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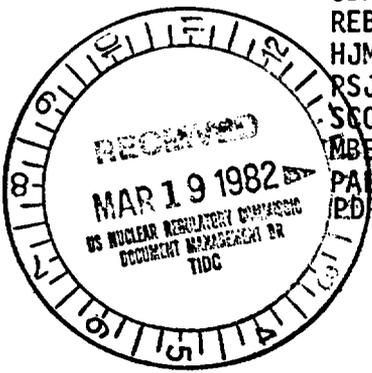
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MAR 01 1982

WMHT: 3109.43

MEMORANDUM FOR: Hubert J. Miller, Chief  
High-Level Waste Technical  
Development Branch  
Division of Waste Management



FROM: Philip S. Justus  
High-Level Waste Technical  
Development Branch  
Division of Waste Management

SUBJECT: NMSS PROGRAM MILESTONE NO. 312313C

Attached is the technical status report for repository siting. The report describes WMHT Siting Section program activities and objectives with emphasis on present status of future plans for and integration of technical assistance contracting efforts. The report satisfies OPS Plan commitment 312313C.

ORIGINAL SIGNED BY

Philip S. Justus  
High-Level Waste Technical  
Development Branch  
Division of Waste Management

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Encl to 3-1-82  
memo to HJM  
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STATUS REPORT SITING SECTION

High-Level Waste Technical Development Branch

March 1, 1982

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## SITING SECTION STATUS REPORT

### SUMMARY

The activities of the Siting Section are categorized into four broad programs which presently encompass all of the contractual obligations and responsibilities of the Section. These are: hydrogeology, geochemistry, geologic stability and geophysical tests and exploration methods.

The principal objectives of the Section are to: (1) establish consensus on what issues must be considered and at what level of effort; what information or data must be produced, at what time and at what level of detail, and what tests, methods and approaches are acceptable and that would lead to early resolution of important issues; (2) assist in revision of the 10 CFR Part 60 technical criteria; and (3) produce a SCR analysis four months after receipt of SCR.

In carrying out these objectives, the Section staff interacts mainly with NRC staff in RES, WMHL, and with contractors and DOE staff in seven broad areas of activity. These are: (1) review of DOE activities, (2) review of SCR and preparation of SCR analysis, (3) development of technical positions and summary reports, (4) revision of 10 CFR 60 - technical rule, (5) revision of the Standard Format and Content Guide, (6) interaction with NRC units to effect progress in the HLW licensing program, (7) management and monitoring of technical assistance and research contracts.

The Section manages an extensive program of technical assistance contracts. These contracts are supplemented by contracts funded by RES, which together, form an important element in the Section's ability to achieve its principal goals.

SITING SECTION COMMITMENTS

- Performs technical review and evaluation of acceptability of HLW geological repositories with regard to geological, tectonic, hydrogeologic, geophysical and geochemical attributes of a site.
- Directs analytical effort of consultants and assesses their input in preparation of site safety and performance evaluations.
- Identifies areas in which appropriate geoscience/geotechnical methodologies need research and development and assists in developing programs to fill these needs.
- Assists in establishing standards, regulations and regulatory guidance applied to site characterization to assure licensability of HLW repositories.

## GOALS AND OBJECTIVES

### Goals

The basic goals of the HLW Management program in which the Siting Section plays an important role are: (1) establishing consensus on licensing information needs in the areas of geochemistry, hydrogeology, geologic stability, and geophysical testing and exploration methods, and (2) achieve early resolution of major licensing needs. A principal consideration is to avoid delaying the DOE program.

### Objectives

Activities of the Siting Section are directed toward the accomplishment of three principal objectives. In essence these are the following:

1. Establish prelicensing agreements. To facilitate review of licensing submittals from the DOE consensus is needed regarding (1) which issues need to be considered and the level of efforts to be devoted to each, (2) what information or data is needed at what stage of the licensing process and at what level of detail, and (3) what tests, methods and approaches will produce data that fully address the essential licensing issues at a level accuracy, reliability and confidence that is sufficient to resolve those issues in a timely manner.
2. Revise the technical criteria of 10 CFR Part 60. A number of issues regarding the siting criteria were raised in public comments on the proposal rule. To finalize the rule, these issues must be resolved.
3. Prepare Site Characterization Report Analysis (SCRA). SCRA's will need to be prepared for SCRs that the DOE will submit for Hanford, NTS, and a yet undesignated salt site. Timely completion of these analyses will require completion of a draft SCRA for each site within four months of submittal of the SCR.

