations by the ultra-centrifugation technique we were using in the experiments might be a factor.

Initial results for Cs in a new set of experiments, in which an ultra-filtration technique was used instead of centrifugation, suggested we were on the right track. However, the results for Ba and Sr indicated that although the water/rock ratio effect was more than an order of magnitude smaller with ultra-filtration than with ultra-centrifugation, a small residual effect remained. The remaining effect is thought to result from rock dissolution reactions, which appear to have a more pronounced effect on experiments with low water/rock ratios than those with high ratios. In essence, the rock dissolution rate appears to be relatively insensitive to the amount of solution present given the time scale of the experiments. This results in greater concentrations of major cations in the small water/rock ratio experiments, which in turn results in greater competition for available adsorption or exchange sites. We are currently analyzing the waters produced in the last experiments for major cations.

Our studies of the sorptive behavior of americium (Am) using natural and synthetic groundwaters and pure minerals are continuing. Initially, we will evaluate the degree to which Am is sorbed to the wall of the containers. This will be followed by batch sorption experiments involving pure mineral separates and various solution compositions. This month, we will pre-equilibrate the containers to be used in the Am experiments. Two teflon bottles are being pre-equilibrated with J-13 water, and the following samples are being equilibrated with a sodium bicarbonate/sodium carbonate buffer (pH = 7.4): two empty teflon containers, two clinoptilolite samples in teflon containers, and two romanechite (Mn-oxyhydroxide) samples in teflon containers.

Pure minerals to be used in the sorption experiments have been analyzed for the following elements: silicon, iron, sodium, potassium, titanium, magnesium, manganese, aluminum, and phosphorus. Batch sorption experiments involving neptunium (Np) were initiated this month. The pre-equilibration and sorption steps were completed, and the desorption step was started. Two samples of each of the following minerals are being studied: a) synthetic calcite from Merck Chemicals, b) calcite from Mexico (<500 microns), c) synthetic hematite from EM Science, d) montmorillonite from Cheto, Az (<500 microns), e) cryptomelane from Socorro, NM (<500 microns), f) romanechite from Casa Grande, AZ (<500 microns), g) purified clinoptilolite from Castle Creek, ID (<500 microns), and h) synthetic goethite.

The pre-equilibration step involved equilibrating the mineral with a sodium bicarbonate/sodium carbonate buffer having a pH of 8.5. This pH is thought to be appropriate for the far-field in Yucca Mountain. The sorption step involved shaking the pre-equilibrated mineral and the Np solution (buffered with sodium bicarbonate and sodium carbonate to a pH of 8.5) for a period of three weeks and separating the phases. The initial and equilibrated Np solutions are being analyzed.

The normal procedure for batch sorption experiments calls for the solid material to be pre-equilibrated with the groundwater in the experiment. Typically, 1 g of solid is "equilibrated" with 20 ml of groundwater. The idea is that following this procedure, the rock will be "in equilibrium" with the background electrolyte (i.e., groundwater) before the solid is contacted with the groundwater bearing the radionuclides of interest. However, for rocks with high ion-exchange capacities, such as zeolitic tuffs, contact with 20 ml of a dilute groundwater such as J-13 will not result in "equilibration." In fact, it would take on the order of 20 liters of J-13 water to approach "equilibration" for a zeolitic tuff such as G4-1502. If the rocks are not adequately pre-equilibrated, the sorption coefficient obtained may not be appropriate in the sense that it might not be the most conservative value obtainable. In order to obtain an "equilibrated" sample of a zeolitic tuff for future batch and column experiments, we have started a column containing approximately 10 g of sample G4-1502 through which 20 liters of J-13 water will be passed.

The Stanford group was trained for the Los Alamos quality assurance program.

Responses to review comments by Battelle Columbus, Lawrence Livermore, and Science Applications International Corp. (SAIC) on the "Position Paper on Sorption" (Milestone T419) were completed. The report is being revised to reflect the review comments.

Sorption task personnel met with the Technical Integration Group (TIG) to discuss input to performance assessment activities.

The status of the remaining detailed procedures that were rewritten according to TWS-QAS-QP 5.2, R1 follows.

PROCEDURE #	TITLE	STATUS
TWS-INC-DP-05	Sorption, Desorption Ratio Determination of Geologic Materials by a Batch Method	In internal review.
TWS-INC-DP-79	Liquid Scintillation Counting of Samples	Completed and forwarded to the INC QAL.

PLANNED WORK:

Continue the study of Am and Np sorptive behavior using synthetic and natural groundwaters and pure minerals.

Start investigation of the sorptive behavior of technetium on pure minerals.

Continue study of sorption mechanisms for important radionuclides.

Develop and carry out purification procedures for pure mineral samples.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Ines R. Triay and Robert S. Rundberg	Application of Deconvolution to the Analysis of Univalent Ion-Exchange Isotherms in Zeolites X and Y	Journal article	Accepted by *Zeolites*

MILESTONE STATUS:

Milestone	Date Due	Description or title	Status
T419	5/15/88	Position Paper on NNWSI Sorption Studies and Data Needs	Being revised after technical reviews requested by Project Office.
R505	9/30/88	Summary Report: Sorption of Nickel and Neptunium in Tuff Using Ground Waters of Different Composition	Project Office approved 5/24/89.
R720	9/30/88	Report on Deconvolution of Ion-Exchange Isotherms	Project Office approved 5/4/89.

WBS: 2.3.4.1.6.A
Project Title: Dynamic Transport Process
Principal Investigator: R. Rundberg

The objectives of the dynamic transport process task are to determine the rate of radionuclide movement along the potential flow paths to the accessible environment and to examine the effect of diffusion, adsorption, dispersion, anion exclusion, sorption kinetics, and colloid movements in the flow geometries and hydrologic conditions that are expected to exist along the flow path to the accessible environment in the scenarios to be used for performance assessment.

ACTIVITIES AND ACCOMPLISHMENTS:

We are continuing our study with Calico Hills and Topopah solid rock columns to investigate the ability of Yucca Mountain to act as a natural filter for particulate matter. For these studies, we utilize two columns of the Calico Hills tuff G4-1502 and two columns of Topopah tuff GU3-1119. This month, we completed the second tritium elution for each of the columns.

The study of the sorption of radionuclides as a function of time using beakers made of Yucca Mountain tuffs is still in progress (see schedule given in February's monthly report).

We assembled columns using the following minerals: calcite, cryptomelane, montmorillonite, romanechite, hematite, and goethite. The columns made of goethite and montmorillonite will require high pressure. Most of the columns assembled with the pure minerals leaked: consequently, we ordered polycarbonate rod, a sturdier and more chemically inert material, to build new columns.

We are analyzing the results obtained from columns made of Topopah Spring Member outcrop samples to study the transport behavior of barium (Ba), strontium (Sr), and cesium (Cs). This analysis will involve time-dependent dispersion. To compare these results with results obtained using the batch sorption approach, we have measured the Kds of Ba, Sr, and Cs using the same tuff (Topopah outcrop samples) and the batch sorption method. The results follow.

Sample No.	Kd for Ba	Kd for Sr	Kd for Cs
1	722.6	24.9	561.8
2	740.7	24.4	436.4
3	795.1	26.9	494.6
4	925.1	24.8	592.9
5	745.7	24.8	491.6
6	732.2	25.6	486.2
7	730.9	23.7	547.4
8	706.5	23.9	488.6
Average	762.3	23.9	512.4

The status of the detailed procedures (DPs) that have been rewritten according to TWS-QAS-QP 5.2, R1 follows.

PROCEDURE #	TITLE	STATUS
TWS-INC-DP-64	Gamma Counting of Samples for Dynamic Transport (Perkin Elmer Model 9000 Robot)	completed and given to the INC QAL
TWS-INC-DP-75	Determination of Particle Size Distribution by Autocorrelation Photon Spectroscopy	completed and given to the INC QAL

We finished revising the study plans for this task and submitted them to the Los Alamos Program Office on 5/12/89.

PLANNED WORK:

Continue solid rock column experiments.

Continue rock beakers experiment.

Start transport work with pure minerals.

Start validating the Autocorrelation Photon Spectroscopy technique using NBS standards.

PROBLEM AREAS:

We are moving some of the YMP equipment at RC-1, TA-48, to a new room within RC-1. After the equipment is moved, it needs to be installed and checked. Unfortunately, this is a time-consuming process.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
A. J. Mitchell, R. S. Rundberg, M. A. Ott, and I. R. Triay	Instrumentation and Operation of an Autocorrelated Photon Spectrometer Used for Particle Size Determinations	Abstract for 198th National Meeting of the American Chemical Society, Miami, FL, September 10-15, 1989	Submitted to Project Office 4/17/89.
M. A. Ott, R. S. Rundberg, and I. R. Triay	Mechanical Manipulation of Intact Tuffaceous Rock to Fabricate and Assemble Solid Rock Columns and Rock Beakers	Abstract for 198th National Meeting of American Chemical Society	Submitted to Project Office 4/17/89.
I. R. Triay, R.S. Rundberg, A.J. Mitchell, and M. A. Ott	Utilization of Inversion Techniques for Particle Size Determinations Using Auto-correlation Photon Spectroscopy	Abstract for 198th National Meeting of the American Chemical Society	Submitted to Project Office 4/17/89.
I. R. Triay, R. S. Rundberg, A. J. Mitchell, M. A. Ott, D. E. Hobart, and P. D. Palmer	Size Determinations of Pu Colloids Using Autocorrelation Photon Spectroscopy	Abstract for 2nd International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere, Monterey, CA, November 6-10, 1989	Submitted to Project Office 5/18/89.

Author(s)	Title	Type of Publication	Status
R. S. Rundberg, I. R. Triay, M. A. Ott, and A. J. Mitchell	Observation of Time Dependent Dispersion in Laboratory Scale Experiments with Intact Tuff Columns	2nd International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere	Submitted to Project Office 5/18/89.
I. R. Triay, A. Meijer, M. R. Cisneros, G. G. Miller, P. D. Palmer, R. E. Perrin, and R. D. Aguilar	Sorption Behavior of Americium in Tuff Samples and Pure Minerals Using Synthetic and Natural Groundwaters	2nd International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere	Submitted to Project Office 5/19/89.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R743	8/16/88	Dynamic Transport of Colloidal Tracers through Fractured Tuff: 0.10- to 9.55-μm-Diameter Carboxylated Polystyrene Spheres	Revision sent to Project Office 12/7/88.

WBS: 2.3.4.1.7.A
Project Title: Retardation Sensitivity Analysis
Principal Investigator: K. Eggert

The objectives of the retardation sensitivity analysis task are to construct a geochemical/geophysical model of Yucca Mountain and to use this model to examine the physical and chemical controls on radionuclide transport along flow paths to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

Analysis of Physical/Chemical Processes

FEHMN/FEHMSN. A zone capability was added to FEHMN that allows irregulary shaped zones within the grid to be defined by their corner points. A 3-D contour-plotting option was also added. The fully coupled 2-D-stress and 3-D-mass module for FEHMSN converges.

S. Kelkar met with D. Galloway (U.S. Geological Survey, Denver) to discuss coupled hydromechanical modeling of Yucca Mountain.

One- and two-dimensional sample problems were successfully run using the CTCN (Colloid Transport Code - Nuclear) code. The N-D version of MOL, the solution routine used in CTCN, works well with standard examples, but it is having some difficulty with specific examples. The MOL method is being compared with a similar standard code in the Information Management System Library (IMSL) library package.

Geochemical/Geophysical Model

A grid is nearly complete to run a 3-D forward transport calculation with TRACRN. The grid is based on a 3-D model of the hydrologic stratigraphy at Yucca Mountain developed at Sandia (Ortiz et al. 1985). Tilted beds and the Ghost Dance Fault Zone are included. Mineralogy and sorption data will be used to perform sensitivity analyses on transport of cesium, technetium, and neptunium from the repository to the water table.

Transport Models and Related Support

The non-vertical gravity vector option was added to TRACRN and verified. This option simplifies the grid set-up for systems with tilted beds or nonvertical boreholes.

Quality Assurance (QA) and Programmatic

K. Eggert is putting together a set of input parameters for sample transport problems. These problems will be included as part of a set of Technical Integration Group sponsored performance assessment calculations. The team will participate in the solution of these problems.

The verification plan for FEHMN was written and reviewed. Three analytic solutions have been verified.

The Software Requirements and Design Specifications report is being written for CTCN.

PLANNED WORK:

Analysis of Physical/Chemical Processes

FEHMN/FEHMSN. Development of the solution for unsaturated flow will continue, along with improvements on the matrix solver for this type of system.

Transport Models and Related Support

A capability for using the solid state disk (SSD) available on the Cray YMPs will be incorporated into TRACRN, FEHMN, and FEHMSN. The SSD will be used to temporarily store information during calculations, which will increase the allowable problem size.

QA and Programmatic

More runs will be done for verification of FEHMN.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
G. Zyvoloski and S. Kelkar	FEHMS - A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Los Alamos National Lab document LA-UR-87-1323	

MILESTONE PROGRESS:

MILESTONE T421 - YMPO/SAIC management and QA comments were addressed, and the report was submitted to the Los Alamos Program Office.

Milestone	Date Due	Description or title	Status
R343	5/1/87	Preliminary Geochemical/Geophysical Model of Yucca Mountain	Revision sent to Project Office 1/9/89.
R346	3/31/87	FEHMS: A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Memo addressing review comments sent to Project Office 5/23/89.
R749	7/30/88	Results of the COVE2a Benchmarking Calculations Run with TRACR3D	Revision sent to Project Office 12/9/88.
T421	12/15/88	TRACR3D Documentation for Baseline-review.	Submitted to Los Alamos Program Office 5/31/89.
T422	12/30/88	Interim Report: Sorption Characteristics of Sorbing Tracers Using TRANQL/MINEQ	Being revised after N-5 policy review.
T424	12/30/88	Particulate Transport	Project Office approved 5/9/89.

WBS: 2.3.4.1.8.A
Project Title: Reactive Tracer Testing
Principal Investigator: E. Springer

Experiments will be conducted at the C-well complex (holes UE25c#1, UE25c#2, and UE25c#3) and in other wells in the vicinity of Yucca Mountain. Reactive tracers will be used to characterize retardation and transport properties on a scale larger than that currently used in laboratory experiments.

ACTIVITIES AND ACCOMPLISHMENTS:

The remaining four detailed procedures (DPs) will require development in conjunction with new instrumentation that has been received; therefore, they will not be completed until July. Training for the DPs has been initiated and will be completed in June.

Comments from management and quality assurance and regulatory reviews of the study plan were received, and responses are being prepared. The study plan was sent to Department of Energy/Headquarters (DOE/HQ).

The FEHMN computer code continues to be baselined. Verification simulations for three-dimensional, transient heat flow in a cube have been completed. Results indicated that the energy balances are being solved properly and that the technique for incorporating irregular-shaped elements is correctly implemented. The dual porosity verification was completed. Results from the code were compared with published solutions obtained for quasi-steady-state transport into and out of matrix blocks, i.e., the block can be treated as a unit of constant pressure. Agreement between the code and the solutions was excellent for conditions in which the assumption was valid (constant pressure); but for conditions in which the assumption breaks down, the simulations deviated from the solution. This effort was the final step in verifying the dual porosity option of FEHMN, and at this time, this option is considered to be properly implemented. The mass transport component of FEHMN is being tested against one-dimensional analytical solutions for linear sorption and the computer code SORBEQ. FEHMN has exhibited slightly more numerical dispersion than SORBEQ: attempts will be made to isolate the source of this dispersion.

PLANNED ACTIVITIES:

Complete training on DPs and prepare individual minerals for new experiments.

Develop four DPs with new instrumentation.

Continue to test the FEHMN code for tracer transport. S. Birdsell will be leaving the project, and his efforts will be transferred to Z. Dash for the remainder of the fiscal year. Both Birdsell and Dash have been working on FEHMN, and no impact on the milestone is expected.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

Author	Title	Type of Publication	Status
H. Fuentes, W. Polzer, E. Essington, and B. Newman	Characterization of Reactive Tracer for C-well Field Experiments I: Electrostatic Sorption Mechanism, Lithium	LA-series report	Being revised after edit.

MILESTONE PROGRESS:

No milestones are due in the next three months.

Milestone	Date Due	Description or title	Status
R397	3/31/87	Reactive Tracer Experiments in the C-Wells and Other Wells in the Yucca Mountain Vicinity	Submitted to Project Office 2/16/89. (Study Plan)
T426	9/1/88	FRACNET - Fracture Network Model for Water Flow and Solute Transport	Being revised after Project Office review.

WBS 2.3.4.1.9.A
Project Title: Biological Sorption and Transport
Principal Investigator: L. Hersman

The purpose of this research is to determine whether microbial activity can influence the movement of plutonium in tuff. Because fluids are used extensively in the exploration of locations for a nuclear repository, of special interest are those microorganisms capable of utilizing drilling fluids as growth substrates.

