4/30/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

NRC STAFF'S ANSWERS TO NATURAL RESOURCES DEFENSE COUNCIL, INC. AND THE SIERRA CLUB NINETEENTH SET OF INTERROGATORIES TO NUCLEAR REGULATORY COMMISSION STAFF

Pursuant to the Licensing Board's Prehearing Conference Order of February 11, 1982, the Nuclear Regulatory Commission Staff (Staff) hereby responds to Intervenor's Natural Resources Defense Council, Inc. and the Sierra Club Nineteenth Set of Interrogatories to the Nuclear Regulatory Commission Staff filed on March 7,1977. Attached hereto are the Staff's answers to NRDC's and the Sierra Club's interrogatories, together with the affidavits of those individuals who participated in answering the interrogatories.1/

At the March 21, 1977 Prehearing Conference, the Licensing Board sustained the NRC Staff's objections to Interrogatories #1, #2 (only the second part), #3, #4, #8, #41 through #43.

1/ The affidavits of Mr. Leech, Mr. Kaltman, Mr. Lowenberg, Mr. Nehemias, Mr. Long, Mr. Becker, Mr. Branagan and Mr. Stark are unsigned. However, a copy of their signed and notarized affidavits will be filed shortly.

On March 4, 1982, the parties in this proceeding developed a Protocol for Discovery. NRDC has requested that answers to interrogatory questions be provided in six parts. The following six parts are:

A) Provide the direct answer to the question.

B) Identify all documents and studies, and the particular parts thereof, relied upon by the Staff, now or in the past, which serve as the basis for the answer. In lieu thereof, at Staff's option, a copy of such document and study may be attached to the answer.

C) Identify principal documents and studies, and the particular parts thereof, specifically examined but not cited in (b). In lieu thereof, at the Staff's option a copy of each such document and study may be attached to the answer.

D) Identify by name, title and affiliation the primary Staff employee(s) or consultant(s) who provided the answer to the question.

E) Explain whether the Staff is presently engaged in or intends to engage in any further, ongoing research program which may affect the Staff's answer. This answer need be provided only in cases where the Staff intends to rely upon ongoing research not included in Section 1.5 of the PSAR at the LWA or construction permit hearing on the CRBR. Failure to provide such an answer means that the Staff does not intend to rely upon the existence of any such research at the LWA or construction permit hearing on the CRBR.

F) Identify the expert(s), if any, which the Staff intends to have testify on the subject matter questioned, and state the qualifications of each such expert. This answer may be provided for each separate question or for a group of related questions. This answer need not be provided until the Staff has in fact identified the expert(s) in question or determined that no expert will testify, as long as such answer provides reasonable notice to Intervenors.

For all the responses to interrogatories in this set the following are the answers to the requested parts in the Protocol for Discovery.

B) All documents and studies, and the particular parts thereof, relied upon by the Staff now or in the past which serve as the basis for the answer are mentioned in the direct answer to the question unless otherwise noted.

C) There were no principal documents and studies specifically examined but not cited in (b) unless otherwise noted.

D) The name, title and affiliation of the Staff employee(s) or consultant(s) who provided the answer to the question are available in the affidavits unless otherwise noted.

E) The Staff is not presently engaged in nor intends to engage in any further, on-going research program which may affect Staff's answer unless otherwise noted.

F) At this time, the Staff has not determined who will testify on the subject matter questioned. Reasonable notice will be given to all parties after the Staff has made this determination. At that time, a statement of professional qualifications will be provided for each witness.

Respectfully submitted,

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Counsel for NRC Staff

Geary S. Mizuno by D.T.S.

Geary S. Mizuno
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Dated at Bethesda, Maryland
this 30th day of April, 1982

NRC STAFF ANSWERS TO NRDC'S AND
THE SIERRA CLUB'S INTERROGATORIES

Interrogatory 2

(FES p. 3-2) What independent evaluation has been conducted by the Staff of the assumed breeding ration for the CRBR? FES p. 3-2.

Response

A) No "independent evaluation" of the CRBR breeding ratio has been performed.

B) Final Environmental Statement, NUREG-0139 February 1977 and CRBR Site Suitability Report, March 1977.

Interrogatory 5

(FES p. 4-1) Provide the Staff's current best estimate of the earliest date that construction could begin on the CRBR and the factors included in that estimate. Describe any changes that this makes in calculations made by the Staff in the FES.

Response

A) May 5, 1983 is the presently projected date for issuance for a Limited Work Authorization (LWA), if the Atomic Safety and Licensing Board makes a favorable decision on environmental and site suitability matters, and site preparation could commence immediately thereafter. This date was projected on the basis that the following schedule will be met:

Issue Environmental Update	06/22/82
Begin Environmental and Site Suitability Hearing	08/24/82

Complete Environmental and Site Suitability	11/24/82
ASLB Issue Partial Initial Decision on Environmental and Site Suitability Matters	04/22/83

In the FES, the hearings were projected to start as early as March 1977, leading to a possible LWA in July 1977. Any calculations in the FES based on that date will probably be extended in the Staff's environmental update by the difference in time between July 1977 and May 1983, or approximately 6 years.

Interrogatory 6

(FES p. 4-1) How does the 6.5 year construction schedule compare to actual construction experience with reactors? In your answer give specific examples and relate your answer to the GAO's recent report on the time required to bring a nuclear power plant on line.

Response

A) The average construction time for the first unit at nuclear power plants has ranged from 47 months in 1970 to 130 months in 1980. The 6.5-year (70-month) schedule planned for the CRBRP is in the lower end of this range. A summary of factors affecting construction time was presented in the GAO report entitled, "Reducing Nuclear Power Plant Leadtimes: Many Obstacles Remain," dated March 2, 1977. For more recent

information on specific plants, see NRC s Construction Status Report (NUREG-0030) which is issued quarterly.

B) 1. NRC's Program Summary Report, pp. 3.2 & 3.3, March 18, 1977.