### SITING SECTION ACTIVITIES

The activities of the Siting Section are guided by the nature of the HLW licensing issues and by the sequence and schedules ~~nature~~ of the licensing process. The proposed means of disposal in deep mined cavities generates several conditions that have not previously been confronted simultaneously by the NRC. Generally, these are the following:

1. The uniqueness of the project. The fact that deep geologic disposal has never been done before means that unique technical problems will arise that will need to be resolved through development of a consensus among the technical community.
2. The principal issues are site-specific. This means that the information needs and methods of resolving issues are non-repetitive and must be re-established for each site.
3. Assessment of performance is over the long-term. Unspecified uncertainties exist in assessing the long-term hazards that could lead to releases of radionuclides. Consensus will be needed to establish what information and of what quality would be acceptable to specify these hazards.
4. There is a complex interplay of natural processes. The identification of the important geological influences on the repository system needs to be established so that the fundamental elements needed to assess long-term safety can be quickly understood and utilized.

Attachment 1 and 2 summarize the on-going activities of the Section. These activities are supported by contracts which are discussed in a subsequent section.

### Scope of Siting Section Activities

Technical Programs. These following main issues areas cut across all site screening characterization activities of the Siting Section and constitute technical programs to which individual staff are assigned broad responsibilities:

Geochem Program	Brooks, Corrado
Hydrogeology Program	Johnson; (Verma)
Geologic Stability Program	Pendleton
Geophysical Test and Exploration Methods Program	Prestholt

The individuals responsible for technical program areas interrelate on all aspects his/her program with the others in the HLW national program, including interacting with DOE. The general guidelines for coordinating the DOE and NRC HLW programs are: (1) eliminate unnecessary duplication between DOE and NRC TA and PBS contracts (2) increase the effectiveness of R&D thru review & coordination of the respective programs (3) coordinate program planning (schedules and content). [Ref: JBMartin memo to MJBell, HJMiller, JOBunting dated Jan 13, 1981]. The scope of individual activities, broadly defined, is to establish consensus on and achieve early resolution of license information which falls within his/her program by the following mechanisms or processes: (a) review DOE activities (b) contribute SCR Review and (c) Develop Technical Positions (~~is~~ <sup>icate</sup> particularly in rule-making (e) coop w/ other NRC units (f) manage and monitor contracts;

these are all defined above. Sufficient flexibility must be built into the program activities to accommodate ~~for~~ changes in DOE plans, schedules and resources.

### Technical Judgments

The technical judgments as to whether a repository has the required characteristic of stability (tectonic, structural, hydrogeologic, geochemical, and geomorphic) and a 1000 yr minimum groundwater travel time to the far field and whether the favorable and adverse conditions of the geologic setting as specified in 10 CFR 60 are met are the ultimate responsibility of the Siting Section. Furthermore, technical judgments by the Siting Section in its technical program areas, listed above, are to be made in regard to performance objective of the waste form and package, the engineered system and the overall performance of the geologic repository system.

### Develop the Capability to Make Sound Technical Judgments

The Siting Section must develop the capability to assess the transport factors that will enable the commencement of and rate of release of radionuclides to the accessible environment to be addressed quantitatively. The two main transport components are groundwater flow and geochemical retardation. These factors are the principal issues in the hydrogeology program and the geochemistry program, respectively. The hydrogeologic and geochemical properties of a site may be quantified

and modeled. Much of the research and technical assistance contracts managed and monitored by the Siting Section fall into these two program areas, as discussed below. However, not all parameters which influence waste isolation that can be identified and assessed can or will be incorporated into quantitative performance assessment models. Numerous parameters associated with tectonic, structural, geomorphic and climatic changes (stability of the geologic setting) will need to be factored into the assessment decisions. The limits of geophysical tests and exploration methods will need to be assessed in order to evaluate the uncertainties in the data and concepts that result. These last two programs address many issues that lend themselves to resolution by site-specific activities rather than by theoretical and numerical analysis, or laboratory experiments. Research and Technical Assistance contracts in these programs ought to increase as site-screening winds down and specific repository horizons are targeted.

#### Address Key Issues at Sites

These issues are recognized as significant ones to be resolved early in site characterization and are the subject of contracts ~~discussed~~<sup>CU</sup> below:

- Hanford - Basalt
- . hydrologic properties
- . high stress field

Nevada Test Site - Tuff

- . hydrologic properties
- . rock strength
- . tectonic stability

Gibson Dome - Bedded Salt

- . regional groundwater flow
- . rock strength
- . interbedding

Dome Salt

- . adjacent hydrology/structure
- . dissolution
- . internal anomalous zones

## SITING SECTION STATUS REPORT

### Evaluation of Siting Section Contracts and Needs

All research and technical assistance contracts support the main objectives of the Siting Section Activities: (1) get early agreement on what are the important issues, what information is needed and at what level of detail, and what tests and methods will lead to resolution of issues, (2) revise the rule, and (3) produce a SCR analysis four months after receiving the SCR.