ACTIVITIES AND ACCOMPLISHMENTS:

Studies have continued on the interaction of colloids and bacteria. As mentioned in last month's report, experiments are now being conducted using cell-free spent medium. The purpose of these experiments is to determine if extra cellular material will affect colloidal agglomeration.

Siderophore is now being purified using a Bio Rad P-2 column, in addition to standard Sephadex C-25 and High-Pressure Liquid Chromatograph column purifications.

PLANNED WORK:

Colloidal agglomeration will continue to be studied. In addition, chelation experiments will be directed towards determining a formation constant with ^{239}Pu.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
T427	12/30/88	Chelation: Progress Report	Submitted to Project Office 5/24/89.

WBS: 2.3.4.1.11.A
Project Title: Geochemical Field Tests for Validation
Principal Investigator: J. A. Canepa

The purpose of this activity is to test the validity of the laboratory geochemistry data generated by the Geochemistry Test Program and to test the geochemical transport modules. Five subtasks constitute this activity: 1) natural analogs, 2) large block test, 3) caisson test, 4) unsaturated zone geochemistry field test, and 5) radionuclide migration studies at the Nevada Test Site.

ACTIVITIES AND ACCOMPLISHMENTS:

Natural Analogs

The Department of Energy (DOE) requested interactions on this task with the Atomic Energy of Canada Limited (AECL). Work scope and a funding profile for the joint natural analog task are required.

Large Block Test

Interactions of this task with the AECL were requested by the DOE. Work scope and a funding profile for the joint natural analog task are required.

Radionuclide Migration Studies at the Nevada Test Site

No action.

Caisson Tests

No action this month.

Geochemistry Field Tests

We have started work on the conceptual design of a field test for the geochemistry program. The general objective of this test is a validation exercise in the Calico Hills tuffs at as large a scale as is reasonable with the time constraints. This objective will be refined as we determine more of the medium characteristics, scaling laws, and model capabilities. Efforts have focussed on reviewing the literature and compiling all known information about the tuffs of Calico Hills below the repository, starting a list of desired measurement capabilities, and developing scaling relations that treat fracture transport.

WBS: 2.3.4.2.1.A
Project Title: Fracture Mineralogy
Principal Investigator: B. Carlos

The purpose of this task is to study fracture-lining minerals and their paragenesis to (1) assess the role of fractures as transport pathways during past alteration, (2) determine the conditions under which various minerals were deposited, (3) determine the nature of fracture surfaces along possible transport pathways, and (4) evaluate the occurrence of potentially hazardous minerals in the intervals to be mined.

ACTIVITIES AND ACCOMPLISHMENTS:

Developing and implementing a qualified quality assurance (QA) program continues to be top priority. We continue to emphasize writing, reviewing and training in various QA program plans and detailed procedures.

Todorokite was identified in the x-ray diffraction patterns of several samples from the Crater Flat Tuff in USW G-4. Thin sections of the fractures were examined using backscatter imaging on the scanning electron microscope (SEM) and qualitative element analysis. Only in one sample could the todorokite be distinguished from the cryptomelane-hollandite by the intensity of backscatter electrons and qualitative chemistry. The two minerals appear to be intergrown and morphologically indistinguishable. In the other samples, differences in backscatter intensity did not correlate consistently with the chemical differences expected between cryptomelane-hollandite and todorokite, and it was not possible to segregate patches of the two phases in SEM images.

Work continues on the manganese oxides in the Tiva Canyon Member of the Paintbrush Tuff in USW G-4.

PLANNED WORK:

Work towards developing a qualified QA program will continue.

Analysis of the fracture-coating manganese oxides in the Tiva Canyon Member in USW G-4 will continue over the next few months.

Examination and analysis of fracture-coating minerals in the Topopah Spring Member in USW G-1, G-2, and GU-3 will continue as time and sample availability allow.

PROBLEM AREAS:

Unavailability of existing core for examination or sampling continues to impact this activity.

The SEM was down for repair. Because of scheduling limitations, our next days to use the SEM are in July. The loss of the three days this month may delay the completion of the milestone report on manganese oxide minerals in the Tiva Canyon Member in USW G-4.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R623	6/30/89	Manganese Oxide Minerals in the Crater Flat Tuff in USW G-4.	Writing 95% complete.

WBS: 2.3.4.2.2.A
Project Title: Alteration History
Principal Investigator: S. Levy

The objective of the alteration history task is to characterize past and present natural alteration processes that have affected the potential geologic repository and to predict future effects of natural and repository-induced alteration.

ACTIVITIES AND ACCOMPLISHMENTS:

Most of our time this month was directed towards addressing Headquarters' review comments on the alteration history study plan in preparation for the comment resolution session held at Los Alamos on May 31. Project management and quality assurance (QA) comments were also resolved at this meeting, in accordance with AP-1.10Q.

P. Snow and S. Levy worked on corrections to the zeolite mineral code subroutine used for the electron microprobe software. This subroutine calculates a variety of molecular ratios that are used as stoichiometry checks and compositional-plotting parameters.

S. Levy and C. Higby made a preliminary application of graded QA to the alteration history study. Most of the determinations of QA criteria applicability correspond to what is already in the Los Alamos Quality Assurance Program Plan (QAPP); therefore, applying graded QA does not appear to aid, clarify, or benefit this task.

A surveillance of the mineralogy-petrology group was conducted by Los Alamos and the Quality Assurance Support Staff. The main focus of the surveillance was on the alteration history study.

The detailed procedure for operation of the scanning electron microscope was completed, received its technical and QA reviews, and was signed off.

PLANNED WORK:

Our first priority during June will be revising the alteration history study plan in accordance with Headquarters' comment resolutions. Support of QA activities will also continue.

Kevin Crowley, professor of geology at Miami University, Oxford, Ohio, will present a talk in Los Alamos on "Annealing of Fission Tracks in Apatite, with Applications to Geothermal History" on June 6.

In July, S. Levy will give a talk on alteration history research results to the U.S. Geological Survey in Denver.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

Work on milestone reports has been delayed to redirect effort toward achieving a fully qualified QA program and study plan revision.

WBS: 2.3.4.2.3.A
Project Title: Mineralogy of Transport Pathways
Principal Investigator: D. Vaniman

The purpose of this activity is to define the important mineralogic and geochemical variables along transport pathways at Yucca Mountain in support of performance assessment and to evaluate the impact of repository construction on natural waste transport barriers.

ACTIVITIES AND ACCOMPLISHMENTS:

Petrographic and chemical analyses of devitrified Topopah Spring Member samples for the Exploratory Shaft mineralogy-petrology test are now 90% complete. These data will be analyzed statistically to determine the necessary sample size and sampling density to adequately characterize the rock mass to be excavated during shaft and drift construction.

Scanning electron microscope image analysis is being explored in an attempt to evaluate pore space sizes, aspect ratios, shape factors, and orientations in the Topopah Spring Member. One reason for this analysis is to examine pore-space parameters as a stratigraphic tool; the other reason is to obtain adjunct pore data that may be applicable to transport calculations. The data collected so far are promising and indicate that roughly half of the pore volume in the altered devitrified Topopah above the basal vitrophyre consists of pores with widths less than 25 micrometers (Figs. 1a and b). The three curves shown in Figs. 1a and b represent the cumulative proportion of pore area accounted for by pores plotted in order of increasing pore width. The three curves correspond to analyses ranging from low magnification (198x) and large area coverage to high magnification (840x) and small area coverage. (Fig. 1b is an expanded view of the <10 micrometer portion of the curves; step-wise growth in Fig. 1b seen at lower magnification is due to larger pixel dimensions.) These data are still exploratory: the effects of magnification used in analysis, variability of millimeter to centimeter scales, and data collection methods (e.g., use of differential versus integrated backscattered electron intensity images) must be evaluated before the utility of the results is demonstrated.

The sample identification and control procedure for mineralogy-petrology studies is being tested before it is issued. Integration of the procedure with the electronic sample tracking database will be completed in June.

The article "Sampling for Site Characterization of a Potential Waste Repository" has been revised by Los Alamos' A-Division in response to internal review comments and to target it to the readership of Mathematical Geology. A-Division also reviewed G. Koch's book on "Exploration-Geochemical Data Analysis with the IBM PC" for Technometrics.

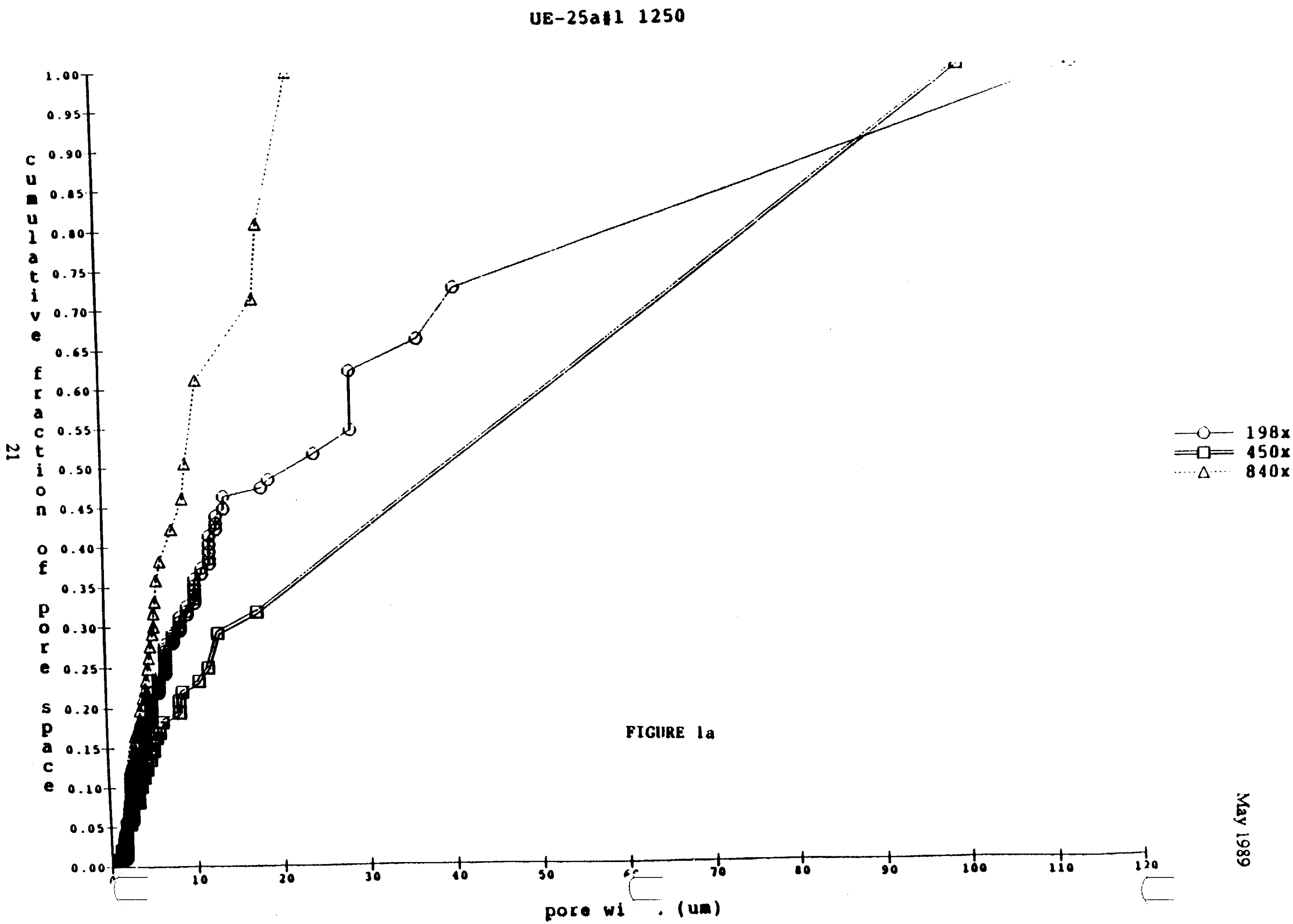
Work continued on evaluating revised x-ray diffraction data, which will be used to generate simulations of mineralogic composition of Yucca Mountain tuffs for use in TRACR3D.

PLANNED WORK:

Continue work on quality assurance (QA) program development.

Develop Exploratory Shaft sampling plan using data from the Solitario Canyon outcrop.

Evaluate revised x-ray diffraction data using multivariate methods.



UE-25a#1 1250
cumulative fraction of pore space
1.00
0.95
0.90
0.85
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0.75
0.70
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0.50
0.45
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10
20
30
40
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pore wi . (um)
198x
450x
840x

FIGURE 1a

UE-25a#1 1250

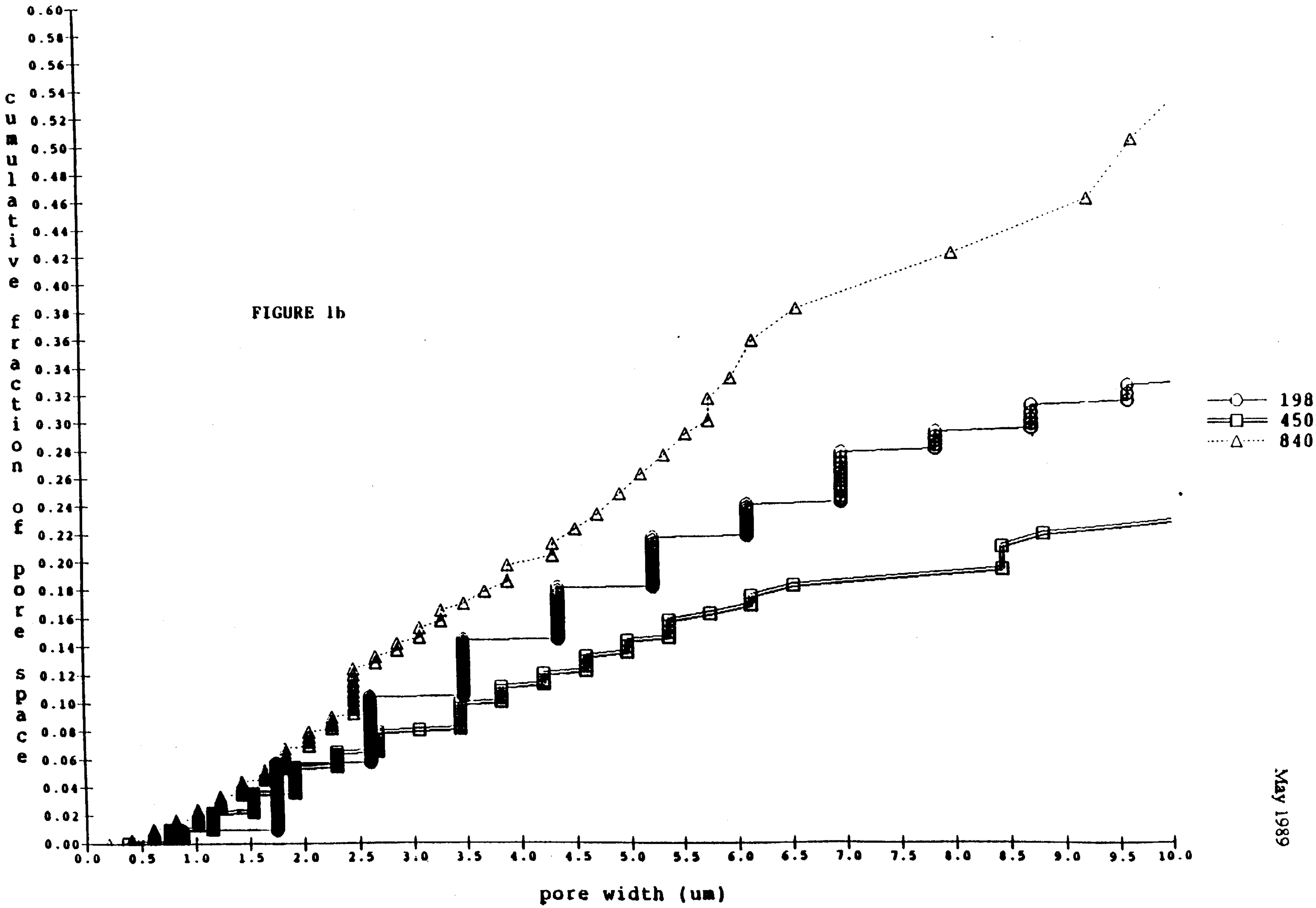

FIGURE 1b

22

May 1989

Work on image analysis methods for texture and trace-mineral analysis.

Develop statistical methods, especially the development of tools for handling compositional data.

Simulate spatial distribution of compositional data for use in transport models, such as TRACR3D.

PROBLEM AREAS:

Milestone progress in FY89 will continue to be delayed while effort is concentrated on revision of QA procedures and preparation of new procedures.

BIBLIOGRAPHY:

Author	Title	Type of Publication	Status
K. Campbell	Sampling for Site Characterization of a Potential Waste Repository	Journal article (*Mathematical Geology*)	Being revised following internal review.
K. Campbell	Statistical Guidelines for Planning a Limited Drilling Program	Article for journal (to be determined)	In technical review.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
T095	11/30/88	Image Analysis Study of the Topopah Spring Member	Project Office approved 5/24/89.
T433	delayed	XRD Analysis of Batch Sorption Samples	Submitted to Project Office 4/14/89.
T469	2/28/89	The Occurrence and Distribution of Erionite at Yucca Mountain, Nevada	Project Office approved 5/24/89.