2. NRC's Construction Status Report, pp. 1-003 to 1-015, September, 1981.

Interrogatory 7

Provide a ranking of the construction activities planned in the first year which disclose as to each activity as compared to all other activities for that year the following:

(a) irretrievable and irreversible commitments of resources;

(b) economic commitments;

(c) environmental damage;

(d) impact on the completion of the CRBR or the planned construction schedule;

(e) likelihood to foreclose alternatives to the site, design or existence of the CRBR;

(f) impact on jobs.

In your answer consider the statements made at the top of p. 11-28 regarding the risk of issuance of an LWA.

Response

A) The construction activities planned for the first year of construction are the site preparation activities identified in a letter dated April 1, 1977, from Anthony R. Buhl, ERDA, to Roger S. Boyd, NRC. (Attached) The Staff did not compare the relative effects of the various construction activities in the

manner requested by this interrogatory since that comparison was not needed for environmental review of the application for a construction permit. However, the impacts of the construction activities were assessed in Chapters 4 and 10 of the 1977 FES and this information will be amended as necessary in our forthcoming update of the FES.

B) See above response. The documents cited have previously been provided to NRDC. However, another copy of the April 1, 1977, letter from ERDA to NRC is an Attachment to Interrogatory #7.

Interrogatory 9

(FES p. 4-18) Explain in detail the manner in which the Staff intends to implement conditions under Paragraph 4.6.2. and the Staff evaluation of what the consequences will be to the local area of this condition is not met. Also explain whether the Staff requires in-lieu-of tax payments under certain circumstances and if so what are those circumstances and how will the Staff compel compliance if such circumstances exist. Finally, will the Staff evaluate the Applicants' analyses, and if so how and if not why not?

Response

A) If item e under Section 4.6.2 of the FES is adopted by the ASLB as a condition on the construction permit, NRC Inspection and Enforcement Division personnel will verify that the requirements of the condition are met. If this condition is not met, the Staff's opinion is that any in-lieu-of-tax payment/non-payment agreements between the applicants and the local governments may come about in a rather arbitrary or unsystematic way if they are not based on fiscal analyses as recommended in section 4.6.2e.

To provide certain information necessary to making the analyses, the Staff has recommended that the Applicants periodically conduct surveys of the construction work force (FES [Section 6.1.6]). The results of these surveys would be available to the public so that independent evaluations can be made of the extent to which the public sector might benefit or suffer from constrcution of the project.

Although the ASLB may require the Applicants to conduct the work force surveys and make period fiscal impact analyses as recommended by the Staff, the Staff recognizes that the NRC cannot compel the Applicants in this case to make in-lieu-of-tax payments as a mitigating measure. We therefore do not propose to evaluate the Applicants' subsequent analyses other than to assure that suitable surveys and analyses are being made and that the results are made available to the public and local government entities whose facilities may be affected by construction of the project.

The Staff understands that the Applicants' representatives have met with local groups to discuss the possible effects of the project and that the local governmental agencies in the vicinity have formed a corporation (East Tennessee Energy Projects Coordination Committee) with a multiplicity of purposes including assistance to the Applicants in developing specific procedures for timely mitigation of socioeconomic

impacts, and identifying (by means of a monitoring program) where mitigation programs need to be developed.

B. Applicants' Environmental Report, as amended.

Interrogatory 10

(FES pp. 3-11 to 3-18 and 5-19 to 5-24) Explain what account, if any, is taken of the points made in the testimony of Dr. Ernest Sternglass in TVA (Hartsville), Docket Nos. STN 50-518 to 50-521 entitled "Testimony Relating to the Adequacy of Population Dose Calculations" and dated February 16, 1977, and sources cited there in determining the radiological impacts of plant operation. To the extent the points are ignored or only partially accepted by the Staff, fully justify your position.

Response

A) The Staff has reviewed the points made in the testimony of Dr. Ernest Sternglass in TVA (Hartsville), Docket Nos. STN 50-518 to 50-521 entitled, "Testimony relating to the Adequacy of Population Dose Calculations." In his testimony, Dr. Sternglass contends that deposition of airborne releases of radioiodines and particulates directly on water and wash off of radioiodines and particulates deposited on the land were not considered in calculating the population doses from exposure to atmospheric releases of radioiodines and particulates from the Hartsville Nuclear Plant. Based on the Staff's estimates of atmospheric releases of radioiodines and particulates in the Clinch River FES (Ch. 3.5.2), the population dose from exposure to atmospheric releases of radioiodines and particulates would be negligible.

B) The referenced testimony of Dr. Sternglass and the FES for Clinch River (Ch. 3.5.2).

Interrogatory 11

(FES p. 5-19) What is the basis for the Staff's "preliminary judgment that the magnitude of occupational radiation exposures at liquid metal breeder reactors should not be substantially different from those experienced at light water reactors"?

Response

A body of relevant past exposure experience is available from operating light-water nuclear power stations, and has been used to provide a widely applicable estimate to be used for all light water reactor power plants similar in type and size to large modern light water plants.

The Commission has compiled occupational radiation exposure experience from operating nuclear power plants (NUREG-0109, "Occupational Radiation Exposure at Light Water Cooled Power Reactors" 1969-1975). These data indicate that the average dose to all onsite personnel at a typical large operating light-water plant has been about 500 man-rems/year per reactor.

This value is not a projection of actual expected doses to personnel at any particular plant or in any particular year. In fact, it is not based on any plant-specific considerations. It is a generic value, based on actual exposures being experienced at operating plants to date.

For LMFBR's on the other hand, no such body of relevant past exposure experience is yet available. Only a few such plants have been in commercial operation; most of them are substantially smaller than the Clinch River Plant, and none of them have been operating more than a few years. Since the Clinch River Plant is essentially a demonstration plant, there is no present basis in experience for developing a

meaningful projection of total occupational man-rem radiation doses at large LMFBRs.