The research and technical assistance contracts in siting are categorized into four program areas: hydrogeology, geochemistry, geologic stability, and geophysical test methods. Each program is supported by a RESEARCH contract which assists in (a) understanding basic phenomena, (b) determining the limits and uncertainties associated with data, data gathering and analyses and testing strategies, and (c) establishment of issues and information needs. Each program, except the geophysical test methods, is supported by or proposed to be supported by TECHNICAL ASSISTANCE contracts which will assist in: (a) critical review of DOE activities and programs, (b) developing rationale for the rule and performance assessment judgments, (c) developing technical positions, and (d) establishing information needs, and what is needed to resolve issues.

The Siting Section contracts <sup>and milestones</sup> are summarized in attachments 3 and 4.

Background for Assessing Status of and Need For Hydrogeology Contracts.

In hydrogeological exploration there is a body of conventional methods on which to rely which derived from the need to find aquifers. It is the application of existing techniques to the characterization of specific sites that gets our greatest attention. The hydrogeology issues are site - specific: (a) regional flow regime, (b) site conditions such as conductivities, potential gradients, dispersivity/diffusivity, discontinuities and heterogeneities. The site stratigraphy and structural geology must be known to maximize the testing and evaluation program. However, the hydrogeologic problems in repository siting are unconventional: (a) concerned with fracture flow, not porous flow, (b) concerned with unsaturated zones and aquicludes, (c) testing in rocks with low permeability and fractured (except salt), and (d) concerned with thermal effects on flow.

Assessment of Status of and Need For Hydrogeology Contracts

Status. Research in understanding the phenomenon of fracture flow is presently funded in B-7291 to the University of Arizona (UAZ). The contractor reviews the literature concerning the assessment of flow and transport through unsaturated fractured rock; assesses measurement techniques that

relate to unsaturated flow in fractured rocks; tests lab and field methods for determining unsaturated fracture flow parameters; determines applicability of existing computer models for unsaturated flow and transport in fractured media. Also at UAZ, B-5753, the contractor assesses the adequacy of specific porous flow models for application to fractured media and develops tracer injection methods for the determination of fracture porosity.

Research in understanding the phenomenon of unsaturated flow is presently funded at UAZ as summarized above in B-7291 and in B-3109 to LBNL. The Lawrence Berkeley work considers tradeoffs in hydrogeology in saturated vs. unsaturated media. This work will be applicable to rendering 10 CFR 60 to accommodate an application for a repository in the unsaturated zone.

Research in field testing is funded as follows. B-7291 (UAZ) contractor tests and assesses lab and field methods for determining unsaturated flow parameters in fractured rocks. B-6628 (UAZ) improves methods of field sampling. B-6628 (UAZ) reviews and improves existing groundwater dating methods. B-5753 (UAZ) performs field testing in fractured rock and investigates the applicability of porous media flow theory to fractured media flow; and develops tracer injection methods for the determination of fracture porosity. B-3110 (LBNL) develops a conceptual

design for a hydrogeologic testing program in an underground test facility.

Site-specific issues, information needs and methods of resolution of issues

are funded as follows. B-3109 (LBNL) contractor identifies site characterization issues and strategies for their resolution, concentrating on Hanford -BWIP. Technical Assistance (TA) contract B-7330 (BOA) reviews and makes recommendations concerning DOE work in hydrogeology during site screening and characterization. R. Williams (Personnel Services) services BWIP activities and makes recommendations.

Assistance in the preparation of technical positions in hydrogeology is provided by these contracts: B-7330 (BOA), B-3109 (LBNL), B-7291 (UAZ), B-5753 (UAZ) as described above. Further, B-5753 examines and recommends changes in diffusion theory as it applies to radionuclide transport.

Need. We find a need to assess the thermal perturbations on flow; to have Dr. R. Mifflin (Personal Services) assist as in assessing NTS activities; to have B-7330 (BOA) furnish assistance in drafting and reviewing portions of technical positions that we are considering and in providing review capability for salt sites. We further find a need to establish the sensitivity of flow models to variations in parameters in

order to establish priority of information needs and to compare the capabilities of the various models. Also need to establish what kind of tests, what scale and level of detail are needed and when should they be run.

Background for Assessing Status of and Need for Geochemistry Contracts

The application of geochemistry to waste isolation in mined cavities is a new endeavor in the science. There was a dearth of data regarding even the basic phenomena of radionuclide migration in groundwater. Research in this broad area has concentrated on understanding mechanisms such as solution/dissolution, sorption/desorption, diffusion and precipitation; in identifying and understanding controlling variables such as rate of groundwater flow, Eh, pH, temperature and pressure, rock/clay cation exchange capacity and the availability and nature of sorption sites. The establishment of site-specific and expected boundary conditions is necessary to manage the limited resources available. The development of geochemical process/transport models and algorithms is needed to allow for sensitivity studies. The numerous variables and complex interactions between waste form/package, backfill, rock, water and accessible environment require that priorities of research needs be established quickly.