WBS: 2.5.2.2.A
Project Title: Regulatory and Institutional
Principal Investigator: J. A. Canepa

The purpose of this task is to coordinate the regulatory and institutional Project requirements within the Los Alamos programmatic structure. The focus of this coordination effort is on the integration of the technical work within the regulatory and institutional framework.

ACTIVITIES AND ACCOMPLISHMENTS:

Site Characterization Plan

A meeting hosted by the Nuclear Regulatory Commission (NRC) was held May 8 and 10 in Washington, D.C. The purpose of the meeting was for NRC to present review comments on the statutory SCP. Clarifying questions were asked by the Department of Energy (DOE) and the participants: in particular, Los Alamos asked clarifying questions on the NRC comments referring to sorption.

Semi-annual Progress Report (SPR)

Revisions to the SPR were made, and references were added for the Geochemistry section. The Bibliography section also was reviewed, and comments were submitted to DOE.

Study Plans

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Yucca Mountain Project Office (Project Office) 1/6/89. Approved by Project Office and Department of Energy Headquarters (DOE/HQ); sent to Nuclear Regulatory Commission (NRC) and State of Nevada.

Diffusion Test, RO (8.3.1.2.2.5). Submitted to Project office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/HQ 4/18/89. Abstract and SCP-based network submitted 5/25/89.

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Revision 1 was sent to DOE/HQ 5/2/89. Project Office AP-1.10Q review comments were received 5/10/89.

Mineralogy, Petrology, and Chemistry of Transport Pathways, R3 (8.3.2.3.2.1). Revision 3, which incorporates Project Office AP- 1.10Q review comments, was submitted to the Project Office 5/25/89.

History of Mineralogy and Geochemical Alteration at Yucca Mountain, RO (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). LANL received a draft copy of DOE/HQ comments. A comment resolution meeting was held on May 31, 1989, for DOE/HQ comments.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Study plan submitted to DOE/HQ for review 3/14/89. Draft Project Office AP-1.10Q review comments were received 5/26/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R1 (8.3.1.3.4.2). Revision 1, which incorporates screening review comments, was submitted to the Project Office 5/26/89.

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP-07 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Diffusion, R0 (8.3.1.3.6.2). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of a Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/88. Undergoing Project Office AP-1.10Q review (1/25/89).

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/88. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

WBS: 2.6.A
Project Title: Exploratory Shaft Management and Planning
Principal Investigator: H. Kalia

These exploratory shaft (ES) tasks will address the issues and information needs associated with the feasibility of storing high-level nuclear waste in a geologic repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

We continued to support the updating of the Subsystem Design System Requirements Document (SDRD). We started resolving the DOE Headquarters' comments on the SDRD and supported the preparation of Benchmark 5.

We continue supporting activities to prepare the network logic for testing activities that lead to the start of the shaft sinking and to extend the logic to the end of FY 1995. We met with U.S. Geological Survey (USGS) at Denver to go over their networks; the information they provided is being incorporated into the revised networks.

We supported the project effort for the construction of a prototype excavation (shaft), and interactions consisted of coordinating probable prototype testing in the excavation.

The readiness review for the Blast Effects Test was completed.

Prototype test data collection continued from engineered barrier test and drill hole instrumentation test, and we resumed overcoring for the diffusion test.

Equipment modification for cross hole prototype testing is being implemented at Denver by USGS technicians.

Data is being collected for wet and dry drilling from two drill holes near the end of the U12g12 drift.

Drilling was started for the perched water test is the laser drift. The hole has been dry drilled to a depth of 13 ft with a core recovery of 85.6%.

Overcoring for the in situ stress measurement is continuing in the demonstration drift. Total dry-drilled depth to date is 13 ft with a core recovery of 98.2%.

A briefing was presented to Don Schlick (YMPO) on Los Alamos work on dry drilling and tests on health-related aspects.

Supported Fenix & Scisson (F&S) efforts on the modification to the CMM-2 drill rig as proposed by F&S.

Requested information on the status of the budget for prototype testing from participants.

Los Alamos Technical Associates (LATA) provided a draft on prototype testing; it was reviewed, and comments were submitted to LATA for incorporation.

Effort is continuing on obtaining test procedures for the planned ESF (Exploratory Shaft Facility) tests.

Participated in site coordination meetings and in WIT-4 and project meetings on ESF construction.

Supported ESF budget validation weekly meetings. Provided input required to update the project networks.

Reviewed AP-5.18Q and Design Acceptability Analysis (DAA) Implementation Plan.

Supported task force for the surface-based site characterization work.

Participated in ESF construction-readiness review activities. Prepared action items and readiness review check list.

Work continues to prepare the Test Description Document.

Dr. Ned Elkins joined the Test Managers' Office as ESF design and testing integrator.

PLANNED WORK:

Resources will be provided to ensure that quality assurance (QA)-related documents are developed to fully qualify the QA program.

Los Alamos will continue to update Appendix B and prepare required engineering change requests, and work will continue to update Appendix C, drilling requirements.

Work will continue to prepare logic networks, power study, site population study, and the long-range plan.

We will continue to update the prototype-testing budget and schedule and to schedule readiness reviews for prototype tests.

Work will be started to prepare Safety Analysis Report (SAR) for ESF testing and to prepare Engineering Management Plan (EMP) for ESF testing and IDS design.

Work will continue for the preparation of the ESF Test Description Document and to prepare the report on prototype testing.

We will continue to support the WIT-4 process.

We will continue to participate in the ESF readiness review meetings, site coordination meetings, and ESF design integration meetings.

We will continue to develop testing networks and provide input to technical management and support services to integrate testing with ESF design and construction.

We will track the progress of the prototype cross hole test to be performed in Arizona by USGS.

PROBLEM AREAS:

None.

WBS: 2.6.9.2.4.A
Project Title: Geochemical Testing
Principal Investigator: A. E. Norris

Two geochemical tests have been proposed as part of the site characterization work associated with the construction of the exploratory shaft (ES). One is the measurement of the rate of water movement through the unsaturated zone as traced by chlorine-36. The second is the measurement of effective diffusivity coefficients under in situ conditions in two of the tuffs that will be penetrated by the ES. The data from both tests will be used in assessing the suitability of the Yucca Mountain site for a nuclear waste repository.

ACTIVITIES AND ACCOMPLISHMENTS:

D. Wonderly of Fenix & Scisson finished writing the drilling program for the next phase of the prototype diffusion test in G-Tunnel, which was signed by Los Alamos and Department of Energy/Yucca Mountain Project. The pacing item for implementing this drilling program is acquisition of an appropriate drilling rig to accomplish the large-diameter overcoring in G-Tunnel.

The new motor for use with the Los Alamos ESS-1 rock saw was delivered and installed this month. The rock saw is being used to develop a technique to section 12-in.-diam tuff cores without the use of a liquid coolant.

A. E. Norris participated in a meeting at Mercury, Nevada, on May 1 to discuss additional excavations in G-Tunnel in support of the YMP prototype activities.

Work this month in support of the Los Alamos quality assurance (QA) program included reviewing the following draft procedures:

TWS-QAS-QP-02.3, R0	Procedure for IDS Design and Interface Control
TWS-QAS-QP-02.5, R0	Procedure for Applying Graded Quality Assurance
TWS-QAS-QP-03.6, R0	Procedure for IDS Design and Interface Control
TWS-QAS-QP-03.8, R0	Procedure for the TAR of the IDS

In addition, the certification of A. E. Norris was completed under the new QA procedures.

PLANNED WORK:

Overcoring for the prototype diffusion test will be restarted as soon as the equipment is available.

MILESTONE PROGRESS:

No level II milestones are scheduled. Level III milestones are on schedule.

WBS: 2.6.9.3.A
Project Title: Exploratory Shaft Integrated Data System
Principal Investigator: R. Crowley

The integrated data system (IDS) is part of the supporting facilities for the Exploratory Shaft Facility (ESF). The IDS supports the data acquisition needs of the ESF test program by providing a central facility to automatically measure and control aspects of the ESF tests. The primary purpose of the IDS is to assist the principal investigators (PIs) in acquiring high-quality test data in a uniform, controlled fashion and to transfer those data to the PIs' organizations for data management and analysis.

ACTIVITIES AND ACCOMPLISHMENTS:

We continued to develop the quality assurance (QA) procedure for IDS Design Interface, the IDS Functional Requirements Document, documents for the configuration management of the IDS, and the contract document for Edgertown, Germeshausen & Grier, Inc., (EG&G) support for the IDS.

We prepared input for the Subsystem Design Requirements Documents for IDS, completed the documentation for the IDS Implementation/Requisition Plan, and developed an integrated network (testing, IDS design, and ESF design) for the IDS.

Work continued for the preparation of software QA procedures, which is requiring significant effort to develop. We also continued to develop Technical Interface Procedures to identify how the IDS interfaces with PIs and other users, such as DOE/YMP, Science Applications International Corp., Architect/Engineers, etc.

Work was initiated for the preparation of the "Basis for Design document."

We met with Fenix & Scisson, Holmes & Narver, and REECo to discuss IDS requirements from ESF designers and operators.

Attended course on Software QA offered by General Atomics of San Diego, California.

PLANNED WORK:

Work will continue to complete EG&G procedures and QA Program Plan (QAPP) for a fully qualified QA program, to develop Functional Requirements Document for the design of IDS, and to finalize contract document for EG&G. We will continue to develop procedures for software, IDs Requirements Plan, Interface Procedures, and Facilities Requirements.

Resources will be diverted to develop documentation to obtain DOE authorization to start Title II-Phase 1A design effort as soon as the required procedures have been developed and accepted.

Work will continue on preparation of the IDS Configuration Management Plan, Data Interface Documents, and Hardware Configuration Plan.

We will continue to obtain information from the PIs for the design of the IDS, and we will schedule meetings with PIs to discuss IDS design-related input.

PROBLEM AREAS:

EG&G's QAPP could not be developed in time and on schedule. The resulting delay may impact the ESF testing schedule; however, we are attempting to recoup the lost time.

WBS: 2.9.1.4.A
Project Title: Records Management
Principal Investigator: G. Ortiz

The objective of this task is to manage records and documents related to the licensing of a geologic repository for the disposal of high-level radioactive waste. The requirements are to support the development, implementation, and maintenance of a comprehensive, automated, and integrated information management system.

ACTIVITIES AND ACCOMPLISHMENTS:

All records processed in the Quality Assurance Records Management System (QARMS) will be transferred to the Records Information System (RIS). Los Alamos YMP has approximately 8,000 indexed records in the QARMS, which will not be processed under the records management requirements for the RIS.

A request has been made through the Central Records Facility (CRF) to obtain a listing of all Los Alamos YMP records indexed and microfilmed to date into the RIS.

On May 24, G. Ortiz met with H. Nitsche and S. Carpenter from Lawrence Berkeley Laboratory (LBL) to prepare several records turnover packages for permanent storage.

Comments have been received for Quality Procedures QP 17.1 and 17.2, which will not need substantial modifications. Project Administrative Procedure AP-1.7Q, R2 has just been issued to Project participants. QP 17.1 and 17.2 will be modified to address any relevant requirements imposed by AP-1.7Q, R2.

Records Processing Center (RPC) is currently on-line with the RIS, and information about records can be retrieved through the RIS. No microfilm of Los Alamos records has been sent by the CRF as of date.

PLANNED WORK:

Transfer the RPC from Los Alamos N-5 to Los Alamos Technical Associates (LATA).

Train LATA in RPC operations and records access through the RIS.

On-line access to RIS for Los Alamos N-5 and ESS-1 resident file custodians.

PROBLEM AREAS:

Records rejected by the CRF are in many cases attachment or enclosures of records received from outside organizations.

WBS: 2.9.3.A
Project Title: Quality Assurance
Principal Investigator: H. P. Nunes

The Quality Assurance Program provides quality assurance support to Los Alamos Yucca Mountain Project (YMP) participants. This support is designed to ensure that the YMP efforts of Los Alamos will provide admissible data and evidence for the repository licensing process.

ACTIVITIES AND ACCOMPLISHMENTS:

The annual staff recertification has been completed. Each group has been directed to submit its Quality Assurance (QA) Records package to Los Alamos N-5 for storage in keeping with the Los Alamos dual record storage requirements and the need to maintain personnel records in accordance with the California Privacy Act.

The biweekly Los Alamos meetings to achieve a qualified QA Program continued. The quality procedure revisions (39 total) are on schedule: 30 procedures are completed and issued, and the remaining 9 are in the review comment resolution cycle. All procedures that require formal training before the start of the Title II Design Efforts have been issued, and two procedures remain to be issued that have some impact on the Title II effort. Three formal training modules need to be prepared to support the final Los Alamos training requirements for the remaining procedures currently being developed.

The effort at Edgerton, Germeshausen & Grier (EG&G) is now directed toward revising the EG&G QA Program Plan. This effort, a result of a Project Office directive to prepare a QA Plan for the Integrated Data System (IDS) that was directly traceable to the YMP QA Plan/88-9, R2, is scheduled for completion by July 10. EG&G has been directed to revise its program plan, prepare the needed revisions, and submit them with the appropriate QA Plan/88-9, R2, checklist to the QA Program Leader for review and approval. Additional direction was provided to ensure that the resulting internal implementing procedures will be compatible with the resulting program plan.

The Los Alamos QA staff effort to review the completed quality administrative procedures with the checklists based on the approved Quality Assurance Program Plan (QAPP), R4.3 continues. These checklists are being used to evaluate the completed implementing procedures, assuring ourselves that all procedures reflect the needed requirements of the approved QAPP.

PLANNED WORK:

Continuation of Los Alamos efforts to achieve a qualified QA program that supports the start of the Title II IDS design efforts is still the first priority of the Los Alamos QA staff. Training the Los Alamos staff will be a second priority to ensure the start of the ongoing research efforts in accordance with the revised Los Alamos QAPP.

The Los Alamos QA staff will continue their review of the completed implementing procedures to ensure that the appropriate requirements from the approved QAPP, R4.3, are completely reflected in the final approved procedure. Revisions will be issued in each case where omissions are found.

Addition staff have been assigned to track and close the outstanding standard deficiency reports, nonconformance reports, and corrective actions reports. These efforts will allow for the timely closure of issues associated with the start of Title IDS design efforts or the Los Alamos Test Manager's Office activities.