What few data there are for these other plants tend to indicate total occupational radiation exposures somewhat lower than those currently being experienced at U.S. light water reactors. However, in developing the generic projected value used in the FES for the Clinch River Plant, the Staff recognized how little actual operating experience exists for similar plants. We cannot project exactly what kinds of maintenance will be required, how often a particular kind of equipment or component may fail, or what dose rates may be present where maintenance work will be performed. Taking into account the limited data available, and recognizing the uncertainties in estimating actual doses likely to occur, the Staff has conservatively projected that the annual average total occupational radiation exposures at the Clinch River Plant is unlikely to exceed 1000 man-rems.

The uncertainties associated with projecting man-rem doses for a demonstration plant of this general size and type, with essentially no prior experience at similar plants, are signficant. In the case of lignt-water reactors, we have been able to develop fairly meaningful projections of average man-rem doses, based on many years of experience with similar plants, for use in estimating average plant impact of proposed new plants (around 500 man-rems). Even in this case, however, individual plant totals have varied considerably from that average. For 1975 the lowest value reported was 25 man-rems; the highest was 2022 man-rems.

In view of these uncertainties, the Staff has selected the above value of 1000 man-rems as a conservative projection of doses that might occur at CRBRP. We believe that this value is conservative because the limited data available for LMFBRs indicate dose levels below those experienced at light-water plants of comparable size, and, as noted below, there are many aspects of LMFBR technology that would be similar in kind or in principle to those already in use at light-water plants.

The radiation protection design principles and operational procedures applied to the control on in-plant occupational radiation exposures are identical, whether the particular plant in question is an LWR or an LMFBR. For example, the following radiation protection considerations are well known and are the same in both cases:

- the kinds of radiations and particles emitted by the radioactive materials present;
- the radiation absorbing properties of shielding materials and the principles of shielding design to protect workers from radiation;
- the design of containment and ventilation to protect workers from intake of radioactive materials;
- the selection of components and materials to emphasize high quality and low maintenance requirements;
- the decontamination of equipment and surfaces to control intake of radioactive materials;
- the design and layout of plant and equipment to facilitate maintenance and to minimize time necessary in maintenance operations;

- the use of remote monitoring and handling equipment and procedures to limit necessary exposures;
- the measurement of radiation doses and intakes of radioactive materials by radiation workers.

There is, therefore, no basis for projecting that occupational radiation exposures at large LMFBRs will be significantly higher than those currently being experienced at large LWRs.

Interrogatory 12

(FES p. 5-22 and 11-23) How would the feasibility timing and cost of the CRBR be affected by a requirement that occupational exposures must be maintained as low as practicable? Describe in detail the assumptions and calculations used in making the findings required for your conclusion.

Response

A) The NRC Staff reviews the Applicant's Preliminary Safety Analysis Report (PSAR) with regard to the commitments therein as to how occupational radiation exposures will be maintained "as low as is reasonably achieveable" (ALARA). In particular, the Staff evaluates the Applicant's conformance with the provisions of Regulatory Guide 8.8 (R.G. 8.8), entitled "Information Relevant to Maintaining Occupational Radiation Exposure as low as is Reasonably Achievable (Nuclear Power Reactors)" and in Regulatory Guide 8.10 (R.G. 8.10), entitled "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable" (ALARA).

The provisions of R.G. 8.8 specify the kinds of information relevant to planning, designing, constructing, and operating a light-water

reactor nuclear power station to meet the criterion that exposures of station personnel to radiation during routine operation of the station will be ALARA. Although R.G. 8.8 was developed for large modern light water reactors, many of its provisions apply directly to LMFBRs, or to analogous equipment or systems in such plants. The Applicants have accepted the philosophy of R.G. 8.8 and have committed to that philosophy in the design and operation of all facilities potentially involving high levels of radiation or radioactive materials.

The NRC Staff has reviewed the Applicants' PSAR with regard to:

1. The Mangement Policy and Organization

   In Appendix 12A, the Applicants address management policy, procedures, and organization, as to keeping occupational radiation exposures ALARA, and a clear, specific commitment to follow the recommendations of R.G. 8.8 and 8.10.

2. The Personnel Qualifications and Training

   In Chapter 12.1, the Applicants address the management positions that are relevent to the administration of the radiaiton protection program, committing to direct access by the Health Physicist to the Plant Manager, and to the qualification and training requirements in R.G. 1.8 for the plant health physicist.

3. The Design of Facilities and Equipment

In Chapter 12.1.2 the Applicants address proposed shielding, design considerations, and layout of facilities and equipment as they relate to keeping occupational radiation exposures ALARA, including scale diagrams of the layout. A commitment is provided to design dose rates in areas where frequent or regular occupancy is required, and assurance as to preliminary design features such as shielding design and location, care in planning shield penetrations, and use of remote handling capability related to those identified in R.G. 8.8 c(3).

4. The Radiation Control Program, Plans, and Procedures

In Chapter 12.3, the Applicants address the health physics program, describing its objectives and briefly discusses the kind of personnel monitoring program to be provided. Normally, detailed decisions regarding program plans and procedures are not determined at the time of the Prelimiary Safety Analysis Report. These matters are examined during the operating license review.

5. The Availability of Supporting Equipment, Instrumentation, and Facilities

In Chapter 12.3, the Applicants also address the radiation protection facilities, equipment, and instrumentation, proposed to support the health physics program.

Again, detailed decisions about individual instruments and equipment items are not made by the time of the PSAR. These matters also are examined during the operating license review.

For the Clinch River Breeder Reactor Plant, based on the Staff's review of the information provided in the Applicants' Preliminary Safety Analysis Report and amendments, the Staff determines that the Applicants are committed as a matter of policy to design features and operating practices such as to assure that individual occupational raidation doses (occupational dose is defined in 10 C.F.R. Part 20) will be within the limits of 10 C.F.R. Part 20, and that the Applicants have taken suitable care in designing and planning the CRBR such that individual and total plant man-rem doses will be as low as is reasonable achievable. The review will continue as subsequent amendments to the PSAR are received, to assure that these commitments are maintained.