The generation and evaluation of data requires lab and field testing as follows: (a) determine site-specific conditions, (b) conduct tests

under expected conditions, (c) develop and evaluate tests and test methods, (d) evaluate results, and (e) validate radionuclide transport models and algorithms.

We have observed the need for the establishment of consensus on these issues and for their early resolution: (e) what is an adequate solubility data set, (b) what are acceptable site-specific boundary conditions, (c) control and assess the effect of oxidation potential on retardation, (d) evaluate effects of temperature variation, (e) utilize natural analog studies and field tests, (f) integrate retardation data into performance models, (g) what constitutes an acceptable program to characterize retardation, (h) what are acceptable levels of accuracy and confidence for radionuclide migration determination, (i) will the program plan assure peer review of methods and results, (j) what are the plans to confirm results from lab research by field testing and evaluation, and (k) what documentation or benchmarking of procedures, methods and approaches is needed?

#### Assessment of Status of and Need For Geochemistry Contracts

Status. Research in understanding the basic mechanisms by which retardation occurs is funded as follows: B-3040 (LBNL) contractor studies microstructure of clays and effect on radionuclide transport through backfill. B-6661 (AABC) compares calculated radionuclide migration

rates with those observed from natural analogues; B-3040 (LBNL) studies radionuclide migration by means of natural analogues; B-7057 (LMT) studies actinide complexation in a range of contemporary natural environment. B-5753 (UAZ) examines and recommends changes in diffusion theory as it applies to radionuclide transport.

Research in understanding the limitations and uncertainties in controlling variables is funded as follows. B-2230 (ANL) studies rates of transport using lab analogues of complex interactions in which effects of temperature, substrate and weathering are varied. B-0462 (ORNL) evaluates the uncertainties in measurement of  $K_d$  as Eh varies.

Research in the development of models/algorithms is funded as follows. B-3109 (LBNL) develops simple analytical models which describe radionuclide migration in diffusion - dominated systems. B-3040 (LBNL) assesses adequacy of predictive models for nuclide migration. B-7291 (UAZ) determines the applicability of existing computer models for unsaturated flow and transport in fractured rocks.

TA is identifying information needs and establishing priorities is funded as follows. B-3109 (LBNL) identifies and prioritizes research needs in geochemistry; assesses use of engineered barriers to retard nuclides; considers siting tradeoffs in geochemistry in saturated and unsaturated media.

TA in determining site-specific conditions and establishing boundard conditions is funded as follows. B-3209 (LBNL) identifies site characterization issues and strategies for their resolution, emphasizing Hanford-BWIP. TA in Geochemistry (UNDES) is proposed to review and make recommendations concerning DOE work in geochemistry during site screening and characterization.

TA in preparing technical positions in geochemistry are funded as follows. B-3109 (LBNL) and B-3040 (LBNL) suggest conclusions regarding chemical reactions in engineered backfill. B-3109 (LBNL) identifies and prioritizes information needs in geochemistry; identifies site characterization issues in three media.

Needs. We find a need to develop a position on what kinds of field tests, what scale and level of detail needed and when they should be run. Further, we find a need to integrate the complex geochemical interactions and retardation processes in the performance assessment models so that sensitivity of these parameters to transport assessment can be determined. We find a need to establish consensus on what constitutes and an acceptable program to characterize retardation at a site; what are acceptable levels of accuracy, reproducibility, and confidence for radionuclide migration determination.

Background for Assessing Status of and Need for Geologic Stability Contracts

There is no place on earth that is stable over long time periods; one or more of these processes is present: chemical weathering (decomposition), mechanical weathering (disintegration), erosion by wind, water, ice or gravity, deposition on land or in sea, volcanism/intrusion, seismicity, deformation by plate tectonic movements, thermal and hydrothermal activity, seasonal climate, tides. Therefore, the assessment of long-term stability of a repository involves judgment that weighs the favorable and adverse effects on groundwater flow and transport and on design performance by the dynamic processes that have affected or might affect a site.

Research activities in this area concentrate on identifying the magnitude and frequency of the causes of instability such as seismicity, volcanism, uplift, erosion and deposition, climate and sea-level fluctuations. Research on the threshold of dynamism needed to effect a change in groundwater flow and transport would be useful in developing models/algorithms and establishing priorities of information needs.

The generation and evaluation of data at a site to specify the local history of instabilities can concentrate on evidence for these: (a) earthquakes/active faulting, (b) volcanism, (c) dissolution (salt sites), (d) severe erosion/deposition, (e) climate/sea-level change, (f)

change in groundwater flow rate or direction, (g) chemical alterations, (h) uplift/subsidence, (i) in situ stress/strain variations. Assure that future instabilities will not lead to a deterioration of performance that would violate a standard.