NWPO

TECHNICAL DATA MANAGEMENT SYSTEM SUBMITTAL RECORD

N-AD-035
11/86

TITLE OF DOCUMENT	DESCRIPTION OF DATA OR INFORMATION	AUTHOR OR PRINCIPAL INVESTIGATOR	DATE PUBLISHED	QUALITY ASSURANCE LEVEL	TECHNICAL DATA MANAGEMENT SYSTEM COMPONENT (INDICATE BY "X")				DATE OF SUBMITTAL
					TRC	SEPDB	IGIS	RIB	
NO DATA WERE	SUBMITTED THIS MONTH								

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments

FY89 Milestones - Level 1 Completed as of June 01, 1989

NONE

FY89 Milestones - Level 2 Completed as of June 01, 1989

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T478	12/15/84		123111A	N-5	Prototype Test Plans, Volume 2 (FY-89 Funded Tests) This milestone is the other part of milestone T435 (Volume 1). T schedulers are incorrectly using M253 for Volume 2. This mileste should not be confused with M105, which is the submission of the prototype test plans for review. M105 is completed. The report entitled "Prototype Test Plans, Volume 2 (FY-89 Funded Tests)" wa completed and sent to the Project Office for policy review on 12/15/88, ref. TWS-N5-12-88-034.
T404	09/28/88		1232312A	ESS-1	Progress Report on Rock-Varnish Work Report entitled "Progress Report on Rock-Varnish Work" wa completed and sent to the Project Office for policy review on 11/16/88, ref. TWS-N5-10-88-046.
T414	02/28/89		123363A	ESS-1	Final Dust Hazard Assessment Report Report entitled "Evaluation of Dust-Related Health Hazards Associated with Air Coring at G-Tunnel, Nevada Test Site" was completed and sent to the Project Office for review on 04/14/89, ref. TWS-N5-04-89-055.
T415	12/16/88		123363A	ESS-1	Final Drilling and Technology Report The final report draft of the Prototype Air Coring Test was completed and sent to the Project Office on 01/17/89, ref. TWS-ESS-1-1/89-11. Report entitled "The Yucca Mountain Project Prototype Air-Coring Test, U12g Tunnel, Nevada Test Site" was sen to the Project Office for policy review on 05/09/89, ref. TWS-N5-89-045.
M367	11/17/88		123414A	INC-11	Interim Progress Report on Colloid Stability Report entitled "Interim Progress Report on Colloid Stability: Voltammetric Studies of the Redox Reactivity of Plutonium (IV) Colloid" was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-033.
P379	11/17/88		123414A	INC-11	Progress Report: Photoacoustic Spectroscopy Methodology (PAS) Report entitled "Photoacoustic Spectroscopy Methodology" was completed and submitted to the Project Office for policy review 01/18/89, ref. TWS-N5-01-89-058.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T418	11/30/88		123414A	INC-11	Letter Report: Progress Report on Solubility Measurements Report entitled "Letter Report: Progress Report on Solubility Measurements" was completed and sent to the Project Office for policy review on 11/28/88, ref. TWS-N5-11-88-069. The report ı approved for publication by the Project Office on 05/09/89, re: TWS-N5-05-89-047.
R505	11/25/88		123415A	INC-7	Summary Report: Sorption of Nickel and Neptunium in Tuff Using Groundwaters of Different Composition Milestone completed on 10/21/88 and the report entitled "Sorpti of Nickel and Neptunium in Tuff using Groundwaters of Various Compositions" was sent to the Project Office, ref. TWS-N5-10-88-050. This report was approved
R720	11/01/88		123415A	INC-7	Issue Report on Deconvolution of Ion-Exchange Isotherms Report entitled "Deconvolution of Ion-Exchange Isotherms" was reviewed, and a copy of the revised paper was sent to the Proje Office on 02/17/89, ref. TWS-N5-02-89-058.
T421	12/15/88		123417A	ESS-5	TRACR3D Documentation for Baselined Version Report entitled "TRACRN 1.0: A Model of Flow and Transport in Porous Media for the Yucca Mountain Project - Model Description User's Manual" was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-032. Final Revision Prog
T424	02/28/89		123417A	ESS-5	Interim Report: Letter Report on Particulate Transport Report entitled "Interim Report on Particle Transport" was completed and sent to the Project Office for policy review on 02/24/89, ref. TWS-N5-02-89-072. The report was approved for publication by the Project Office on 05/09/89, ref. TWS-N5-89-0
T426	11/25/88		123418A	ESS-4	FRACNET - Fracture Network Model For Water Flow and Solute Transport Milestone completed on 10/25/88. A policy review conducted on report entitled "FRACTNET - Fracture Network Model for Water Flc and Solute Transport", was sent to the Project Office, ref. TWS-N5-10-88-059.
T207	11/30/88		123422A	ESS-1	Dating Zeolitization at Yucca Mountain with Tectonic and Structural Report entitled "Dating Zeolitization at Yucca Mountain with Tectonic and Structural Data" was completed and sent to the Pro Office for policy review on 12/01/88, ref. TWS-N5-12-88-003.
T095	11/30/88		123423A	ESS-1	Issue Report: Statistical Test of Repeatability and Operator Varian on Modal Analysis Report entitled "Status of Image Analysis Methods to Delineate Stratigraphic Position in the Topopah Spring Member of the Paintbrush Tuff, Yucca Mountain, Nye County, Nevada" was comple and sent to the Project Office for policy review on 12/23/88, r TWS-N5-12-88-072.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T469	02/28/89		123423A	ESS-1	Issue Report on Erionite Abundances at Yucca Mountain. Report entitled "The Occurrence and Distribution of Erionite a Yucca Mountain, Nevada" was completed and sent to the Project Office for policy review on 02/14/89, ref. TWS-ES-02-89-045.
R321	12/23/88		123431A	WX-4	Complete Design of the Exploratory Shaft Water Tracer System Demonstrated to H&N use of the equipment and provided drawings H&N. No further action is required. This milestone was comple on 03/09/89, ref. TWS-ESS-LV-1-03-89-17.
T163	11/30/88		12611A	WX-4	Revised NNWSI 'White Paper' on "ES Fluids and Materials Usage" Deli to WMPO. Report entitled "Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility and Materials Evaluation" was compl and sent to the Project Office on 12/15/88, ref. TWS-ES-12/88/

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YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	JCB Baseline Date	New WBS Element	Organization Responsible	Description Comments

FY89 Level 1 Open Milestone List

NONE

FY89 Level 2 Open Milestone List

New WBS Number 1.2.3

Number	LANL Proposed Date	JCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
M287	09/01/89		1231	ESS1/WX	Compile Draft ES Test Procedures (Construction Phase) Precursor to M651.
R705	06/30/89 90		1232122	INC-7	Issue Letter Report: Thermodynamics and Kinetics of Phases Important t Silica Activity at Yucca Mountain
3115	09/01/89		1232551	ESS-1	Issue report varnish analysis utilizing SEM and microprobe techniques. Work is ongoing on both SEM and microprobe to resolve problem of T and Ba peak overlap and deconvolution of these peaks to obtain accurate analyses where both Ti and Ba occur within varnish samples. Several possible avenues of approach to the problem are being evaluated.
M160	07/31/89		12341	N-5	SCP Progress Report: Results of Geochemistry Investigations
T535	04/17/89		123411	HSE-12	Study Plan Approved (Ground Water Chemistry Model)

Not in contract X cf. ...

New WBS Number 1.2.5

Number	LANL Proposed Date	JCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
T001	03/15/89		12522	N-5	Submit draft ongoing Geochemistry Test Program Study Plans to WMPO/NV for review. Will be completed when all study plans are submitted to the Projec Office.

New WBS Number 1.2.6

Number	LANL Proposed Date	JCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
M667	02/24/89		12684	WX-4	IDS Phase 1 Final Design Issued Review completed.

ATTACHMENT 1
06/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
T062	01/10/89		12684	WX-4	IDS Phase 2 Final Design Issued. Delayed due to fully qualified QA program effort.
T436	06/08/88		12684	WX-4	IDS Development System - Status Report #1
T437	06/10/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #1
T438	10/17/88		12684	WX-4	IDS Phase 1 & 2 Facilities - Detailed Requirements
T439	10/17/88		12684	WX-4	IDS Phase 1 Hardware - Interim Design Report
T440	10/17/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #2
T443	02/01/89		12684	WX-4	IDS Phase 2 Hardware - Interim Design Report
T444	02/01/89		12684	WX-4	IDS Development System - Status Report #2
T445	05/01/89		12684	WX-4	IDS Phase 1 Software - Validation and Verification Report
T446	05/01/89		12684	WX-4	IDS Phase 1 Hardware - Acceptance Test Report
T447	05/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #1
T448	09/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #2

ASSUMPTIONS:
ES start date 11/89
WBS Structure baseline 7/22/86
Prep: 06/01/89
A. Pratt

DISTRIBUTION:
J.A. Canepa, N-5, J521
H.N. Kalia, ESS-1, J900/527
R.L. Byers, N-5, J521
D.T. Oakley, N-5, J521
K.A. West, N-5 , J521

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR MAY 1989
RESPONSIBILITY CODE: LANL
31 May 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR MAY 1989
RESPONSIBILITY CODE: LANL
31 May 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

MAY PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR MAY 1989
RESPONSIBILITY CODE: LANL
31 May 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.3.4							
Submit Draft Geochemistry Test Program Study Plans to YMPO for Review	Blanchard	2	T001 (P)	16 Jun 89	21 July 89		[illegible]
WBS: 1.2.3.4.1.1.A							
Study Plan Approved (Ground Water Chemistry Model)	Clanton	2	T535 (P)	25 Aug 89			[illegible]
WBS: 1.2.3.4.1.3.A							
Issue Letter Report: Thermodynamics and Kinetics of Phases Important to Silica Activity at Yucca Mountain	Livingston	2	R705 (P)	30 Jun ~~89~~ 90			[illegible]
WBS: 1.2.3.4.3.1.A							
Complete Design of the Exploratory Shaft Water Tracer System	Robson	2	R321 (P)	28 Jul 89			[illegible]

NO. MILESTONES IN THIS SECTION: 4

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR MAY 1989
RESPONSIBILITY CODE: YMP/LANL
31 May 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

MAY PROGRESS REPORT

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR MAY 1989
RESPONSIBILITY CODE: YMP/LANL
31 May 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR MAY 1989
RESPONSIBILITY CODE: YMP/LANL
31 May 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

LOS ALAMOS NATIONAL LABORATORY
OUTSTANDING PROJECT OFFICE ACTION ITEMS
May 30, 1989

Policy Reviews

1. Milestone R743 report: resubmitted 12/7/88 with response to Project Office review.

2. Milestone R749 report: resubmitted 12/9/88 with response to Project Office review.

3. Milestone R343 report: resubmitted 1/9/89 with response to Project Office review.

4. Milestone P379 report: resubmitted 1/18/89.

5. Milestone T404 report: resubmitted 2/28/89 with response to Project Office review.

6. Milestone R346 report: resubmitted 4/4/89; responded to Project Office comments 5/23/89.

7. Milestone M367 report: resubmitted 4/11/89 with response to Project Office review.

8. Milestone T414 report: submitted 4/14/89.

9. Milestone T433 report: submitted 4/14/89.

10. Milestone T415 report: submitted 5/9/89.

11. Milestone T427 report: submitted 5/24/89.

12. Abstract - B. Crowe et al., "Polycyclic Volcanism: A Common Eruption Mechanism of Small Volume Basaltic Volcanic Centers of the Southern Great Basin, USA": submitted 3/6/89.

13. Report manuscript - S. G. Wells et al., "A Geomorphic Assessment of Late Quaternary Volcanism in the Yucca Mountain Area, Southern Nevada: Implications for Volcanic Hazard Assessment at the Proposed High-Level Radioactive Waste Repository": submitted 4/11/89

14. Book contributions - B. Crowe, "GSA Field Trip Segment: Lathrop Wells Volcanic Center" and "GSA Field Trip Segment: Crater Flats": submitted 4/27/89.

15. Abstract - H. Nitsche, "Solubility Studies of Transuranium Elements for Nuclear Waste Disposal: Principles and Overview": submitted 5/11/89.

16. Abstract - R. A. Rundberg et al., "Observation of Time-Dependent Dispersion in Laboratory Scale Experiments with Intact Tuff Columns": submitted 5/16/89.

17. Abstract - L. E. Hersman, "Effects of Microorganisms on the Transport of Actinide Elements": submitted 5/16/89.

18. Abstract - I. R. Triay et al., "Sorption Behavior of Americium in Tuff Samples and Pure Minerals Using Synthetic and Natural Groundwaters": submitted 5/19/89.

19. Abstract - I. R. Triay et al., "Size Determinations of Pu Colloids Using Autocorrelation Photon Spectroscopy": submitted 5/19/89.

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

WBS #: 1.2.9
QA: N/A

May 30, 1989

TWS-N5-05-89-141

Mr. Carl P. Gertz, Project Manager
Yucca Mountain Project Office
US Department of Energy
P.O. Box 98518
Las Vegas, NV 89193-8518

Dear Mr. Gertz:

SUBJECT: APRIL PROJECT STATUS REPORT

Attached are the April Project Status Report for Los Alamos' participation in the Yucca Mountain Project, the Technical Data Management System Submittal Record, and the Monthly Milestone Status Report. A list of outstanding policy reviews and other documents is also included. Documents checked on that list have been at the Project Office for at least two months; the authors are very eager to have those documents approved.

Sincerely,

R. J. Herbst

R. J. Herbst

ABC/em

Attachment: a/s

Cy w/attachment:

R. Bullock, F&S, Las Vegas, NV
J. C. Calovini, H&N, Las Vegas, NV
V. J. Cassella, HQ/Washington, DC
D. Eppler, SAIC, Las Vegas, NV
C. Garvin, SAIC, Las Vegas, NV
L. Hayes, USGS, Denver, CO
J. Steigler, SNL, Albuquerque, NM
T. Jackson, SAIC, Las Vegas, NV
R. F. Pritchett, REECo, Las Vegas, NV
L. Ballou, LLNL, Livermore, CA
A. M. Sastry, MACTEC, Las Vegas, NV
N. Carter, SAIC, Las Vegas, NV
A. B. Caughran, IS-11, MS J521
ESS-1 Distribution, MS D462
N-5 Distribution, MS J521
K. G. Eggert, ESS-5, MS F665
T. J. Hirons, N-DO, MS E561
H. N. Kalia, ESS-1, MS J900/527
T. J. Merson, WX-4, MS G787
E. C. Roybal, INC-7, MS J514
R. A. Morley, LATA, MS M321
A. R. Pratt, FIN-10, MS J521
RPC File, MS J521
N-5 Library, MS J521
TWS-N5, MS J521
TWS-N5, MS M321
CRM-4 (2), MS A150

Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
April 1989

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Los Alamos National Laboratory
Yucca Mountain Project

PROJECT STATUS REPORT
April 1989

WBS: 2.1.2.4.A
Project Title: Systems Engineering Integration
Principal Investigator: R. Herbst

The objective of this task is to integrate Yucca Mountain Project technical work through the application of systems engineering techniques.

ACTIVITIES AND ACCOMPLISHMENTS:

No activity to report this month.

WBS: 2.3.2.3.1.A
Project Title: Tectonics and Volcanism
Principal Investigators: B. Crowe and F. Perry

The objective of these volcanism studies is to determine the hazards of future volcanic activities with respect to siting a high-level radioactive waste repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

The rock crushing laboratory is now in operation at the University of New Mexico. A technician was trained at the crushing laboratory for "The Procedure for Preparation of Sample Powders at the University of New Mexico." Rock samples from the "A" cone at the Cima volcanic field were crushed and prepared for major and trace element analysis. The geochemical literature was reviewed for use of Pearce chemical diagrams for scoria studies of volcanic sequences and for applications to attempting to discriminate the source or sources of basaltic volcanic ash in fault trenches around Yucca Mountain.

A rough draft paper discussing the results of potassium-argon (K-Ar) age determinations and paleomagnetic pole position measurements at the Lathrop Wells volcanic center was completed during April. The paper has been expanded to include discussion of paleomagnetic studies and earlier results of K-Ar studies at the center. The paper was reviewed and returned to the U. S. Geological Survey (USGS) for further modifications prior to submitting the manuscript for technical review.

Mineral separates were obtained for a scoria sample collected from the interior of the Lathrop Wells scoria cone. Two major phases were separated (bulk rock and magnetite) and will be used to construct an isochron for uranium-thorium (U-Th) disequilibrium studies. Measurement of the mineral separates has been delayed by the moving of the instruments to the new mass spectrometry building.

The equipment for extracting helium from crushed rock for mass spectrometric measurement of the $^3He/^4He$ ratios of basalt was tested during the month.

John Stuckless of the USGS directed our attention to a previously published measurement of a U-Th series measurement on a caliche zone in basalt scoria at the Lathrop Wells volcanic center (USGS Open File Report 81-119). A measurement of 25,000 plus/minus 10,000 yrs was obtained for a sample that appears to represent a soil developed on the Qs5 unit at the Lathrop Wells volcanic center. We are attempting to obtain information about the exact collection site. Preliminary information indicates the date may represent a minimum age of the oldest volcanic unit of the center. If the site and age of the sample are correctly interpreted, the data suggest the oldest activity at the center may be on the order of 50 ka. This interpretation would be consistent with studies of the paleomagnetic pole position and chlorine-36 measurements of rock units from the center.

PLANNED WORK:

Attempts will be made to date lava flows at the Lathrop Wells volcanic center using the thermoluninescence technique.

A five day field trip is being planned with the Nuclear Regulatory Commission and the State of Nevada to examine volcanic centers in southern and central Nevada. The trip will be led by State participants and by Los Alamos.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Crowe, Harrington, Perry, Wells, McFadden, Renault, Turrin, and Champion	Volcanic Hazard Studies for the Yucca Mountain Project	Paper for meeting - Waste Management '89, Tucson, Feb. 26-March 2, 1989	Sent to Project Office 3/21/89.
Turrin, Crowe, and Fleck	K-Ar Determinations of Lava Flow Units of the Lathrop Wells Volcanic Center	Article for journal (to be determined)	Final draft in progress.

MILESTONE PROGRESS:

The milestone report for the K-Ar report on the Lathrop Wells volcanic center has been delayed. It is still in draft form, and we are currently evaluating the significance of the U-Th series measurement on the K-Ar results.

Milestone	Date Due	Description or title	Status
T403	5/15/89	Potassium-Argon Geochronology-Basalts of Crater Flat	Delayed; see above.
T404	9/30/88	Progress Report on Rock Varnish Work	Revision sent to Project Office 2/28.

WBS: 2.3.4.1.1.A
Project Title: Groundwater Chemistry
Principal Investigator: M. H. Ebinger

The goal of this investigation is to provide conceptual and mathematical models of the groundwater chemistry at Yucca Mountain. These models will explain the present groundwater composition in relation to interactions of minerals and groundwater and will be used to predict groundwater compositions as a result of anticipated and unanticipated environments.

ACTIVITIES AND ACCOMPLISHMENTS:

The study plan for this investigation is being prepared and is the focus of current effort. Draft of the groundwater chemistry study plan will be circulated for internal review and comment early in May.

PLANNED WORK:

Continue development of study plan and circulate draft for comments and Los Alamos review.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

None.

MILESTONE PROGRESS:

No milestones scheduled in the next three months.