In summary, one of the principal purposes of the Staff review of PSAR material concerning control of occupational radiation exposures is the determination that such exposures will be ALARA, in effect "a conclusion that the Applicant has committed to maintain as low as practicable". On the basis of that review to date is appears reasonable to expect that occupational radiation exposures will be ALARA. Since this has been the intent of the review as undertaken, no additional investment of time or money would be involved.

Interrogatory 13

(FES pp. 5-22 to 5-24) If the NRC analysis regarding the health effects of plutonium as set forth in NRDC filings with the Commission and in Contentions 7 and 8 is accurate, how are the Staff calculations altered? How, in the FES, does the Staff evaluate the residual risk that the NRDC analysis is correct?

Response

A) This interrogatory is too vague to be able to provide a meaningful response. In the first question in interrogatory #13, it is not clear which "NRC analysis regarding the health effects of plutonium as set forth in" which "NRDC filings with the Commission" is referred to in interrogatory 13.

In the second question in interrogatory #13, it is not clear what "residual risk", or which NRDC analysis is referred to in the interrogatory.

Interrogatory 14

(FES p. 11-2) Why does the Staff consider evaluating radiological impact of plant operation for 50 years adequate when a number of radionuclides released will continue to be active beyond 50 years?

Response

A) The Staff has reviewed p. 11-2 of the FES and does not find any information concerning the "radiological impact of plant operation for 50 years." The interrogatory does not state which individuals or groups are impacted, or which plant operations were evaluated.

Interrogatory 15

(FES p. 11-23) Quantify what is meant by the statement "Exposure of workers at nuclear facilities is carefully monitored and controlled." In particular, describe the worker exposure at other facilities, particularly exposure during maintenance and repair, and how the exposure levels and number of workers exposed increases as the facilities get older. In this regard, discuss the policy of allowing substantial quantities of workers to receive maximum doses in short periods of time such as was experienced at West Valley.

Response

A) The statement that "Exposure of workers at nuclear facilities is carefully monitores and controlled," refers to the relevant requirements in 10 CFR Part 20, "Standards for Protection Against Radiation," which are based on the guidance of the Federal Radiation Council and the Environmental Protection Agency.

1. § 20.0=101(a) provides quarterly dose limits for individuals who enter restricted areas of 1-1/4 rems to the whole body and certain organs, 18-3/4 rems to hands and forearms, feet and ankles, 7-1/2 rems to the skin.

2. § 20.101(b) permits up to 3 rems in a quarter for such individuals provided that certain records are kept and that the individual's accumulated occupational dose does not exceed 5(N-18) rems, where N is his age in years.

3. § 20.103 provides criteria for protecting individuals in restructed areas against intake of radioactive materials, such

that the resulting radiation doses would not exceed the limits in § 20.101.

4. § 20.104 specifies limits ten times lower than those in § 20.101 and § 20.103 for individuals who are under 18 years of age.

5. § 20.108 describes the Commission's mechanism to require monitoring of the intake of radioactive materials.

6. § 20.201(b) requires surveys necessary to show compliance with the provisions of 10 CFR Part 20.

7. § 20.202 requires that personnel monitoring equipment be provided for individuals who might receive a dose in excess of 25% of the values in § 20.101(a), or 5% for individuals under 18 years of age.

8. § 20.401 requires retention of records related to individual exposures to radiation or radioactive materials until the Commission authorizes disposition, and of records of radiation and radioactive material surveys for two years.

9. § 20.405 requires reports to the Commission within 30 days of any exposures to radiation or to radioactive materials in

excess of the applicable limits in §§ 20.101, 20.103, or 20.104.

10. § 20.407 requires an annual report to the Commission that indicates how many individuals received doses within certain dose ranges.

11. § 20.408 requires for certain licensees, including power reactors, a report to the Commission of each individual's record of exposure to radiation or radioactive material, within 90 days of that individual's termination of work at the licensee's facility.

Each power reactor licensee is required to conform to the above regulatory provisions related to monitoring and control of individual radiation exposures. At the time of application for an operating license, the Applicants must provide, in Chapter 12 of the Final Safety Analysis Report, a description of the proposed radiation protection program. On the basis of the information provided, the Staff must be satisfied that the program will function to assure that the regulatory requirements listed above will be met and that occupational exposures will be ALARA.

Interrogatory 16

(FES p. 11-23) Is the assertion that 10 C.F.R.§20 results in "minimal risks to individual workers" intended to imply that the risks

could not be made lower, should not be lower, would not be made lower? Explain your answer and the assumptions and bases for it in detail.

Response

A) The regulatory limits on radiation doses received by individuals exposed to radiation or to radioactive materials by NRC licensees are set out in 10 CFR Part 20, "Standards for Protection Against Radiation." These NRC regulations are based upon guidelines issued by the Federal Radiation Council (until 1971) and by the Environmental Protection Agency (since its formation in 1971). The federal guidelines are consistent with the recommendations of national and international radiation protection advisory bodies, such as the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

In its Publication 22, "Implications of Commission Recommendations that Doses be Kept as Low as Readily Achievable," issued in 1973, the ICRP restated the underlying considerations that entered into the development of current dose limit recommendations:

"(a) The risks associated with the dose limitations should be judged to be appropriately small in relation to the benefits resulting from the practice.

(b) The limitation must be set at a sufficiently low level so that any further reduction in risk would not be considered to justify the effort required to accomplish it.

(c) In the case of occupational exposure the hazards should not exceed those that are accepted in most other industrial or scientific occupations with a high standard of safety."

For example, the current dose limits recommended by the above advisory bodies for occupational radiation exposure to the whole body are 3 rems in any quarter, and an average of 5 rems per year. In addition, however, each of these advisory bodies also recommends that actual exposures be kept as far below these limits as is reasonably achievable. In fact, operating experience indicates that average occupational exposures have consistently been substantially below the recommended limits. In the nuclear power industry, average annual doses have been around 1 rem.