Assessment of Status of and Need for Geologic Stability Contracts

Status. There are two contracts in this area. G-1010 (CSU) studies the effect of rates of uplift/subsidence and climate change on rates of erosion/deposition. B-7121 (NSF) evaluates methodologies for reconstructing paleoclimates; develops paleoclimatic data and maps for the last 12000 years; develops a model to simulate climatic conditions of last 18000 year; recommends acceptable methodologies for conducting paleoclimatic investigations.

TA is assessing stability at a site has been furnished through B-6935 (COE) Corps of Engineers district offices.

Needs. We have a growing need to establish priorities in identifying and measuring the geologic causes of instability at a site; <sup>to</sup> develop models to relate the magnitude and frequency of occurrence to effect on flow and transport; to allow for sensitivity studies to ascertain priorities; <sup>to</sup> determine what seismic exposure would yield risks to health, safety or performance. Technical assistance will be needed on a site-

specific basis to judge the adequacy of compensating favorable and unfavorable conditions. TA is needed in preparing and reviewing technical positions on what criteria for stability at a site are acceptable.

### Background for Assessing Status of and Need for Geophysical Test

#### Methods Contracts

Geophysical techniques have been developed by oil and mining companies to sense from the surface the rock properties and structure in the subsurface; its' a lot faster and therefore cheaper than drilling or mining to examine strata in situ. Geophysical tests of rock properties can be made in boreholes, they yield a geophysical log which is subject to interpretation. Some tests and methods utilize natural rock properties as clues to composition and structure, such as aeromagnetism and magnetotellurics which measure local variations in magnetism and electrical conductivity, respectively. Some tests and methods generate *one* effect to produce another which reflects rock properties, for example, the seismic reflection method utilizes an induced acoustic vibration from an explosion to deduce rock densities and layering. Such tests and methods are routinely used to characterize a site and the interpretation of remotely sensed data has become an art which is aided by computer enhancement of digitized data. Geophysical methods have been used in site screening to detect folding and faulting, thickness of strata, density and degree of consolidation, groundwater and earthquakes.

Assessment of Status of and Need for Geophysical Tests and Exploration

Methods Contracts

Status. There are two contracts in this area, both are Research contracts. A-0367 (LLNL) assesses the geotomographic technique in field tests; assesses the reliability and limitations of geotechnical, environmental and radiological instruments and monitoring systems. B-6337 (UAZ) develops and tests data processing techniques to support the geotomography tests; summarizes state-of-the-art geophysical techniques.

A-0367 (LLNL) has a TA task that allows for reviews and assessment of geophysical instrumentation to be made by the contractor.

A technical position or feasibility study report on the utility of geotomography in site characterization ought to be made upon completion of A-0367 and B-6337.

Need. There is a need for TA in the area of geophysical tests and exploration methods to identify which are suitable to resolve an issue; determine when testing should be done; agree on what level of detail, accuracy, reliability, and confidence is acceptable; determine the appropriate scale of testing and establish the limitations of tests and methods and the uncertainties in the resulting data.

## ATTACHMENT 1

### SITING SECTION ACTIVITIES

#### I. Activities to establish consensus and achieve resolution of issues

- Review of DOE activities
  - Site Visits to BWIP, NTS, Salt, Geochemistry Labs
  - Technical meetings with DOE
  - Review of DOE technical document
  - Critique and analysis of pertinent programs - WIPP, STRIPA
- SCR Review - to assure SCRA is issued within four months of SCR receipt
  - Complete revised SF&C reviews
  - Establish SCR Review Plan
  - Review Teams identify and develop issues - BWIP, NTS
  - Review Teams establish information needs/requirements
  - Review Teams establish what tests and methods are available and acceptable and what tests, methods, strategies, and programs are needed to produce a complete data of set of adequate quality.
- Develop Technical Positions
  - Geochemistry Technical Position - new application of geochemistry
  - In Situ testing strategy for site characterization
  - ASTM/ANSI standards

#### II. Rule-making Activities

- 10 CFR 60 Revision
  - review public comments
  - address public comments and recommend changes to the rule
- Standard Format and Content Guide Revision
  - completed revision of public comments
  - recommended changes
  - discussed draft final with DOE and USGS

### III. Supporting Activities

- Cooperate with other NRC Units
  - Design Section, WMHT - share contracts and staff; assess input to repository design
  - Performance Assessment Section, WMHL - assess input to models; evaluate model output
  - Waste Form and Package Section WMHL - share knowledge of glass leaching; evaluate source term
  - Projects Section, WMHL - jointly repond to public comments on 10 CFR 60 rule
  - Office of Research, RES - support, modify, suggest new contracts; assess work
  - LLW Section, WMLL - compare results of pertinent contracts in flow and transport
  - Geoscience Branch, NRR - share information on Hanford; share licensing concerns
- Manage and Monitor Contracts
  - Manage TA contracts
    - develop staff licensing capability
    - assist critical reviews of DOE work in trying to get consensus and achieve early issue resolution
    - assist with development of technical positions
  - Monitor RES contracts
    - understand basic phenomena
    - understand limitations and uncertainties associated w/data, data gathering and analysis and test strategies.