WBS: 2.3.4.1.2.A
Project Title: Natural Isotope Chemistry
Principal Investigator: A. E. Norris

The objective of the natural isotope chemistry task is to determine the distribution of naturally occurring radioactive elements at Yucca Mountain as part of the work to characterize the infiltration of precipitation, the velocity of water movement through the unsaturated zone, and the retardation of radionuclide transport relative to water velocity.

ACTIVITIES AND ACCOMPLISHMENTS:

A pulse of chlorine-36 was observed in cuttings from the DH-2 air-cored hole in G-Tunnel, but no pulse was observed in cuttings from the AC-1 hole, about 200 feet to the west. Work is underway to confirm the observation of the pulse by measuring the chlorine-36 in cuttings from the DH-1 hole, which is located about 10 feet from DH-2. Two DH-1 samples are being prepared for chlorine-36 analysis. One is from the 17.3- to 27.3-ft interval, and the second is from the 27.3- to 37.0-ft interval. The DH-1 hole was drilled only four feet from a 12-in. diameter hole that was cored with water. It is hoped that water from the large-diameter coring did not spread horizontally to the tuff where the DH-1 hole was cored. If it did, the drilling water may have washed away the chlorine-36 that we want to detect.

Additional work to determine the extent of the chlorine-36 pulse was started this month. Two samples of cuttings from air-cored hole AC-2 were shipped from G-Tunnel this month for chlorine-36 sample preparation. One sample is from the 44.2- to 54.2-ft interval, and the other is from the 97.4- to 106.0-ft interval. These locations are east of DH-1 and DH-2. If the sample preparation is completed in time, the AC-2 samples will be analyzed for chlorine-36 at the University of Rochester's tandem accelerator mass spectrometer in May, along with the other samples from this task.

Quality assurance (QA) activities in support of the Los Alamos effort to achieve a qualified program included completing all required training for the new QA procedures, writing a job description, and reviewing four draft procedures: QP 4.2, R2, procedure for accepting the performance of procured services; QP 6.1, R1, procedure for document control; QP 16.1, R1, procedure for corrective action; and QP 18.1, R1, procedure for audits.

PLANNED WORK:

Samples will be collected from UE-25 UZ P#1 and UE-25 UZ P#2 and analyzed for chlorine-36.

MILESTONE PROGRESS:

No level II milestones are scheduled this fiscal year. The level III milestone to provide technical support during the QA audit of Hydrothermal Geochemistry, scheduled for June, will be delayed for three months. The date of the audit has changed to September. The other level III milestones are on schedule.

WBS 2.3.4.1.3.A
Project Title: Hydrothermal Geochemistry
Principal Investigator: C. Duffy

The objective of the hydrothermal geochemistry task is to produce a model for past and future mineral alteration in Yucca Mountain. The model is intended to explain 1) natural mineral evolution resulting from the transformation of metastable mineral assemblages to more stable assemblages and 2) the effects of a repository emplacement.

ACTIVITIES AND ACCOMPLISHMENTS:

Most of our effort has remained directed toward the preparation of detailed technical procedures and the review of quality assurance (QA) procedures. We are continuing to make progress on the data acquisition system for the flexible cell hydrothermal system. We are also continuing scoping studies on the kinetics of the cristobalite-to-quartz transition. Experiments completed this month confirm a rather large rate dependence on pressure as well as on temperature. However, we are seeing more scatter in the data, especially at 350°C and 1000 bar; the reason for this scatter is unclear at this time.

We have also resumed examination of the available data on the smectite-to-illite transformation. The extent of this transformation has been used as a temperature indicator, but we noted earlier that this transition may also be dependent on the activity of aqueous silica. This dependence on aqueous silica activity may explain the differences in the temperature ranges over which this transformation occurs in different sediments. If the activity of aqueous silica proves to be a primary variable controlling the smectite-to-illite transformation, the rate of reaction will be limited by the rate of quartz precipitation.

PLANNED WORK:

Work will continue toward a fully qualified QA program. We will also continue using cold-seal hydrothermal techniques in scoping studies on the kinetics of silica transition. As soon as possible, we plan to start using the flexible cell hydrothermal system in scoping studies on the silica concentration in equilibrium with silica polymorphs. We will also be increasing examination of the literature on the smectite/illite transition in preparation for preparing a milestone report on the subject (due at the end of September).

PROBLEM AREAS:

Project-wide problems with the traceability of standards preclude the possibility of standardizing our hydrothermal lab at this time. Because of the long duration of many hydrothermal experiments, this problem could impact the milestone schedule if not corrected in the near future.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
B. E. Scheetz and D. M. Roy	Reactivity of a Tuff-Bearing Concrete: CL-40 CON-14	LA-series report	Issued April 1989
B. E. Scheetz and D. M. Roy	Preliminary Survey of the Stability of Silica-Rich Cementitious Mortars 82-22 and 84-12 with Tuff	LA-series report	Issued March 1989
D. M. Roy and C. A. Langton	Studies of Ancient Concrete as Analogs of Cementitious Sealing Materials for a Repository in Tuff	LA-series report	Issued March 1989

These reports were originally prepared under the sealing materials task by subcontractors at the Materials Research Laboratory at Pennsylvania State University: this task is no longer active. They are reported here because editing and preparation for publication were done by staff working on this task.

MILESTONE PROGRESS:

No milestones are due in next three months.

WBS: 2.3.4.1.4.A
Project Title: Solubility Determination
Principal Investigator: D. Hobart

The objective of the solubility determination task is to determine the solubilities and speciation of important waste elements under conditions characteristic of the repository and along flow paths from the repository into the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

The final draft version of the Solubility Task Study Plan has been sent by Los Alamos Technical Associates, and minor corrections are being addressed. Again, most of our time was spent on quality assurance (QA) business. A number of detailed procedures (DPs) were completed and submitted, and personnel certification forms were revised and submitted, mostly for Lawrence Berkeley Laboratory (LBL) personnel. D. Hobart interviewed candidates for the INC-7 quality assurance liaison job opening during this reporting period. On April 7, the Quality Assurance Manager visited the LBL group and provided an official QA training session.

The following DPs are in progress:

- Determination of UV-VIS-IR Absorption and Diffuse Reflectance Spectra.
- X-Ray Powder Diffraction Analysis for Solubility (YMP-LBL-DP03).
- Sodium Concentration Determination in Radionuclide Solutions (YMP-LBL-DP05).
- Eh (Oxidation--Reduction) Potential Measurements (YMP-LBL-DP06).

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Completed and submitted DPs are as follows:

- Sample Identification and Handling.
- Purification of Colloidal Plutonium(IV) by Centrifugation and Ion Exchange (YMP-INC-DP80).
- Calibration of Low Energy Gamma Counters (YMP-LBL-DP02).
- Trace Element Characterization by Atomic Emission Spectroscopy (YMP-LBL-DP04).

Results from the preliminary collaborative experiment involving the x-ray absorption spectrum of a sample of neptunium sorbed on geothite were quite promising; the final analysis indicates that Np is not greatly modified in its structure when adsorbed on the mineral phase.

H. Nitsche reports that experiments in UE-25p#1 groundwater were started for plutonium. Results for the neptunium and americium/neodymium experiments show that the solutions are approaching steady-state concentrations or that they have already reached steady-state. The final results will be forthcoming.

Work continued on assembly and testing of the components in the integrated photoacoustic/photothermal deflection spectroscopy system. The final component in the pulsed-laser excitation source was ordered during this reporting period, and delivery and installation should take place in six to eight weeks. Preliminary work will continue without this component, and all other instrumentation is now on hand. We have begun to focus our attention on optimum cell designs and optical layouts for the initial testing of the system.

Postdoctoral recruiting activities for assistance on the photoacoustic spectroscopy (PAS) task continued in April. A second candidate was invited to Los Alamos on April 3 and 4. Both candidates were nominated for Director's Funded positions, which will be determined at the forthcoming meeting of the Postdoctoral Committee. Both candidates are extremely well qualified in the field of laser spectroscopies, and both could make significant contributions to our efforts. Hiring actions were initiated during this reporting period for Dr. C. Drew Tait. Dr. Tait will assume a joint staff position in INC-4 and INC-7. His principal responsibilities in INC-4 will be related to this PAS task.

PLANNED WORK:

We will continue work on a number of detailed procedures due this fiscal year.

System assembly and testing will continue. We should be in a position to begin acquisition of test data in the very near future. Initial work will probably be done on Nd^{3+} and Pr^{3+} solutions because these require no special sample-handling precautions and provide electronic transitions similar to those expected for the waste radionuclides of interest. Emphasis will be given to developing the communication interfaces between the various components in the spectrometer system.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

All milestones will be completed on time. However, we are unable to report milestone due dates because of our lack of a fully qualified QA program.

Milestone	Date Due	Description or title	Status
M367	11/17/88	Progress Report on Colloid Stability	Revision sent to Project Office 4/11/89.
P379	11/17/88	Photoacoustic Spectroscopy Methodology	Sent to Project Office 1/18/89.
T418	11/30/88	Solubility Measurements	Revision sent to Project Office 3/27/89.

WBS: 2.3.4.1.5.A
Project Title: Sorption
Principal Investigator: A. Meijer

The objective of the sorption and precipitation task is to provide sorption coefficients for elements of interest in order to be able to predict radionuclide movements from the repository to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

Investigation of the influence of water/rock ratios on sorption coefficients has continued. These experiments are designed to address concerns of the Nuclear Regulatory Commission about the applicability of sorption coefficients determined in the laboratory, at high water/rock ratios, to the natural environment where water/rock ratios could be lower. The rock sample selected for these experiments is a zeolitic tuff (G4-1502), and the water/rock ratios selected were 5:1, 10:1, 20:1, and 30:1. As noted in the last monthly report, the sorption coefficients obtained to date for barium (Ba), cesium (Cs), and strontium (Sr) show regular increases with increasing water/rock ratios. Because such a correlation is contrary to theoretical expectations, we suspected our solid-solution separations may have been imperfect because of the formation of colloids. Resuspension of very small colloidal particles after the ultracentrifugation step, but before the solution was sampled, could explain the results. To test this hypothesis, we started another set of experiments in which the solution was separated from the solid by ultrafiltration.

The preliminary results provide support for our hypothesis. The sorption coefficients obtained for Cs were as follows: 34,200 ml/g for the 10:1 sample, 44,100 ml/g for the 20:1 sample, and 45,900 for the 30:1 sample. These numbers are within analytical error of one another. The 5:1 result is unavailable because the amount of solution available for counting was insufficient. A reanalysis of this sample will be reported next month. When compared to the Cs sorption coefficients obtained using ultracentrifugation (14,000 ml/g for 5:1 to 32,000 ml/g for 30:1), the new results are encouraging and suggest the effect of water/rock ratios on sorption coefficients should be minimal at sufficiently low concentrations. At higher solution concentrations, sorption coefficients would be expected to decrease with increasing water/rock ratios as observed for a welded devitrified tuff (YM-22) by Wolfsberg et al. (1981). At sufficiently high solution concentrations, the solubility of a given radionuclide would be controlled by precipitation of a solid phase. Results for Ba and Sr will be reported next month.

Work on the sorptive behavior of americium (Am) in selected tuff samples and pure minerals has continued now that appropriate clean room facilities are available.

Ultrapure reagents have been prepared by sub-boiling distillation, and these have been used by investigators in the solubility task to prepare the Am solution to be used in the planned sorption experiments.

Efforts to obtain pure minerals for sorption experiments are ongoing. We have continued working on the purification of clinoptilolite from Castle Creek, Idaho, and have managed to purify a total of 60 g. The pure minerals obtained to date were submitted to ESS-1 for x-ray diffraction analysis. The results follow (note that original identifications of the natural samples were from Wards Scientific, Inc.):

Calcite (Iceland Spar) from Mexico - no impurities detected

Cryptomelane from Nancy Mine, Socorro, NM - no impurities detected

Montmorillonite, from Cheto Mine, Apache County - >99% montmorillonite, trace of quartz

Pyrolusite from Casa Grande, Az - actually romanechite, no impurities detected

Psilomelane, Nancy Mine, Socorro, NM - actually cryptomelane, no impurities detected

Calcium carbonate (synthetic), Merck Chemicals - calcite, no impurities detected

Ferric Oxide (synthetic), EM Science - hematite, no impurities detected

These minerals have been sent to John Husler at the University of New Mexico for analysis of the following elements: silicon, iron, sodium, potassium, titanium, magnesium, manganese, aluminum, and phosphorus.

An experimental plan for neptunium (Np) experiments involving the available pure minerals and a synthetic J-13 water has been developed. These experiments will be initiated in May.

Work under the contract with Stanford University concentrated on the following tasks:

(1) Preparation of a report on "Development of Surface Complexation Modeling Strategies for Natural Materials Found Within the Yucca Mountain Site." This report will be available in draft form next month.

(2) Goethite preparation. The preparation and surface area measurement (BET) of goethite (500 gm) was completed this month.

(3) Experimental work on uranyl surface complex formation on monomineralic surfaces. This work is ongoing and will generate a basic data set for uranyl interaction with goethite and refine laboratory techniques as appropriate. The experimental work will have a duration of approximately two months and will produce the following: (a) equilibrium uranyl adsorption as a function of pH and uranyl adsorption density, (b) kinetic behavior of uranyl adsorption onto goethite, (c) uranyl adsorption as a function of ionic strength, and (d) the influence of uranyl/carbonate and carbonate/goethite complexes on uranyl adsorption.

(4) Development of analytical methods. The detection limit for the electrochemical determination of Np seems to be at a concentration of about 10^{-7}M. This is rather high and would require initial Np concentrations of about 10^{-5}M for adsorption experiments (99% adsorption would produce supernatant concentrations at the detection limit). This concentration level is close to the allowed alpha activity level in the Stanford lab. Therefore, other analytical techniques such as liquid scintillation counting are being evaluated. Preliminary experiments show that it is possible to measure ^{237}Np concentrations down to 2 X 10^{-8}M. One problem posed is the daughter product ^{233}Pa, which emits electrons with energies up to 568 kev; these can interfere with the alpha particles emitted by ^{237}Np. In addition to the detection limit advantage, samples for liquid scintillation counting can be prepared quickly and easily, and counting is very simple and automated.

Numerous administrative quality assurance procedures were reviewed this month, with responses forwarded to the Quality Assurance Support Staff.

The status of the detailed procedures that have been re-written according to TWS-QAS-QP 5.2, R1 follows.

PROCEDURE #	TITLE	STATUS
TWS-INC-DP-05	Sorption, Desorption Ratio Determination of Geologic Materials by a Batch Method	In internal review
TWS-INC-DP-35	pH Measurement	Implemented
TWS-INC-DP-62	Bulk NTS Well Water Samples	Implemented
TWS-INC-DP-63	Preparation of NTS Core Samples for Crushed Rock Experiments	Implemented
TWS-INC-DP-79	Liquid Scintillation Counting of Samples	Completed and forwarded to the INC QAL

PLANNED WORK:

Continue the study of the influence of water/rock ratios on sorption coefficient values.

Continue the study of sorption mechanisms for important radionuclides.

Complete rewriting the detailed technical procedures.

Evaluate the purity of pure minerals on hand and develop new purification procedures as required.

Continue work on surface complexation strategies for natural minerals found in the Yucca Mountain site.

Continue work on the physical and chemical characterization of solid materials for sorption studies.

Continue the study of Am and Np sorptive behavior on selected tuff and pure minerals.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
Ines R. Triay and Robert S. Rundberg	Deconvolution of Multivalent Cation-Exchange Isotherms	Journal article	Accepted by the *Journal of Physical Chemistry*
Ines R. Triay and Robert S. Rundberg	Application of Deconvolution to the Analysis of Univalent Ion-Exchange Isotherms in Zeolites X and Y	Journal article	Submitted to *Zeolites*

MILESTONE STATUS:

Milestone	Date Due	Description or title	Status
T419	5/15/88	Position Paper on NNWSI Sorption Studies and Data Needs	Being revised after technical reviews requested by Project Office.
R505	9/30/88	Summary Report: Sorption of Nickel and Neptunium in Tuff Using Ground Waters of Different Composition	Revision sent to Project Office 2/17.
R720	9/30/88	Report on Deconvolution of Ion-Exchange Isotherms	Revision sent to Project Office 2/17.

WBS: 2.3.4.1.6.A
Project Title: Dynamic Transport Process
Principal Investigator: R. Rundberg

The objectives of the dynamic transport process task are to determine the rate of radionuclide movement along the potential flow paths to the accessible environment and to examine the effect of diffusion, adsorption, dispersion, anion exclusion, sorption kinetics, and colloid movements in the flow geometries and hydrologic conditions that are expected to exist along the flow path to the accessible environment in the scenarios to be used for performance assessment.

ACTIVITIES AND ACCOMPLISHMENTS:

We are continuing our study using Calico Hills and Topopah solid rock columns to investigate Yucca Mountain's ability to act as a natural filter for particulate matter. For these studies, we utilize two columns made of the Calico Hills tuff G4-1502 and two columns made of Topopah tuff GU3-1119, and duplicate experiments will be effected. Last month, we reported the first tritium elution for the columns. This month, we initiated the duplicate tritium study for each of the columns, and these results will be reported next month.