The term, "minimal risks to individual workers", should be taken to mean that, in the perspective of other risks associated with day-by-day living and working, and the advantages to be gained by any occupational endeavor, occupational radiation risks are not unduly large. Furthermore, there are continuing efforts by the industry, the NRC, and the radiation protection community to reduce unnecessary exposures and to keep total exposures as low as is reasonably achievable.

Interrogatory 17

(FES pp. 7-11, 7-13, 7-26, 8-16 and 10-8) Inasmuch as the Staff has not completed its safety review and thus does not know whether the CRBR

analyzed in the FES will meet the NRC safety requirements, and inasmuch as the Staff intends to reach a decision on the CRBR design which includes a number of crucial items for which R&D will be required, and inasmuch as the result of such R&D or other R&D as described in the Technical Safety Activities Report and as recommended by the ACRS for generic items is yet to be completed, and inasmuch as all of these events could either result in a conclusion that the CRBR analyzed in the FES does not meet all required safety standards and/or that to meet those standards will require a substantial additional economic cost and/or substantial delay, what is the basis for the Staff's conclusions in the FES:

(a) operation of the CRBR and its support facilities will not involve unacceptable risks to the environment from plant accidents, transportation accidents or deliberate acts;

(b) the CRBR can be completed and operation begun and continued within the time requirements of ERDA's objectives:

(c) the costs of CRBR will not outweigh its benefits?

In your answer provide in detail the bases and assumptions used. In particular explain how the commitment that the CRBR will be required to make all changes required in the future to keep residual risks low has been quantified by appropriate bounding to set an outer limit on possible economic and timing impacts, and explain how the reliance of NRC on R&D work conducted principally by the Applicant ERDA and its contractors or conducted for NRC by contract with persons who normally depend upon ERDA or its contractors for employment can assure that problems which are now open will be resolved in a way which is consistent with an objectively-determined adequate level of safety.

Response

A) There is no significant uncertainty as to the nature of the required safety standards. The question is therefore interpreted to relate to the unresolved features of the CRBRP. As pointed out in the Site Suitability Report for CRBRP (SSR) page I-7:

> "The staff believes that sufficient information is available to identify: (1) a facility of the general size and type proposed; and (2) those design parameters that impact upon the question of site suitability".

This applies also to parameters that impact upon safety. The SSR continues

> "The identification of such a facility and design parameters is based on information submitted by the applicants and independently generated by the staff. In some cases the applicants present design may not meet staff design criteria. Where this has occurred, in order to determine site suitability....."

> "the staff has determined whether the state of technology would allow the staff's design criteria to be met."

It is this determination that acceptable solutions are or are not within the current state of technology that allows the Staff to estimate that the timing impacts of alternate designs would not adversely effect the overall plant schedule, and that the costs would not be prohibitive.

As for "R&D work conducted by the applicant ERDA", this work must be and always is evaluated by the Staff. The evaluation process is not basically different than it would be if the research were done for a university, for another government department, or for the NRC by an outside contractor or consultant.

The Staff does not believe that the distinction made in Q 17 about who sponsors the research has any influence on the objectivity of the Staff's evaluation.

Transportation accidents involving packages of radioactive material present potential for radiological exposure to transport workers and to members of the general public. The expected values of the annual radiological impact from such potential exposure are very small, estimated to be about one latent cancer fatality and one genetic effect for two hundred years of shipping at 1975 rates.

The purpose of the CRBRP safeguards environmental review is to determine if the Applicant's proposed safeguards systems are appropriate for the types of facilities and fuel cycle involved and contains safeguards measures which can be reasonably expected to provide adequate protection of the public health and safety, or will have unacceptable environmental impacts. It is the Staff's belief that sufficient information is available about the CRBRP and fuel cycle to make this determination.

B) USNRC NUREG-0170 Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes
Final Environmental Statement, NUREG-0139 February 1977
CRBR Site Suitability Report, March 1977

C) John Long, Nuclear Engineer Reactor Systems Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation and R. Davis Hurt, Mc&A Program Analyst, Division of Safeguards, Office of Nuclear Material Safety and Safeguards provided part of the answer to the question.

Interrogatory 18

In the answers to Interrogatories Set 11, particularly pages 7-10, Mr. Denise indicates that in several critical areas the Staff has required that the CRBR design incorporate additional safety features primarily because at this time it is not possible to conclude that safety features of the plant as designed are adequate and substantial additional work will be required before such conclusions could be made. Answer the following questions (except (e)) with respect to all of the systems discussed -- i.e., decay heat removal systems, subassembly faults, transport system integrity and designing, site suitability source term, and core disruptive accidents):

(a) Will the Staff consider removal of these requirements when further safety analyses are completed and if warranted by the analysis? If so, what standard will be applied for such permit modifications and will all of them in the areas discussed in the Denise letter be preceded by an opportunity for public hearing?

(b) How can the CRBR with the Staff proposed requirements for the CRBR design be a useful demonstration of the LMFBR technology if the additional design requirements are probably (in the Staff's views) conservative and would not be needed on commercial-size LMFBR's?

(c) Explain how the Staff conducted the implicit cost/benefit analysis which conlcuded that addtional safety features were preferable to awaiting further analysis necessary to confirm present design.

(d) How does the addition of more new and complicated safety features to the CRBR design save review time when the new designs must also be evaluated to see if they are adequate?

(e) If there is insufficient information on plant arrangements for decay heat removal to approve the original system and if the areas of uncertainty include the following: "The

staff also believed that it would have to review the details of the proposed system design, with consideration of potential transients, failure modes and effects, and system interactions before it could conclude that dependence on circulation through main loops would be satisfactory;" (NRC Staff Response to NRDC Et Al Eleventh Set of Interrogatories, January 27, 1977, p. 8) how can the Staff be confident at this time that adding an independent, diverse and functionally redundant system will be satisfactory?