Attachment 2  
 Status of FY 1982 Operations Plan Commitments

<u>PPSAS</u>	<u>Commitments and Products of Siting Section</u>	<u>Status (3/2/81)</u>	<u>Due Date</u>
312113	Complete 10 CFR 60 Revision	<u>In progress.</u> Public comments on siting grouped and reviewed; scoped; main issues to be revised; reached consensus w/WMHL on responses to indiv. comments; remains to get agreement w/RES on proposed changes to rule and to flex rule to accommodate an applic for a site in unsat. zone; staff responsible-MPendleton	4/82
311112	Complete BWIP Trip Report	<u>Complete.</u> Completed site 12/10/81 investigation; compiled staff's and consultants' findings issued report; briefed NRC and DOE mgmt staff participants-PPrestholt; DBrooks	
311113	Conduct NTS Site Review	<u>In preparation.</u> Developed NTS issues; preliminary contact made with DOE/USGS; itinerary in preparation; staff responsible-SCoplan	4/82
311211	Prepare BWIP SCRA	<u>In progress.</u> Review teams established; SCR review plan nearly complete; issues analysis in progress; staff responsible-entire section	10/15/82
311212	Prepare NTS SCRA	<u>In progress.</u> Review teams established; site visit in preparation; staff responsible-entire section w/SCoplan PM	3/83

31331	Assist RES in Revision of SF&C Guide	<u>Complete.</u> Public comments resolved; Standard Format and Content guide draft discussed with DOE; staff responsible-RUleck	11/06/81
312312	Develop Draft Technical Position in Geochemistry	<u>In preparation.</u> Scope of technical position under discussion; outline of points to be covered drafted; staff responsible-DBrooks, JCorrado	9/30/82
31313	Complete Letter Report on DOE Siting Program	<u>Complete.</u> Critiqued DOE technical report on siting in domal salt; staff responsible-RJohnson	12/01/81
31316	Complete Geochem Lab Review Report	<u>Complete.</u> Prepared draft report; 1/8/82 comments by DOE incorporated in report; transmitted at a meeting on 2/25/82; staff responsibility-DBrooks	

## HLW Contract (Task) FIN CODES: Repository Siting

Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitations and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Hydrogeology		B7330, T1, BOA	B7291, T1-T4, UAZ B6628, T1-T3, UAZ B5753, T1-T4, UAZ B3110, T2, LBL	B7330, T2, BOA B3109, T1, T4, T6, LBL B7291, T1-T3, UAZ
Geochemistry	B3109, T2, LBL	TBD, UNDES	A2230, ANL B0462, ORNL B3040, T1-T5, LBL B6661, AAEC B7057, LMT B7291, T4, UAZ	TBD, UNDES B3040, T1-T4, LBL B3109, T1-T4, T6, LBL B7291, T4, UAZ
Geologic Stability		B6935, COE	G1010, CSU B7121, T1-T4, NSF	G1010, CSU B7121, T1-T2, T4, NSF
Test Methods		A0637, T4, LLL	A0367, T1-T2, LLL B6337, T1-T5, UAZ	A0367, T1-T2, T4, LLL B6337, T5, UAZ