The study of the sorption of radionuclides as a function of time using beakers made of Yucca Mountain tuffs is still in progress (see schedule given on February's monthly report).

We continue our efforts to obtain pure minerals for transport and sorption work.

We have continued the purification of clinoptilolite from Castle Creek, Idaho, and have managed to purify a total of 60 g.

S. Chipera and D. Bish have analyzed the pure minerals that were sent for crystallographic analysis. The results can be found under WBS 2.3.4.1.5.A.

To continue our efforts to determine the size of colloids using Autocorrelation Photon Spectroscopy (APS), we have decided to validate our system. Validation of the APS technique will be effected by measuring single-sized particles as well as mixtures of particles of different sizes using National Bureau of Standards standards and ultrapure water. This involves sub-boiling distillization of millipore water. To this effect, we have fabricated and cleaned stills, and we have also cleaned storage containers and the clean room area. To date, we have collected 3 liters of ultrapure water.

The status of the detailed procedures that have been re-written according to TWS-QAS-QP 5.2, R1 follow.

PROCEDURE #	TITLE	STATUS
TWS-INC-DP-15	Crushed Rock Column Studies	implemented
TWS-INC-DP-60	Preparation of NTS Samples for LANL YMP Solid Core Experiments	implemented
TWS-INC-DP-61	Solid Rock Column Experiment	implemented
TWS-INC-DP-64	Gamma Counting of Samples for Dynamic Transport (Perkin Elmer Model 9000 Robot)	completed and given to the INC QAL
TWS-INC-DP-66	Saturated Diffusion Cell Experiment	implemented
TWS-INC-DP-67	Rock Beaker Experiment	implemented
TWS-INC-DP-68	NTS Fracture Core Experiments	implemented
TWS-INC-DP-69	Operation of SPEX Fluorometer Model 222	implemented
TWS-INC-DP-75	Determination of Particle Size Distribution by Autocorrelation Photon Spectroscopy	in internal review

Along with other participants of the Los Alamos Yucca Mountain Project (YMP), we interviewed two applicants for the position of INC quality assurance liaison (QAL).

I. Triay went to the Yucca Mountain Project Office to obtain a list of surplus equipment available for utilization by the Los Alamos participants. I. Triay, A. Mitchell, and M. Ott prepared a list of all the equipment that the participants of the INC YMP desire. This list was sent to the Project Office by D. Broxton.

We submitted two proposals to the Los Alamos YMP program office for the collection of J-13 well water and surface rocks from Calico Hills and Busted Butte areas.

PLANNED WORK:

Continue solid rock column experiments.

Continue rock beakers experiment.

Continue our efforts to obtain pure minerals.

Continue our work with colloids using APS.

PROBLEM AREAS:

The APS system cannot be operated until the cooling system is moved to the basement of TA-48 RC-1.

BIBLIOGRAPHY:

Author(s)	Title	Type of Publication	Status
A. J. Mitchell, R. S. Rundberg, M. A. Ott, and I. R. Triay	Instrumentation and Operation of an Autocorrelated Photon Spectrometer Used for Particle Size Determinations	Abstract for 198th National Meeting of the American Chemical Society, Miami, FL, September 10-15, 1989	Submitted to Project Office 4/17/89.
M. A. Ott, R. S. Rundberg, and I. R. Triay	Mechanical Manipulation of Intact Tuffaceous Rock to Fabricate and Assemble Solid Rock Columns and Rock Beakers	Abstract for 198th National Meeting of American Chemical Society	Submitted to Project Office 4/17/89.
I. R. Triay, R.S. Rundberg, A.J. Mitchell, and M. A. Ott	Utilization of Inversion Techniques for Particle Size Determinations Using Auto-correlation Photon Spectroscopy	Abstract for 198th National Meeting of the American Chemical Society	Submitted to Project Office 4/17/89.
R. S. Rundberg, A. J. Mitchell, M. A. Ott, J. L. Thompson and I. R. Triay	Laboratory Studies of Radio-nuclide Migration in Tuff	Abstract for FOCUS 89, Nuclear Waste Isolation in the Unsaturated Zone, Las Vegas, NV, September 1989.	Received Project Office Approval 4/28/89.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R743	8/16/88	Dynamic Transport of Colloidal Tracers through Fractured Tuff: 0.10- to 9.55-μm-Diameter Carboxylated Polystyrene Spheres	Revision based on Project Office review sent to Project Office 12/7/88.
T420	3/31/89	Summary of RNM Work That Would Benefit or Compliment NNWSI Radionuclide Transport Work	Submitted to INC QAL.

WBS: 2.3.4.1.7.A
Project Title: Retardation Sensitivity Analysis
Principal Investigator: K. Eggert

The objectives of the retardation sensitivity analysis task are to construct a geochemical/geophysical model of Yucca Mountain and to use this model to examine the physical and chemical controls on radionuclide transport along flow paths to the accessible environment.

ACTIVITIES AND ACCOMPLISHMENTS:

Analysis of Physical/Chemical Processes

FEHMN/FEHMSN. A multiple tracer capability and a reactive tracer capability were installed in FEHMN. G. Zyvoloski wrote an interface for 3-D graphics output.

E. Nuttall tested the 1-D version of MOL against the analytical solution for a column problem with adsorption and desorption. He found that MOL1D was unsatisfactory for the solution of a square wave input. He is continuing to investigate this problem and is working on the N-D version as well.

Geochemical/Geophysical Model

Team members met with Kathy Campbell to discuss setting up a 3-D grid for a forward calculation of radionuclide transport from the repository to the water table. Available minerology and sorption data will be used to perform sensitivity analyses of the geochemical processes that might occur at the site. The grid will be based on a 3-D model of the hydrological stratigraphy at Yucca Mountain developed by Sandia (Ortiz et al., 1985).

Transport Models and Related Support

TRACRN was modified (basically converted to double precision) to run on the SUN computers. The five test problems from the User's Manual were run. The output files matched those from the CRAY computer to three significant figures (all that are printed).

G. Zyvoloski installed a matrix-solving routine in the FRACNET code. FRACNET is used for the C-Wells task.

Quality Assurance (QA) and Programmatic

K. Birdsell attended an INTRAVAL meeting for U. S. INTRAVAL participants in Washington, D. C., April 11-12. Modeling progress and experimental results were presented for the three field-scale experiments in unsaturated media.

A review comment meeting on the performance assessment strategy plan was held in Las Vegas. Written comments on documents were submitted to J. Younker.

Retardation Sensitivity Analysis plans were discussed with the performance assessment Technical Integration Group.

Work was continued on the verification and validation plan for FEHMN. A verification structure was set up in FEHMN for comparing FEHMN solutions to analytical solutions.

Certification forms for all our group were completed for 1989. They will be sent to the Records Processing Center as soon as an issue is resolved regarding possible privacy act conflict.

PLANNED WORK:

Analysis of Physical/Chemical Processes

FEHMN/FEHMSN. G. Zyvoloski will install an unsaturated zone heat transfer model and a 3-degree-of-freedom adaptive solver in FEHMN.

QA and Programmatic

A User Manual update for FEHMN will be written.

Purchase request documentation and file will be completed.

MILESTONE PROGRESS:

Milestone T421 - YMPO/SAIC management and quality assurance reviews were received for the TRACRN Manual. The comments are being addressed, accession numbers for the references are being gathered, and a revised version of the report will be sent to the Los Alamos Program Office by May 10th.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R346	3/31/87	FEHMS: A Finite Element Heat-Mass-Stress Code for Coupled Geological Processes	Revision sent to Project Office 4/4/89.
R343	5/1/87	Preliminary Geochemical/Geophysical Model of Yucca Mountain	Revision sent to Project Office 1/9/89.
R749	7/30/88	Results of the COVE2a Benchmarking Calculations Run with TRACR3D	Revision sent to Project Office 12/9/88.
T421	12/15/88	TRACR3D Documentation for Baseline-review.	Being revised after Project Office review (see above).
T422	12/30/88	Interim Report: Sorption Characteristics of Sorbing Tracers Using TRANQL/MINEQ	Being revised after policy review.
T424	12/30/88	Particulate Transport	Submitted to Project Office 2/24/89.

WBS: 2.3.4.1.8.A
Project Title: Reactive Tracer Testing
Principal Investigator: E. Springer

Experiments will be conducted at the C-well complex (holes UE25c#1, UE25c#2, and UE25c#3) and in other wells in the vicinity of Yucca Mountain. Reactive tracers will be used to characterize retardation and transport properties on a scale larger than that currently used in laboratory experiments.

ACTIVITIES AND ACCOMPLISHMENTS:

Primary emphasis continues to be on completing detailed procedures (DPs). A total of 15 out of 21 DPs have been approved. The equilibrium and kinetics batch procedures are in comment resolution and will be completed soon. The four remaining DPs will require development in conjunction with new instrumentation that has been received, so these will not be completed until sometime in July.

Analyses of sorption data, from lithium experiments conducted using Prow Pass tuff from hole UE25p#1 by nonlinear least-squares techniques, have revealed differences in coefficient and exponent values from previous analyses using a transformation to linearize the various sorption expressions. The approach with the nonlinear least-squares technique will be continued to determine the effects in column experiments.

The FEHMN computer code continues to be baselined with verification runs. An analytical solution to three-dimensional heat flow in a cube is being used to test the heat transport portion of the code. Also, this problem allows the irregular-shaped elements feature to be tested by running the same problem with different element shapes and sizes. Initial simulations have closely matched the analytical solution. The dual porosity feature has been debugged, and preliminary testing has been done. The mass transport component has been modified in two ways: 1) several tracers can be simulated simultaneously without having to rerun the heat and mass transfer solutions for each tracer; and 2) equilibrium adsorption characterized by the linear, Langmuir, Freundlich, and modified Freundlich isotherms has been implemented.

A modification to the FRACNET code was explored during this month to increase the efficiency of the code. A direct system solver that uses incomplete factorization and conjugate gradient techniques was tried in place of the current successive overrelaxation (SOR) approach. Results indicated that the new solver was superior to the SOR approach, and this solver will be implemented into FRACNET. A new version of the code will be released.

PLANNED ACTIVITIES:

Complete the two remaining DPs and purchase individual minerals for new experiments.

Develop four new DPs with new instrumentation.

Continue to test the FEHMN code and implement improvements.

Make necessary changes to FRACNET and modify documentation as needed. Prepare for column experiments by conducting simulations with the SORBEQ code.

PROBLEM AREAS:

None.

BIBLIOGRAPHY:

Author	Title	Type of Publication	Status
H. Fuentes, W. Polzer, E. Essington, and B. Newman	Characterization of Reactive Tracer for C-well Field Experiments I: Electrostatic Sorption Mechanism, Lithium	LA-series report	Editing

MILESTONE PROGRESS:

No milestones are due in the next three months.

Milestone	Date Due	Description or title	Status
R397	3/31/87	Reactive Tracer Experiments in the C-Wells and Other Wells in the Yucca Mountain Vicinity	Submitted to Project Office 2/16/89.
T426	9/1/88	FRACNET - Fracture Network Model for Water Flow and Solute Transport	Being revised after Project Office review.

WBS 2.3.4.1.9.A
Project Title: Biological Sorption and Transport
Principal Investigator: L. Hersman

The purpose of this research is to determine whether microbial activity can influence the movement of plutonium in tuff. Because fluids are used extensively in the exploration of locations for a nuclear repository, of special interest are those microorganisms capable of utilizing drilling fluids as growth substrates.

ACTIVITIES AND ACCOMPLISHMENTS:

Studies have continued on the interaction of microorganisms and colloids, as measured by light microscopy. Because of the inability of the image analysis system to distinguish between microorganisms and colloidal particles, experiments were conducted using cell-free spent medium. Spent medium is medium, such as nutrient broth, in which microorganisms have been cultured and then removed by filtration and that contains all the metabolic by-products of the microorganisms. The purpose of the experiment was to determine if these metabolic by-products influence the agglomeration rate of clay colloids. Early results suggest that in spent medium, colloidal agglomeration is accelerated.

PLANNED WORK:

Colloidal agglomeration will continue to be studied. In addition, chelation experiments will be directed towards determining a formation constant with plutonium-239.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
T427	12/30/88	Chelation: Progress Report	Being revised after N-5 review.

WBS: 2.3.4.1.11.A
Project Title: Geochemical Field Tests for Validation
Principal Investigator: J. A. Canepa

The purpose of this activity is to test the validity of the laboratory geochemistry data generated by the Geochemistry Test Program and to test the geochemical transport modules. Five subtasks constitute this activity: 1) natural analogs, 2) large block test, 3) caisson test, 4) unsaturated zone geochemistry field test, and 5) radionuclide migration studies at the Nevada Test Site.

ACTIVITIES AND ACCOMPLISHMENTS:

Subcontract support staff attended a meeting with the Technical Integration Group (TIG) to discuss performance assessment and discuss modeling capabilities and field test recommendations. The subcontract support staff provided the final report of Task I, a literature search and an evaluation of field test capabilities in unsaturated media. They also provided two letters assessing possibilities for surface facilities (adits) and an analysis of the need to test in the Calico Hills unit. This work is in support of developing a field test design and eventually a study plan. A Level III report on field testing possibilities at the NTS was completed. This information is being evaluated for inclusion in the study plan.

WBS: 2.3.4.2.1.A
Project Title: Fracture Mineralogy
Principal Investigator: B. Carlos

The purpose of this task is to study fracture-lining minerals and their paragenesis to (1) assess the role of fractures as transport pathways during past alteration, (2) determine the conditions under which various minerals were deposited, (3) determine the nature of fracture surfaces along possible transport pathways, and (4) evaluate the occurrence of potentially hazardous minerals in the intervals to be mined.

ACTIVITIES AND ACCOMPLISHMENTS:

Developing and implementing a qualified quality assurance (QA) program continues to be top priority. We are emphasizing writing, reviewing, and training in various QA Program Plans (QAPPs) and Detailed Procedures (DPs).

Work on manganese oxide minerals continues on several fronts. A fracture coating from a 3185 ft depth in UE25 b1h that was previously reported to be todorokite was re-examined by x-ray diffraction and a scanning electron microscope and identified as lithiophorite. Reflected light petrography suggests the presence of two extremely fine-grained oxide minerals intergrown with calcite in the sample. Electron microanalyses will be attempted to help identify the phases.

The standards used in electron microprobe analysis of manganese minerals are gradually being replaced with QA certified standards, and results using the new standards are being compared with results using the previous standards. Work has resumed on the manganese oxides in the Tiva Canyon Member of the Paintbrush Tuff in USW G-4.

PLANNED WORK:

Work toward developing a qualified QA program will continue.

Analysis of the fracture-coating manganese oxides in the Tiva Canyon Member in USW G-4 will continue over the next few months.

Examination and analysis of fracture-coating minerals in the Topopah Spring Member in USW G-1, G-2, and GU-3 will continue as time and sample availability allow.

PROBLEM AREAS:

As reported last month, unavailability of existing core for examination or sampling is again beginning to impact this activity. With the postponement of new drilling, the existing core becomes increasingly important to our understanding of the distribution and chemistry of fracture-coating minerals at Yucca Mountain. No samples have been authorized for over three years, and QA qualified procedures are not yet in place to allow authorization and distribution of existing core.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
R623	6/30/89	Manganese Oxide Minerals in the Crater Flat Tuff in USW G-4.	Writing 90% complete.

WBS: 2.3.4.2.2.A
Project Title: Alteration History
Principal Investigator: S. Levy

The objective of the alteration history task is to characterize past and present natural alteration processes that have affected the potential geologic repository and to predict future effects of natural and repository-induced alteration.

ACTIVITIES AND ACCOMPLISHMENTS:

Quality assurance (QA) continued to be a top priority. Training for the procedure for submittal of design input for the Exploratory Shaft Facility (QP- 03.14, RO) was accomplished and certified. Drafts of the procedures for control of measuring and test equipment and for interface control were reviewed. Review comments for the interface control procedure expressed concern that the procedure, as written, has the potential to obstruct exchange of data in cooperative research projects involving Los Alamos and the U. S. Geological Survey (USGS). It was suggested that clarification or changes be made to address this concern.

Four revised quality procedures were also re-reviewed. The technical procedure for operation of the scanning electron microscope and associated x-ray analysis system is in technical review. Informal comments were provided for the exploratory shaft (ES) muck-sampling procedure.

The write-up for the Trench 14 stop of the 1989 Geological Society of America field trip guide to the Nevada Test Site (NTS) underwent major revision following USGS review. The revision provided an opportunity to update information on secondary mineral occurrences.

We have begun applying the criteria for graded QA to the alteration history study plan.

The heating stage on the x-ray diffractometer is being used to study heating effects on the crystal lattice dimensions of commercially obtained zeolites.