Response

A) a) As a general rule, the Staff will consider removal of requirements when analyses so warrant. The Staff will be guided by the relevant NRC regulatory requirements regarding protection of the public health and safety governing the particular change being proposed.

b) The opportunity for public hearings will depend on whether the specific licensing action being contemplated falls within 10 C.F.R. §§ 2.104 or 2.105. If CRBR is brought into operation with the required constraints and subsequent reactors are not required to have these constraints, the outlook for the future reactors would be more favorable. The Staff has not tried to estimate the probability that these requirements might be removed in the future.

c) No such conclusion was made by the Staff. The Staff is not certain that future analysis would ever reduce the necessity for these features.

d) These added features involve proven technology, therefore the review time uncertainty for these features is less than that for the CRBR without these features.

e) Staff has not concluded that the added system is, in fact, a satisfactory solution. Rather, the Staff has concluded that the system can be a satisfactory solution. This conclusion is based on the concept of redundancy and diversity, which could not be applied favorably to the original single system, but which can be applied to the required two independent systems.

Interrogatory 19

To the extent not answered in other interrogatories in this Set or in Sets 16 and 17, list all the components covered by the paragraph in the middle of page 12 of the answers to the Eleventh Set which will not be resolved until the SER or after and with respect to each answer, question 6 of Set 16.

Response

A) As indicated in the Denise letter of May 6, it was not possible to identify systems and components and associate with each the same or a more stringent safety standard than for LWRs. It was not possible to identify a list that would be resolved prior to the SER, except to reiterate that the adequacy of only major components would be demonstrated in testing and start-up (pre-load) programs. The same is true today.

Interrogatory 20

As to each aspect of the safety review of the CRBR for which the Staff is using conservative assumptions not specfically embodied in an

NRC regulation, explain in detail for each assumption the basis for the Staff judgment that the conservatism used is deemed appropriate to establish the necessary tolerance. See Answers to 11th Set of Interrogatories, p. 13. In particular, answer the question for the decay heat removal systems, sub-assembly faults, transport system integrity and design, site suitability source term and CDA. Id. pp. 7-10.

Response

A) Where there is no specific NRC regulation, the bases for the judgements expressed in the May 6 letter are found in several other documents as listed in the introduction to the response to Interrogatory 18 of the 11th Set. The CRBRP Design Criteria, published as Appendix A of the SSR, contains the bases for many important plant systems. Specifically, the decay heat removal system is covered in Criteria 26 and 35; instrumentation for subassembly faults is covered in Criteria 8 and 11; the integrity and design of the heat transport system is covered in Criteria 12, 13, 28, 29 and 30; and the containment design for the SSST is given in Criteria 14. CDAs are not design base accidents, are not covered in the design criteria, and are given special treatment as described in the May 6 letter.

You may also refer to the SSR Sections II.C and II.D for an elaboration for the staff's requirements as based on the design criteria.

B) CRBR Site Suitability Report, March 1977.

Interrogatory 21

When, if at all, will the Staff be able to conclude whether there is any tolerance and if so how large it is, in the design? Ibid. p. 13.

Response

A) A conclusion on feasibility to achieve a satisfactory design must be reached at the LWA stage.

Interrogatory 22

With respect to each Staff identified operation error, off-normal operations and component malfunctions, provide the following:

(a) Identification of the event and its likely causes;

(b) Designs in CRBR to cope with it;

(c) Status of Staff review of the existence of tolerances in CRBR design to cope with it;

(d) Basis and assumptions for Staff conclusion that an acceptable tolerance exists;

(e) Or if no basis for such a conclusion, then basis and assumptions for Staff conclusion that this aspect of the CRBR has acceptable residual risks, acceptable economic costs and can be resolved within a time frame consistent with CRBR objectvies.

Response

A) The FES, Chapter 7, discusses a wide spectrum of accidental events and their consequences. Nine categories of accidental events are identified and the most severe event in each category is analyzed. The consequences of these accidents are listed in Table 7-2 of the FES, and the tolerances are easily recognizable from the results tabulated there and by comparison with the dose guidelines listed in the SSR, pp. III 15-16.

B) Final Environmental Statement, NUREG-0319 February 1977.

CRBR Site Suitability Report, March 1977.

Interrogatory 23

In light of the answer to Interrogatory Set 11, Q 24-26, how does the Staff propose that the validity of Staff conclusions about the adequacy of CRBR safety systems be objectively stated. In your answer explain how the Staff objectively tests the validity of comparable conclusions submitted by the Applicants.

Response

A) The objective standards for adequacy of the safety systems are stated in CRBR Design Criteria 18-25, which are set forth in the SSR at App. A.

B) Final Environmental Statement, NUREG-0139 February 1977; CRBR Site Suitability Report, March 1977.

Interrogatory 24

In light of the answer to Q 27-30 of Set 11, what basis exists for believing that the CRBR evaluated in the FES is the CRBR which will be built and/or operated?

Response

A) The Staff has determined from its review and has stated in SSR, page I-7, that the technology is available to design and build a facility of general size and type proposed and that a system has been identified. Assurances beyond this detail will be determined at the CP and OL stages of Licensing. The review performed for the FES remain relevant as long as the design

selected for the CRBR, and the environmental impacts associated with it, are reasonably related to the impacts evaluated in the FES.

B) Final Environmental Statement, NUREG-0139 February 1977.

CRBR Site Suitability Report, March 1977.

Interrogatory 25

Explain in detail as to each system of the CRBR for which sufficient data was not available at the issuance of the FES to determine whether it is designed to conservative standards and engineering practices:

(a) the system;

(b) the economic costs of possible design changes needed for the system to meet conservative standards and engineering practices;

(c) the cost in delay of criticality of possible design changes needed for the system to meet conservative standards and engineering practices;

(d) the risk that the CRBR will not meet its objectives because it will not be built and/or operated;

(e) the desirability of completing the Staff review as to that system through (1) the SER stage, or (2) through the OR stage before holding hearings on or having issuance of an LWA or a CP.