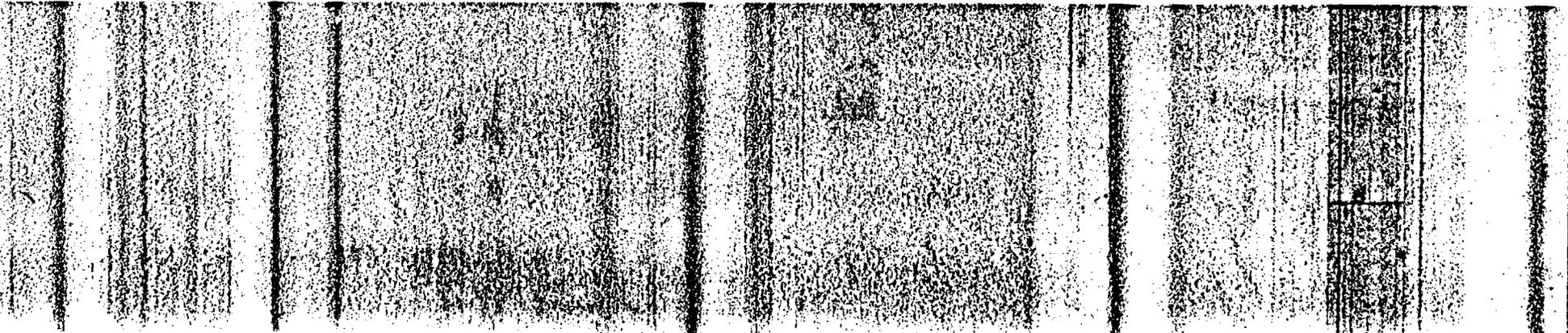
Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Hydrogeology		B7330, T1, BOA Reviews and makes recommendations concerning DOE work in hydrogeology during site screening and site characterization. Reports as needed.	B7291, T1, UAZ Reviews literature concerning flow and transport through unsaturated, fractured rock. Final report October 1982.	B3109, T1, LBL Identifies site charac- terization issues and strategies for their resolution. Final report August, 1982.
			B7291, T2, UAZ Assesses measurement techniques that relate to unsaturated flow in fractured rocks. Final report October, 1982	B3109, T4, LBL Considers siting trade- offs in hydrogeology in saturated and unsatura- ted media. Final reports September 1982.
			B7291, T3, UAZ Tests laboratory and field methods for determining unsaturated flow parameters. Final report October 1982.	B3109, T6, LBL Provides general technical assistance in areas covered by Tasks 1 and 4. Reports as needed.
			B7291, T4, UAZ Determines applicability of existing computer models for unsaturated flow and transport of fractured rock. Final report October, 1982.	B7330, T2, BOA Drafts and reviews portions of NRC technical positions in hydrogeology. Reports as needed.
			B6628, T1, UAZ Reviews existing groundwater dating methods. Annual reports 1981 and 1982.	B7291, T1, UAZ Reviews literature concerning flow and and transport through unsaturated, fractured rock. Final report October, 1982.

Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Position
Hydrogeology (con't.)			B6628, T2, UAZ Improves methods of groundwater field sampling. Annual reports 1981 and 1982	B7291, T2, UAZ Assesses measurement techniques that relate to unsaturated flow in fractured rocks. Final report October, 1982.
			B6628, T3, UAZ Improves existing groundwater dating methods. Annual reports 1981 and 1982.	B7291, T3, UAZ Tests laboratory and field methods for determining unsatur- ated flow parameters. Final report October, 1982.
			B5753, T1, UAZ Examines and recommends changes in diffusion theory as it applies to radionuclide transport. Final report May, 1983.	B7291, T4, UAZ Determines applicability of existing computer models for unsaturated flow and transport to fractured rock. Final report May, 1983.
			B5753, T2, UAZ Performs field testing in fractured rock and investigation the applicability of porous media flow tests to fractured media flow. Final report May, 1983.	B5753, T1, UAZ Examines and recommends changes in diffusion theory as it applies to radionuclide transport. Final report May, 1983.

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Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Position
Hydrogeology (con't.)			B5753, T3, UAZ Develops tracer injection methods for the determination of fracture porosity. Final report May, 1983.	B5753, T2, UAZ Performs field testing in fractured rock and the applicability of porous media flow tests to fractured media flow. Final report May, 1983.
			B5753, T4, UAZ Assesses the adequacy of specific porous flow models for application to fractured media. Final report May, 1983.	B5753, T3, UAZ Develops tracer injection methods for the deter- mination of fracture porosity. Final report May, 1983.
			B3110, T2, LBL Develops conceptual design for hydrogeologic testing program in underground test facility. Final report March, 1982.	

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Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Geochemistry	B3109, T2, LBL Develops simple analytical models describing radio- nuclide migration in diffusion dominated systems. Final report October, 1982.	TBD, UNDES Reviews and makes recom- mendations concerning work in geochemistry during site screening and site characterization. Reports as needed.	A2230, ANL Studies rates of radionuclide transport, rates of hydration and interaction of systems using laboratory analogue. Topical reports September, 1981, July 1982, July 1983, and May 1984.  B0462, ORNL Evaluates uncertainties in measurement of $K_d$ . Topical September 1982 and September 1983.  B3040, T1, LBL Studies microstructure of clays and its effect on radionuclide transport through backfill. Topical report September 1982.  B3040, T2, LBL Studies chemical reactions of waste radionuclides in backfill. Topical reports April 1982 and September 1982.  B3040, T3, LBL Studies chemistry of rock/water interactions. Topical report July 1982.	TBD, UNDES Reviews and provides input to NRC technical positions in geo- chemistry. Reports as needed.  B3040, T1, LBL Studies microstructure of clays and its effect on radionuclide transport through backfill. Topical report September, 1982.  B3040, T2, LBL Studies chemical reactions of waste radionuclides in back- fill. Topical report April and September 1982.  B3040, T3, LBL Studies chemistry of rock/water interactions.  B3040, T4, LBL Assesses adequacy of predictive models for nuclide migration. Topical reports January and September, 1982.