PLANNED WORK:

A trip to NTS is tentatively planned for May to examine alteration features in Topopah Spring tuff outcrops with U. S. Bureau of Reclamation personnel. The objective is to acquaint ES-mapping personnel with a full variety of alteration features that may be encountered in the ES.

We are planning to invite Kevin Crowley, of Miami University at Oxford, Ohio, to come to Los Alamos on June 6 for a presentation on the use of fission-track annealing studies in reconstructing the thermal history of an area.

PROBLEM AREAS:

None.

MILESTONE PROGRESS:

Work on milestone reports has been delayed to redirect effort toward achieving a fully-qualified QA program.

WBS: 2.3.4.2.3.A
Project Title: Mineralogy of Transport Pathways
Principal Investigator: D. Vaniman

The purpose of this activity is to define the important mineralogic and geochemical variables along transport pathways at Yucca Mountain in support of performance assessment and to evaluate the impact of repository construction on natural waste transport barriers.

ACTIVITIES AND ACCOMPLISHMENTS:

A level-III progress report (TWS-ESS-1-4-89-17) was completed on the study of trace minerals in Yucca Mountain tuffs. This report summarizes the x-ray diffraction analysis of a heavy-mineral separate from the devitrified Topopah Spring Member; Mossbauer studies of this separate and of bulk samples from the altered zone above the basal Topopah vitrophyre and from the vitrophyre; and scanning electron microscope image analysis of oxide microphenocrysts. Results confirm earlier studies, which indicate that although the Yucca Mountain tuffs are generally oxidized, ferrous iron is retained in the glassy tuff samples above the water table (particularly in the lower Topopah vitrophyre). Also, in terms of mineral surface characteristics that may affect sorption, the oxide microphenocrysts in the Topopah Spring Member tend to be rimmed by Mn-rich minerals.

Petrographic and chemical analysis of devitrified Topopah Spring Member samples for the Exploratory Shaft mineralogy-petrology test is in progress; all data should be complete by mid-Summer. These data will be analyzed statistically to determine the necessary sample size and sampling density to adequately characterize the rock mass to be excavated during shaft and drift construction.

The sample identification and control procedure for mineralogy-petrology studies has been revised following review. Final concurrence of affected personnel will be obtained before it is issued.

Work continued on an evaluation of revised x-ray diffraction data. These data will be used to generate simulations of mineralogic composition of Yucca Mountain tuffs for use in TRACR3D.

PLANNED WORK:

Continue work on quality assurance (QA) program development.

Develop Exploratory Shaft Sampling plan using data from the Solitario Canyon outcrop.

Evaluate revised x-ray diffraction data using multivariate methods.

Work on image analysis methods for texture and trace-mineral analysis.

Develop statistical methods, especially tools for handling compositional data.

Simulate spatial distribution of compositional data for use in transport models such as TRACR3D.

PROBLEM AREAS:

Milestone progress in FY89 will continue to be delayed while effort is concentrated on revision of QA procedures and preparation of new procedures.

BIBLIOGRAPHY:

Author	Title	Type of Publication	Status
K. Campbell	Sampling for Site Characterization of a Potential Waste Repository	journal (to be determined)	Being revised following internal review.
K. Campbell	Statistical Guidelines for Planning a Limited Drilling Program	Article for journal (to be determined)	In technical review.

MILESTONE PROGRESS:

Milestone	Date Due	Description or title	Status
T095	11/30/88	Image Analysis Study of the Topopah Spring Member	Being revised after Project Office review.
T433	delayed	XRD Analysis of Batch Sorption Samples	At Project Office for review.
T469	2/28/89	The Occurrence and Distribution of Erionite at Yucca Mountain, Nevada	At Project Office for review.

WBS: 2.5.2.2.A
Project Title: Regulatory and Institutional
Principal Investigator: J. A. Canepa

The purpose of this task is to coordinate the regulatory and institutional Project requirements within the Los Alamos programmatic structure. The focus of this coordination effort is on the integration of the technical work within the regulatory and institutional framework.

ACTIVITIES AND ACCOMPLISHMENTS:

Site Characterization Plan

No action required this month.

Semi-annual Progress Report (SPR)

A working meeting was held in Las Vegas, NV at Scientific Applications International Corporation to prepare the SPR. Guidance was presented by DOE/HQ for the preparation. Los Alamos submitted text on Section 8.3.1.3, 8.3.1.2, and 8.3.1.5 for the SPR.

Study Plans

The status of the study plans is as follows.

Water Movement Test, R3 (8.3.1.2.2.2). Submitted to Yucca Mountain Project Office (Project Office) 1/6/89. Approved by Project Office and Department of Energy Headquarters (DOE/HQ); sent to Nuclear Regulatory Commission (NRC) and State of Nevada.

Diffusion Test, R0 (8.3.1.2.2.5). Submitted to Project Office 11/1/88. Project Office AP-1.10Q review comments received. Submitted to DOE/HQ (4/18/89).

Testing of the C-Hole Sites With Reactive Tracers, R1 (8.3.1.2.3.1.7). Completed revision based on Project Office and DOE/HQ comments. Submitted to DOE/HQ (2/16/89).

Mineralogy, Petrology, and Chemistry of Transport Pathways, R2 (8.3.1.3.2.1). Project Office AP-1.10Q review comments received (4/14/89).

History of Mineralogy and Geochemical Alteration at Yucca Mountain, R0 (8.3.1.3.2.2). Submitted to Project Office 11/02/88. On 1/23/89, information copies of abstract and quality assurance appendix submitted to Project Office so AP-1.10Q review could proceed (1/25/89). LANL received a draft copy of DOE/HQ comments. A comment resolution meeting is scheduled for May 30, 1989.

Kinetics and Thermodynamics of Mineral Evolution and Conceptual Model of Mineral Evolution, R0 (8.3.1.3.3.2; 8.3.1.3.3.3). Submitted to Project Office 2/23/89. Undergoing Project Office AP-1.10Q review (3/14/89). Study plan submitted to DOE/HQ for review 3/14/89.

Sorption Studies and Sorption Modeling, R0 (8.3.1.3.4.1; 8.3.1.3.4.3). Submitted to Project Office 1/4/89. Undergoing Project Office AP-1.10Q review (1/30/89).

Biological Sorption and Transport, R0 (8.3.1.3.4.2). Submitted to Project Office 12/12/88. Project Office screening review comments received 3/9/89. Author resolving comments.

Dissolved Species Concentration Limits, and Colloid Formation and Stability, R0 (8.3.1.3.5.1; 8.3.1.3.5.2). Undergoing Los Alamos QP-07 technical review.

Dynamic Transport Column Experiments, R0 (8.3.1.3.6.1). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Diffusion, R0 (8.3.1.3.6.2). Los Alamos policy review complete. Study plan revised on basis of policy review comments; back at N-5 for final approval.

Probability of Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.1). Submitted to Project Office 3/29/89. The study plan is currently undergoing Project Office AP-1.10Q review (4/27/89). Submitted to DOE/HQ (4/19/89).

Effects of a Volcanic Eruption Penetrating the Repository, R0 (8.3.1.8.1.2). In preparation.

Characterization of Volcanic Features, R0 (8.3.1.8.5.1). Submitted to Project Office 12/14/88. Undergoing Project Office AP-1.10Q review (1/25/89).

Retardation Sensitivity Analysis, R0 (8.3.1.3.7.1). Submitted to Project Office 12/14/88. Undergoing Project Office AP-1.10Q review (2/8/89). Information copy of abstract submitted to Project Office 2/16/89. Study plan submitted to DOE/HQ for review 3/6/89.

Ground Water Chemistry Modeling, R0 (8.3.1.3.1.1). In preparation.

WBS: 2.6.A
Project Title: Exploratory Shaft Management and Planning
Principal Investigator: H. Kalia

These exploratory shaft (ES) tasks will address the issues and information needs associated with the feasibility of storing high-level nuclear waste in a geologic repository at Yucca Mountain.

ACTIVITIES AND ACCOMPLISHMENTS:

We continue to support the updating of the Subsystem Design System Requirements Document (SDRD). Several hundred comments on the SDRD Benchmark 4 were resolved, and Benchmark 5 was prepared.

We continue to support activities to prepare network logic for testing activities that lead to the start of the shaft sinking and to extend the logic to the end of FY 1995.

Sample logic networks were provided to the U. S. Geological Survey (USGS) and Sandia for their Exploratory Shaft Facility (ESF) tests for informal review. Additional networks are being prepared to complete required networks for the ESF tests.

We prepared a revised and updated schedule for prototype testing. A detailed preliminary logic network has been prepared and is being coordinated with Edgertown, Germeshausen & Grier, Inc., for finalization.

We scheduled readiness reviews for prototype tests.

We continued collecting data for prototype tests with the Engineered Barrier test and Drill Hole Instrumentation test, and we resumed overcoring for the diffusion test. Solute injection monitoring at DH #2 of diffusion tests is also continuing.

Effort is continuing on obtaining test procedures for the planned ESF tests.

We participated in site coordination meetings.

We participated in Work Integration Team 4 (WIT 4) and Project meetings on ESF construction.

We supported ESF budget validation weekly meetings and developed information in support of Schedule 47 budget validation for the Integrated Data System.

We completed the budget for WBS 1991.

Quality assurance (QA) procedures QP 3.14, R0 and QP 0.3.15, R0 were approved for use by N-5.

We participated in ESF construction readiness review activities.

We provided annotated outline for Test Descriptions Document to the Liaison Principal Investigators for comments.

PLANNED WORK:

Resources will be provided to ensure that QA-related documents are developed to fully qualify the QA program.

Los Alamos will continue to update Appendix B and prepare required engineering change requests as required.

Work will continue to update Appendix C, drilling requirements.

Work will continue on preparing logic networks, the power study, the site population study, and the long-range plan.

Work will continue on updating the prototype testing budget and schedule.

Work will continue to schedule readiness reviews for prototype tests.

Work will be started for the preparation of ESF Test Description Document.

Work will be initiated to develop the outline for prototype testing reports and to schedule for the preparation of the report.

We will continue to participate in and support the WIT 4 process.

We will continue to participate in ESF readiness review meetings, site coordination meetings, and ESF design integration meetings.

PROBLEM AREAS:

None.

WBS: 2.6.9.2.4.A
Project Title: Geochemical Testing
Principal Investigator: A. E. Norris

Two geochemical tests have been proposed as part of the site characterization work associated with the construction of the exploratory shaft (ES). One is the measurement of the rate of water movement through the unsaturated zone as traced by chlorine-36. The second is the measurement of effective diffusivity coefficients under in situ conditions in two of the tuffs that will be penetrated by the ES. The data from both tests will be used in assessing the suitability of the Yucca Mountain site for a nuclear waste repository.

ACTIVITIES AND ACCOMPLISHMENTS:

A prototype diffusion test is being performed to develop the techniques necessary for the ES diffusion test. The initial attempt at overcoring the prototype diffusion test site in nonwelded tuff at the Nevada Test

Site's G-Tunnel showed that the equipment available for the work was not capable of doing the job. An addendum to the prototype test criteria letter was completed this month specifying the requirements for continuing the overcoring. Fenix & Scisson assigned David Wunderly to prepare a drilling program for the additional G-Tunnel work. He circulated a draft of the drilling program for comment, and the final version should be completed early in May.

Work by David Mann at Los Alamos to section a piece of 12-in. diam core of welded tuff, as part of the prototype work, continued this month, following delivery of a 36-in. diam, diamond-impregnated saw blade. The motor speed was determined to be too fast for adequate cooling of this blade when it was used to complete the cut started with the 24-in. diam blade. The new motor on order for the rock saw is expected to make sectioning of large-diameter welded tuff cores possible without the use of lubricating fluids.

The Yucca Mountain Project Office sent the ES diffusion test study plan to headquarters for review. The principal investigator of this task reviewed the exploratory shaft facility's (ESF) Integrated Data System Functional Requirements Document, Rev. A. He participated in the ES Test Coordination meeting on April 13 and responded to H. N. Kalia's request for comments on the outline for the proposed ESF Test Descriptions Document.

PLANNED WORK:

Efforts will continue to prepare all the needed documents and to procure the necessary equipment on a timely basis for completion of the G-Tunnel portion of the prototype diffusion test.

MILESTONE PROGRESS:

No level II milestones are scheduled. Level III milestones are on schedule.

WBS: 2.6.9.3.A
Project Title: Exploratory Shaft Integrated Data System
Principal Investigator: R. Crowley

The integrated data system (IDS) is part of the supporting facilities for the Exploratory Shaft Facility (ESF). The IDS supports the data acquisition needs of the ESF test program by providing a central facility to automatically measure and control aspects of the ESF tests. The primary purpose of the IDS is to assist the principal investigators (PIs) in acquiring high-quality test data in a uniform, controlled fashion and to transfer those data to the PIs' organizations for data management and analysis.

ACTIVITIES AND ACCOMPLISHMENTS:

We continued to develop a quality assurance (QA) procedure for IDS Design Interface.

We prepared input for the Subsystem Design Requirements Document for IDS.

Work continued on the development of the IDS Functional Requirements Document.

We continued developing documents for the configuration management of the IDS.

Work continued to develop a contract document for Edgertown, Germeshausen & Grier, Inc., (EG&G) support for the IDS.

We continued preparing software QA procedures, which require significant effort to develop.

Work continued on developing Technical Interface Procedures to identify how the IDS interfaces with PIs and other users, such as the Department of Energy/Yucca Mountain Project (DOE/YMP), Science Applications International Corporation, Architect/Engineer, etc.

A liaison for the coordination of IDS design development work to support the participating organization was identified.

PLANNED WORK:

Work will continue to complete EG&G procedures for a fully qualified QA program.

Resources will be diverted to develop documentation to obtain DOE authorization to start Title II-Phase 1A design effort as soon as the required procedures have been developed and accepted.

Work will continue to develop the Functional Requirements Document for the IDS design.

Work will continue to finalize a contract document for EG&G.

Work will continue to develop procedures for software, IDS requirements plan, interface procedures, and facilities requirements.

Work will continue on preparation of the IDS Configuration Management Plan, Data Interface Documents, and Hardware Configuration Plan.

Work will continue on obtaining information from the PIs for the design of the IDS.

Meetings will be scheduled with PIs to discuss IDS design-related input.

PROBLEM AREAS:

None.

WBS: 2.9.1.4.A
Project Title: Records Management
Principal Investigator: G. Ortiz

The objective of this task is to manage records and documents related to the licensing of a geologic repository for the disposal of high-level radioactive waste. The requirements are to support the development, implementation, and maintenance of a comprehensive, automated, and integrated information management system.

ACTIVITIES AND ACCOMPLISHMENTS:

Quality Procedures TWS-QAS-QP-17.1,RO (Procedure for Group Resident Files) and TWS-QAS-QP-17.2,RO (Procedure for Records Processing Center) have been revised and are currently being reviewed to comply with revised administrative procedure AP.1.7Q. rev 1.

On April 19, G. Ortiz explained to A. Pendergrass and K. Foster how records are logged, inspected, prepared, and shipped to the Central Records Facility through the Records Processing Center (RPC).

The Los Alamos RPC is linked to the Projects Records Information System (RIS) VAX computer, which is currently used to search the RIS to find the index of the documents desired. This system will decrease the turnaround time for obtaining accession numbers for references that have been entered into the system. Several groups have requested on-line access to this information: a user must have a valid username and password to access the VAX computer.

PROBLEM AREAS:

None.

PLANNED WORK:

H. Nitsche and S. Carpenter from Lawrence Berkeley Laboratory are scheduled to be in Los Alamos on May 24 to transfer a turnover package to the RPC.

WBS: 2.9.3.A
Project Title: Quality Assurance
Principal Investigator: H. P. Nunes

The Quality Assurance Program provides quality assurance support to Los Alamos Yucca Mountain Project (YMP) participants. This support is designed to ensure that the YMP efforts of Los Alamos will provide admissible data and evidence for the repository licensing process.

ACTIVITIES AND ACCOMPLISHMENTS:

The annual staff recertification was delayed to May 12 in keeping with the training schedule to allow sufficient time for the formal documentation to be completed.

The biweekly Los Alamos (LANL) meetings to achieve a qualified quality assurance (QA) Program continued. The quality procedure revisions (38 total) are on schedule: 27 have been completed and issued, 9 are in the review comment resolution cycle, and 2 are in the draft stage. All procedures that require formal training before the start of the Title II Design Efforts have been issued. Four procedures remain to be issued that have some impact on the Title II effort. Three formal training modules will be prepared to support the final LANL training for the remaining procedures that are currently being developed.

The effort at Edgerton, Germeshausen & Grier (EG&G) shifted during the past month to revising the EG&G QA Program Plan. This effort was caused by a Project Office directive to prepare a QA Plan for the Integrated Data System (IDS) that was directly traceable to the YMP QA Plan/88-9, R2. EG&G has been directed to revise their program plan, prepare the needed revisions, and submit them along with the appropriate QA Plan/ 88-9, R2 checklist. Additional direction was provided to ensure that the resulting internal implementing procedures will be compatible with the program plan.