Response

A) I.a) Shutdown systems

b) Cost included in Applicants plant estimate.

c) Development program for this sytem has been submitted in accordance with 10 C.F.R. § 50.34(8). The Staff has conluded that technology exists to design the system without delay to the project.

d) Significant (i.e. designing but not building any CRBR shutdown systems would be a course of action unlikely to meet objectives.)

e) Desirable to complete review at OL stage. Not a condition for LWA or CP hearings.

II.a) Decay heat removal system redundancy and diversity.

b) Since these systems are required to cope with only about 5% of the rated reactor power, their cost is a relatively small increment to the already planned heat transport system.

c) Available heat transport technology can be used, without new concept - development. Hence no delay is anticipated.

d) Significant (See response (d) above)

e) Conceptual review of design commitments is desirable at CP stage. Final review at OL stage. Delay in LWA hearings not desirable.

III.a) Means to detect and cope with subassembly faults.

b) Expected to be a small increment to the instrumentation system ($1000k).

c) Solutions available within present technology. No delay expected - see SSR Page II 24-26.

d) Significant (see above)

e) Staff review of concepts and commitments by CP time. Reivew of final installed system by and imposition possible of operating restrictions, surveillance requirements by OL time. Delay in LWA hearings undesirable.

IV.a) Primary piping system

b) The additional requirements identified on page II-19 of SSR will not be costly. (Preservice and inservice inspection program, material surveillance program, continued R&D verifying material degradation processes, verification of leak detection system.

c) Present technology. No delay

d) Significant (see above)

e) Review of concepts and commitments at CP state. Final review at OL stage. No delay in LWA is desirable.

B) Final Environmental Statement, NUREG-0139 February 1977.

Interrogatory 26

With respect to the answer to Q 31-41 of Set 11, list every failure or malfunction or malfunction which could lead to accidents in CRBR which have been identified, every incident or malfunction which can occur during the life of the CRBR which has been identified, and with respect to each one, answers Q 39, 40 and 41 of Set 11.

Response

A) Refer to Table 7.2 of the FES for a representative list of accidents resulting from failures and malfunctions, each one

believed to be the bounding accident in its class. Classes 1-8 are expected to have a probability of occurrence during the life of the plant ranging from moderate to very small.

As stated on the previous response to questions 39, 40 and 41 of the 11th Set of Interrogatories, the Staff is not satisfied that the measures to cope with these accidents are acceptable, and the requested information is not available at this time. The Staff will be able to reach conclusions on acceptability when the SER and SER Supplements are issued, except for information which can reasonably be left for later consideration.

B) Final Environmental Statement, NUREG-0139 February 1977.

CRBR Site Suitability Report, March 1977.

Interrogatory 27

With respect to each of the items referred to in the previous question which have not been identified and each which has been identified but for which acceptable measures or features in the CRBR to cope with them have not yet been determined to be acceptable, answer Q 41 and provide, as to those which have not been identified, a quantitative evaluation of the magnitude of the unidentified items or any other items for which Q 41 cannot be answered. In the quantitative evaluation use the factors identified in Q 25(b)-(e) of this Set.

Response

A) See above answer to Interrogatory #26.

Interrogatory 28

Specifically answer Q.44 of Set 11.

Response

A) The objective standards for various systems are those in the CRBR Design Criteria, code classifications, NRC Regulations, and quality assurance provisions, plus the general principles of reliability, redundancy and diversity, as set forth in the May 6, 1976 Denise to Caffery letter, pages 3 and 4.

B) Final Environmental Statement, NUREG-0139 February 1977.
CRBR Site Suitability Report, March 1977.

Interrogatory 29

Does the answer to Q 47-50 of Set 11 mean the safety objective does or does not have to be achieved.

Response

A) The safety objective must be achieved.

Interrogatory 30

Explain in detail how the Staff can objectively determine whether the safety objective has been met if it does not require demonstration of the numerical value in the strictest sense? What is the less strict sense in which the safety objective is demonstrated?

Response

A) The discussion on p. 17 of the response to Interrogatory Set 11 (1/27/77) indicates a minimum procedure for arriving at a conclusion on fulfillment of a safety objective. The response submitted on January 27, 1977 anticipated the uncertainties in the probablistic analysis of these sequences that have since been confirmed (Lewis Report). Probabalistic analyses involve

statistical rather than deductive analyses. The Staff believes that statistical analyses can be applied objectively, giving due regard for the uncertainties involved. It is in the above sense that the Staff judgement will be objectively reached.

Interrogatory 31

Inasmuch as the Staff evaluation of the research and development programs will not be completed until issuance of the SER (Set 11, answers 56 and 57), answer the following:

(a) Identify each item of R&D for which the Staff evaluation is not yet completed;

(b) What are the possible consequences of a Staff rejection of the R&D program with respect to cost, timing, and design of the CRBR?

Response

A) (a) Over 600 questions have been proposed to the applicant on these matters, and all questions have also been furnished to NRDC.

(b) If the R&D program were rejected, a more comprehensive program would have to be submitted. We have no estimate on cost and timing of such unsubmitted proposals.

Interrogatory 32

Answer specifically Q 60 of Set 11 with respect to each item for which the Staff has a conclusion, tentative or otherwise, with respect to any open safety question.

Response

A) Staff has not reached any conclusion with respect to the Applicants' compliance with the cited regulation.

Interrogatory 33

What constitutes "satisfactory resolution" of an important safety matter? See Set 11, answers 58-60. Does it contemplate merely a commitment from Applicants to resolve the problem before the OL stage? If more, how much more? Be specific.

Response

A) The phrase, "satisfactory resolution," has different meanings in different phases of the licensing process. Its meaning at the CP stage is more than "merely a commitment", and the details as to the level of resolution necessary at the CP stage are given in 10 C.F.R. § 50.53(a).

Interrogatory 34

For which initiators of accidents has the Staff calculated a probability of 10^{-6} or less?

Response

A) The Staff does not have numerical estimates of the probability of accident initiators. See also the Staff's responses to the 14th Set and to interrogatories 24-26 of the 11th Set.