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Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Geochemistry (con't.)			B3040, T4, LBL Assesses adequacy of predictive models for nuclide migration. Topical reports January and September, 1982.	B3109, T1, LBL Identifies site characterization issues and strategies for their resolution. Final report August, 1982.
			B3040, T5, LBL Studies radionuclide migration by means of natural analogues. Topical reports September, October and November, 1982 and March 1983.	B3109, T2, LBL Identifies and prioritizes research needs in geochemistry. Final report October 1982.
			B6661, AAEC Compares calculated radionuclide migration rates with those observed from natural analogues. Quarterly reports through FY83.	B3109, T3, LBL Assesses use of engineered barriers to retard radionuclides. Final report August 1982.
			B7057, LMNT Studies radionuclide complexations in a range of natural environments. Topical report December, 1982.	B3109, T4, LBL Considers siting trade-off in geochemistry in saturated and unsaturated media. Final report September, 1982.
			B7291, T4, UAZ Determines applicability of existing computer models for unsaturated flow and transport in fractured media. Final report October, 1982.	B3109, T6, LBL Provides general technical assistance in areas covered by tasks 1-4. Reports as needed.

Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitations and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Geochemistry (con't.)				B7291, T4, UAZ Determines applicability of existing computer models for unsaturated flow and transport in fractured media. Final report October, 1982.

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Technical/NRC Issues/Activities	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitations and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
Geologic Stability		B6935, COE Reviews DOE site investigations and research programs reports. Reports Reports as needed.	G1010, CSU Studies effect of maximum rates of uplift and subsidence and climatic change on denudation and deposition rates. Final report April, 1982.	G1010, CSU Studies effect of max- imum rates of uplift and subsidence and climatic change on denudation and depo- sition rates. Final report April, 1982.
			B7121, T1, NSF Determines limitations and strengths of methodologies for reconstructing paleoclimatic conditions. Final report March, 1982.	B7121, T1, NSF Determines limitations and strengths of metho- dologies for recon- structing paleoclimatic conditions. Final report March 1982.
			B7121, T2, NSF Develops climatic data and maps for the last 12,000 years. Final report March 1982.	B7121, T2, NSF Develops climatic data and maps for the last 12,000 years. Final report March, 1982.
			B7121, T3, NSF Develops model to simulate climatic conditions over last 18,000 years. Final report March 1982.	B7121, T4, NSF Recommends acceptable methodologies for con- ducting paleoclimatic investigations. Final report March, 1982.
			B7121, T4, NSF Recommends acceptable methodologies for conducting paleoclimatic investigations. Final report March, 1982	

Technical/NRC Issues/Activities Test Methods	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena Limitation and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
		A0367, T4, LLL Conducts special reviews and assessments concerning geophysical instrumentation as directed by NRC Project Manager. Reports as needed.	A0367, T1, LLL Assesses High Resolution Electro- magnetic and seismic geophysical (geotomography) methods by analysis and field testing. Final report TBD.	A0367, T1, LLL Assesses High-Resolu- tion Electromagnetic and seismic geophysical (geotomography) methods by analysis and field testing. Final report TBD.
			A0367, T2, LLL Assesses reliability and limitations of geotechnical, environmental, and radiological instruments and measuring systems. Final report TBD.	A0367, T2, LLL Assesses reliability and limitations of geo- technical, environ- mental, and radiological instruments and meas- uring systems. Final report TBD.
			B6337, T1, UAZ Develops and tests the appli- cation of the iterative column technique for matrix inversion to the VECTOR approach of geotomograph data processing in two dimensions. Final report September, 1982.	A0367, T4, LLL Conducts special reviews and assessments con- cerning geophysical instrumentation as directed by NRC Project Manager. Report as needed.
			B6337, T2, UAZ Compares ART and VECTOR recon- struction techniques using data generated from known solutions to simple anomaly shapes. Final report September, 1982.	B6337, T5, UAZ Summarizes state-of-the art of geophysical techniques. Final report September, 1982.

Technical/NRC Issues/Activities Test Methods (con't.)	Develop Licensing Capabilities	Review - DOE/EPA Programs	Understand Basic Phenomena - Limitations and Uncertainties in Data and Test Methods	Develop Generic Technical Positions
			<p>B6337, T23, UAZ Evaluates the influence of geophysical noise on the ART and VECTOR reconstructions. Final report September, 1982.</p> <p>B6337, T4, UAZ Tests VECTOR against ART using data obtained from the Oracle test. Final report September, 1982.</p> <p>B6337, T5, UAZ Summarizes state-of-the art of geophysical techniques. Final report September, 1982.</p>	

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