The LANL QAS have developed implementing procedure checklists based on the approved Quality Assurance Program Plan (QAPP) QAPP, R4.3. These checklists are used to evaluate the completed implementing procedures, assuring ourselves that all procedures reflect the necessary requirements of the approved QAPP.

PLANNED WORK:

Completion of all QA implementing procedures and associated training.

PROBLEM AREAS:

Delays in the approval of the software QA plan and associated implementing procedures are expected.

TECHNICAL DATA MANAGEMENT SYSTEM SUBMITTAL RECORD

N-AD 035
11/86

TITLE OF DOCUMENT	DESCRIPTION OF DATA OR INFORMATION	AUTHOR OR PRINCIPAL INVESTIGATOR	DATE PUBLISHED	QUALITY ASSURANCE LEVEL	TECHNICAL DATA MANAGEMENT SYSTEM COMPONENT (INDICATE BY "X")				DATE OF SUBMITTAL
					TRC	SEPDB	IGIS	RIB	
NO DATA WERE	SUBMITTED THIS MONTH								

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR APRIL 1989
RESPONSIBILITY CODE: LANL
28 April 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA M‹ ›AIN PROJECT
MILESTONE WORKSHEET FOR MON...LY STATUS REPORT FOR APRIL 1989
RESPONSIBILITY CODE: LANL
28 April 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.3.4.1.1.A							
Study Plan Approved (Ground Water Chemistry Model)	Clanton	2	T535 (P)	~~17 Apr 89~~	25 Aug 89		Delayed due to QA effort
WBS: 1.2.3.4.3.1.A							
Complete Design of the Exploratory Shaft Water Tracer System	Robson	2	R321 (P)	~~28 Apr 89~~	28 July 89		Technical design complete, design report in draft form

NO. MILESTONES IN THIS SECTION: 2

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR APRIL 1989
RESPONSIBILITY CODE: LANL
28 April 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT
WBS: 1.2.3.3.6.3.A							
Final Drilling and Technology Report	Blanchard	2	T415 (P)	26 May 89	26 MAY 89		ON SCHEDULE IN FINAL EDIT & REVIEW
WBS: 1.2.5.2.2.A							
Submit Draft Geochemistry Test Program Study Plans to YMPO for Review	Blanchard	2	T001 (P)	16 Jun 89	16 Jun 89		ON SCHEDULE
Results of Geochemistry Investigations	Clanton	2	N160 (P)	31 Jul 89	31 Jul 89		LANL PARTICIPATION COMPLETE - MILESTONE ON SCHEDULE

NO. MILESTONES IN THIS SECTION: 3

YUCCA M   AIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR APRIL 1989
RESPONSIBILITY CODE: YMP/LANL
28 April 1989

SIGNIFICANT MILESTONES ACCOMPLISHED SINCE LAST REPORT	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	ACTUAL DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR APRIL 1989
RESPONSIBILITY CODE: YMP/LANL
28 April 1989

SIGNIFICANT MILESTONES OPEN	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

YUCCA MOUNTAIN PROJECT
MILESTONE WORKSHEET FOR MONTHLY STATUS REPORT FOR APRIL 1989
RESPONSIBILITY CODE: YMP/LANL
28 April 1989

KEY MILESTONES UPCOMING - NEXT THREE MONTHS	PROJ RESP	LEV	MILESTONE NUMBERS	PROJ/HQ DATE	FORECAST DATE TO PROJ	PENDING C/SCR #	COMMENT

NO. MILESTONES IN THIS SECTION: 0

ATTACHMENT 1
05/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments

FY89 Milestones - Level 1 Completed as of May 01, 1989

NONE

FY89 Milestones - Level 2 Completed as of May 01, 1989

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
T478	12/15/84		12311A	N-5	Prototype Test Plans, Volume 2 (FY-89 Funded Tests) This milestone is the other part of milestone T435 (Volume 1). The schedulers are incorrectly using M253 for Volume 2. This milestone should not be confused with M105, which is the submission of the prototype test plans for review. M105 is completed. The report entitled 'Prototype Test Plans, Volume 2 (FY-89 Funded Tests)' was completed and sent to the Project Office for policy review on 12/15/88, ref. TWS-N5-12-88-034.
T404	09/28/88		1232312A	ESS-1	Progress Report on Rock-Varnish Work Report entitled 'Progress Report on Rock-Varnish Work' was completed and sent to the Project Office for policy review on 11/16/88, ref. TWS-N5-10-88-046.
T414	02/28/89		123363A	ESS-1	Final Dust Hazard Assessment Report Report entitled 'Evaluation of Dust-Related Health Hazards Associated with Air Coring at G-Tunnel, Nevada Test Site' was completed and sent to the Project Office for review on 04/14/89, ref. TWS-N5-04-89-055.
T415	12/16/88		123363A	ESS-1	Final Drilling and Technology Report The final report draft of the Prototype Air Coring Test was completed and sent to the Project Office on 01/17/89, ref. TWS-ESS-1-1/89-11.
M367	11/17/88		123414A	INC-11	Interim Progress Report on Colloid Stability Report entitled 'Interim Progress Report on Colloid Stability: Voltammetric Studies of the Redox Reactivity of Plutonium (IV) Colloid' was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-033.
P379	11/17/88		123414A	INC-11	Progress Report: Photoacoustic Spectroscopy Methodology (PAS) Report entitled 'Photoacoustic Spectroscopy Methodology' was completed and submitted to the Project Office for policy review on 01/18/89, ref. TWS-N5-01-89-058.
T418	11/30/88		123414A	INC-11	Letter Report: Progress Report on Solubility Measurements Report entitled 'Letter Report: Progress Report on Solubility Measurements' was completed and sent to the Project Office for policy review on 11/28/88, ref. TWS-N5-11-88-069.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description Comments
R505	11/25/88		123415A	INC-7	Summary Report: Sorption of Nickel and Neptunium in Tuff Using Groundwaters of Different Composition Milestone completed on 10/21/88 and the report entitled 'Sorptio of Nickel and Neptunium in Tuff using Groundwaters of Various Compositions' was sent to the Project Office, ref. TWS-N5-10-88-050.
R720	11/01/88		123415A	INC-7	Issue Report on Deconvolution of Ion-Exchange Isotherms Report entitled 'Deconvolution of Ion-Exchange Isotherms' was reviewed, and a copy of the revised paper was sent to the Projec Office on 02/17/89, ref. TWS-N5-02-89-058.
T421	12/15/88		123417A	ESS-5	TRACR3D Documentation for Baselined Version Report entitled 'TRACRN 1.0: A Model of Flow and Transport in Porous Media for the Yucca Mountain Project - Model Description User's Manual' was completed and sent to the Project Office for policy review on 12/12/88, ref. TWS-N5-12-88-032.
T424	02/28/89		123417A	ESS-5	Interim Report: Letter Report on Particulate Transport Report entitled 'Interim Report on Particle Transport' was completed and sent to the Project Office for policy review on 02/24/89, ref. TWS-N5-02-89-072.
T426	11/25/88		123418A	ESS-4	FRACNET - Fracture Network Model For Water Flow and Solute Transport Milestone completed on 10/25/88. A policy review conducted on report entitled 'FRACTNET - Fracture Network Model for Water Flo and Solute Transport', was sent to the Project Office, ref. TWS-N5-10-88-059.
T207	11/30/88		123422A	ESS-1	Dating Zeolitization at Yucca Mountain with Tectonic and Structural Da Report entitled 'Dating Zeolitization at Yucca Mountain with Tectonic and Structural Data' was completed and sent to the Proje Office for policy review on 12/01/88, ref. TWS-N5-12-88-003.
T095	11/30/88		123423A	ESS-1	Issue Report: Statistical Test of Repeatability and Operator Variance on Modal Analysis Report entitled 'Status of Image Analysis Methods to Delineate Stratigraphic Position in the Topopah Spring Member of the Paintbrush Tuff, Yucca Mountain, Nye County, Nevada' was complete and sent to the Project Office for policy review on 12/23/88, ref TWS-N5-12-88-072.
T469	02/28/89		123423A	ESS-1	Issue Report on Erionite Abundances at Yucca Mountain. Report entitled 'The Occurrence and Distribution of Erionite at Yucca Mountain, Nevada' was completed and sent to the Project Office for policy review on 02/14/89, ref. TWS-N5-02-89-045.
R321	12/23/88		123431A	WX-4	Complete Design of the Exploratory Shaft Water Tracer System Demonstrated to H&N use of the equipment and provided drawings tc H&N. No further action is required. This milestone was completec on 03/09/89, ref. TWS-ESS-LV-1-03-89-17.

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	WBS Element	Organization Responsible	Description / Comments
T163	11/30/88		12611A	WX-4	Revised NNWSI 'White Paper' on 'ES Fluids and Materials Usage' Delivery to NNWPO. Report entitled 'Nevada Nuclear Waste Storage Investigations Exploratory Shaft Facility and Materials Evaluation' was completed and sent to the Project Office on 12/15/88, ref. TWS-N5-12/88/043.

ATTACHMENT 1
05/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments

FY89 Level 1 Open Milestone List

NONE

FY89 Level 2 Open Milestone List

New WBS Number 1.2.3

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
M287	09/01/89		1231	ESS1/WX	Compile Draft ES Test Procedures (Construction Phase) Precursor to M651.
R705	06/30/89		1232122	INC-7	Issue Letter Report: Thermodynamics and Kinetics of Phases Important t Silica Activity at Yucca Mountain
N160	07/31/89		12341	N-5	SCP Progress Report: Results of Geochemistry Investigations
T535	04/17/89		123411	HSE-12	Study Plan Approved (Ground Water Chemistry Model)
T416	09/30/89		12354	ESS-1	End Test in GTUF (G-Tunnel Underground Facility) The field phase of Prototype Air-Coring ended 5/5/88 but technical advisement, data collection, and support to other tests requiring air-cored holes (e.g., Diffusion Test, Drill-Hole Instrumentation Test, Cross-Hole Test, and Wet vs. Dry Drilling Test, etc.) are ongoing.

New WBS Number 1.2.5

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
T001	03/15/89		12522	N-5	Submit draft ongoing Geochemistry Test Program Study Plans to WMPO/NV for review. Will be completed when all study plans are submitted to the Projec Office.

New WBS Number 1.2.6

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description / Comments
M667	02/24/89		12684	WX-4	IDS Phase 1 Final Design Issued Review completed.

ATTACHMENT 1
05/01/89

YMP MONTHLY MILESTONE STATUS REPORT

LOS ALAMOS NATIONAL LABORATORY

Number	LANL Proposed Date	CCB Baseline Date	New WBS Element	Organization Responsible	Description Comments
T062	01/10/89		12684	WX-4	IDS Phase 2 Final Design Issued. Delayed due to fully qualified QA program effort.
T436	06/08/88		12684	WX-4	IDS Development System - Status Report #1
T437	06/10/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #1
T438	10/17/88		12684	WX-4	IDS Phase 1 & 2 Facilities - Detailed Requirements
T439	10/17/88		12684	WX-4	IDS Phase 1 Hardware - Interim Design Report
T440	10/17/88		12684	WX-4	IDS Phase 1 Software - Interim Design Report #2
T443	02/01/89		12684	WX-4	IDS Phase 2 Hardware - Interim Design Report
T444	02/01/89		12684	WX-4	IDS Development System - Status Report #2
T445	05/01/89		12684	WX-4	IDS Phase 1 Software - Validation and Verification Report
T446	05/01/89		12684	WX-4	IDS Phase 1 Hardware - Acceptance Test Report
T447	05/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #1
T448	09/01/89		12684	WX-4	IDS Phase 2 Software - Interim Design Report #2

ASSUMPTIONS:
ES start date 11/89
WBS Structure baseline 7/22/86
Prep: 05/01/89
A. Pratt

DISTRIBUTION:
J.A. Canepa, N-5, J521
H.N. Kalia, ESS-1, J900/527
R.L. Byers, N-5, J521
D.T. Oakley, N-5, J521
K.A. West, N-5, J521

LOS ALAMOS NATIONAL LABORATORY
OUTSTANDING PROJECT OFFICE ACTION ITEMS
April 30, 1989

Policy Reviews

1. Milestone R743 report: resubmitted 12/7/88 with response to Project Office review
2. Milestone R749 report: resubmitted 12/9/88 with response to Project Office review
3. Milestone R343 report: resubmitted 1/9/89 with response to Project Office review
4. Milestone P379 report: resubmitted 1/18/89
5. Milestone R505 report: resubmitted 2/17/89 with response to Project Office review
6. Milestone R720 report: resubmitted 2/17/89 with response to Project Office review
7. Milestone T424 report: submitted 2/24/89
8. Milestone T404 report: resubmitted 2/28/89 with response to Project Office review
9. Milestone T418 report: resubmitted 3/27/89 with response to Project Office review
10. Milestone R346 report: resubmitted 4/4/89
11. Milestone M367 report: resubmitted 4/11/89 with response to Project Office review
12. Milestone T095 report: resubmitted 4/14/89 with response to Project Office review
13. Milestone T414 report: submitted 4/14/89
14. Milestone T433 report: submitted 4/14/89
15. Report manuscript - D. Vaniman, "Volcanic Stratigraphy at Yucca Mountain": submitted 3/6/89
16. Report manuscript - B. M. Crowe et al., "Volcanic Hazard Studies for the Yucca Mountain Project": submitted 3/21/89
17. Report manuscript - S. G. Wells et al., "A Geomorphic Assessment of Late Quaternary Volcanism in the Yucca Mountain Area, Southern Nevada: Implications for Volcanic Hazard Assessment at the Proposed High-Level Radioactive Waste Repository": submitted 4/11/89

18. Technical Abstract - A. J. Mitchell et al., "Instrumentation and Operation of an Autocorrelated Photon Spectrometer Used for Particle Size Determinations": submitted 4/17/89

19. Technical Abstract - I. R. Triay et al., "Utilization of Inversion Techniques for Particle Size Determinations Using Autocorrelated Photon Spectroscopy": submitted 4/17/89

20. Technical Abstract - M. A. Ott et al., "Mechanical Manipulation of Intact Tuffaceous Rock to Fabricate and Assemble Solid Rock Columns and Rock Beakers": submitted 4/17/89

TENTATIVE AUDIT SCHEDULE - AUDIT LANL 89-7				
Monday 11/13	Tuesday 11/14	Wednesday 11/15	Thursday 11/16	Friday 11/17
8:00 Team/Observer Badging 9:00 Team/Observer Meeting 10:30 Pre-audit Conference	8.3.1.3.2.1/8.3.1.3.2.2 TA 3 (Open) D. Broxton (LANL) C. Rutland P. Bryant (3) Kratzinger/Mcfall (4,7) 8.3.1.3.4.1 TA 48(5 Max) N Patera/A. Meijer P. Cloke M. Mitchell (SM) A. Arceo (8,13) S. Crawford (3) QAS - Criteria 1,5	8.3.1.2.3.1 TA 51 (Open) E. Springer (LANL) C. Rutland P. Bryant (3) M. Mitchell (SM) A. Arceo (8,13) Kratzinger/Mcfall (4,7) 8.3.1.8.1.1 TA 48 (Open) B. Crowe (LANL) D. Eppler S. Crawford QAS- Criteria 6,15	QAS - Criteria 2,12,16,17 18 FOLLOWUP OPEN TECHNICAL ISSUES	PROPGRAMMATIC FOLLOWUP & PREPARATION FOR POST-AUDIT CONFERENCE
11:30 - 12:30 Lunch	11:30 - 12:30 Lunch	11:30 - 12:30 Lunch	11:30 - 12:30 Lunch	11:30 - 12:30 Lunch
8.3.1.3.4.2 TA 3 (Open) (LS-2) L. Hersman/ C. Duffy (LANL) P. Cloke S. Crawford (3) M. Mitchell (SM) A. Arceo (8,13) 8.3.1.3.3.2 TA 48/INC-7 (5 Max) N. Patera (LANL) C. Rutland P. Bryant (3) EES-13 Criteria: 1,4,5	8.3.1.3.5.1 TA 3 (CMR Bldg) (5 Max) N. Patera/D. Morris(LANL) P. Cloke,S. Crawford (3) Kratzinger/ Mcfall (4,7) 8.3.1.3.2.1/8.3.1.3.2.2 TA 3 (EESI) (Open) D. Broxton (LANL) C. Rutland,P. Bryant (3) M. Mitchell(SM),A. Arceo (8,13) 8.3.1.8.5.1,TA 48 (Open) B. Crowe/C. Harrington D. Eppler QAS- Criteria 6,15	8.3.1.2.3.1 TA 51 (Open) E. Springer (LANL) C. Rutland Kratzinger/Mcfall (12) QAS Criteria: 2,12,16 17,18 FOLLOWUP OPEN TECHNICAL ISSUES	QAS Criteria: 17 FOLLOWUP OPEN TECHNICAL & PROGRAMMATIC ISSUES	2:00 POST AUDIT CONFERENCE
4:00 Caucus	4:00 Caucus	4:00 Caucus	4:00 Caucus	4:00 Caucus