The 10^{-6} figure used in the May 6 letter of Denise to Caffery did not refer to accident initiators but rather to the fact that the probability that the consequences of an accident exceed 10 C.F.R. §100 should be reduced to 10^{-6}. Thus if the probability of the initiation is $>10^{-6}$ and consequences > 10 C.F.R. §100 then some other event in the sequence must have sufficiently low probability to bring the overall sequence probability down to 10^{-6}.

Interrogatory 35

For which has it not calculated such a probability and for which of these does it intend to calculate such a probability? For those for which it does not intend to calculate such a probability, how as to each one will the Staff determine whether additional designs are required to cope with the initiator?

Response

A) See the Staff's updated answer to Interrogatory #34.

Interrogatory 36

Describe in detail the factors and the assumptions and bases for those factors which the Staff is using to determine what is a reasonable range of parameters to help determine site suitability? See Set 11, answers 62-63. In this answer explain whether the Staff or any member of it has considered the possibility that there is insufficient information at this time to determine site suitability. Identify all Staff members who for any reason have come to that conclusion and describe in detail the basis for their conclusions.

Response

A) Site suitability is determined in accordance with 10 C.F.R. §100. The range of parmeters considered is given in the SSR; Section I.B on Summary Conclusions describes the evaluation. None of the Staff who worked on the site evaluation have reached a negative conclusion on site suitability.

B) CRBR Site Suitability Report, March 1977.

Interrogatory 37

Given the substantial difference in design between the CRBR and an LWR -- for instance, the blanket as well as the core is a source of radioactivity, and the coolant is far more volatile and post-accident energetics are higher -- please try again to answer Q 68 of Set 11 and be specific and informative.

Response

A) The Site Suitability Source Term (SSST) has been determined after consideration of postulated highly unlikely events. Included among the accidents analyzed are inadvertent reactivity additions, a steam or feed-line pipe break; sodium-water reactions as the result of steam generator tube failures, PHTS and IHTS pipe leaks, fuel handling accidents, sodium fires, rupture of the RAPS surge vessel, and a failure in the liquid radwaste system. The SSST is a non-mechanistic term and its use is intended to represent an assumed release from the core whose consequences would result in potential hazards not exceeded by those from any accident considered credible, in a manner comparable to the determination of the design basis loss-of-coolant accident doses for a LWR.

Although plutonium is accumulated in the blanket of an LMFBR it does not augment the core inventory by more than about 20%. Moreover, much of the blanket operates at lower power density than the core and thus has less opportunity for energetic dispersal.

In clarification of the answer given to question 70 of the 11th Set of Interrogatories, please note the manner of calculation of fission product inventories described on pp. 11-43 of the FES. The fission yields appropriate for fast neutron spectrum and for the plutonium fuel are included in the calculation. Although the yields of some fission products increase due to

the fast spectrum and the plutonium, the yields of others decrease. The net effect on population doses has been found to be not significant.

Sodium is not volatile (FES, 11.7.13).

Although post-accident energetics for an LMFBR may be higher than for an LWR, by inclusion of the energy of reactions between sodium and air or concrete for example, post accident temperatures are not calculated to be high enough to vaporize fuel. No further source of dispersed fuel results from this energy level. Any additional amount of fission products vaporized by the post-accident temperatures are insignificant compared to the 1% fuel already in the source term.

B) Final Environmental Statement, NUREG-0139 February 1977.
CRBR Site Suitability Report, March 1977.

Interrogatory 38

In the answer to Q 70 and 71 of Set 11, was the Staff claiming that the design difference identified makes no real difference or that it is assumed it makes no difference? Explain in detail the assumptions and bases for either answer.

Response

A) See above answer to Interrogatory #37.

Interrogatory 39

Explain how the Staff has such confidence that shutdown system and the decay heat removal system could be made highly reliable and that in core faults could be adequately protected against, although no one has yet been able to meet these requirements? Why doesn't the failure to yet meet the requirements suggest that the Staff confidence is at best based upon a theoretical analysis which cannot be realized? See Set 11, answers 74-76.

Response

A) An amplification of the discussion of the required system, and illustrations that solutions are within the state of the art, are provided in the SSR, Section IIC, pp. II-12 to 30.

B) CRBR Site Suitability Report, March 1977.

Interrogatory 40

Answer Q 76, Set 11.

Response

A) The answer to this question appears in SSR, p. II-12, the only full paragraph on the page.

B) CRBR Site Suitability Report, March 1977.

Interrogatory 44

Isn't it true that the purpose of contingency costs in the construction costs of the CRBR is to cover contingencies arising after commencement of construction?

Response

A) The contingency construction cost estimate covers unforseen costs that may occur in the future and provides protection

against known and specific risks. Contingency allowances have not been made to provide protection against changes in schedule, escalation rates different than the 8% assumed, or for new scope added to the project.

Interrogatory 45

Did the Staff obtain from the Applicants a specific cost of the design features and characteristics?

Response

A) No. A cost breakout was provided but at a fairly high level of aggregation, e.g., RM equipment, BOP equipment, RM engineering, AE engineering, and similar levels of aggregation for Development and Operating Costs.

B) Applicants response to NRC item 320.7R, Nov. 1981.

Interrogatory 46

If not, how does the Staff know whether the balance in the contingency costs is reasonably adequate in light of all other uncertainties?

Response

A) The latest official cost estimate provided by the Applicants contains a remaining contingency cost on total plant investment of $153.8 million on a to-go total plant investment of $1,701.9 million. Therefore, the contingency allowance is 9% of the total future plant investment. The NRC typically relies on the

CONCEPT[1/] code as its independent check on capital cost estimates submitted by applicants. In the CONCEPT model the contingency allowance is set at 10% of the total plant investment exclusive of interest and escalation. The Staff views the 9% value used for CR as in reasonable agreement with this independent measure, and concludes that the Applicant's remaining contingency cost is reasonable.

B) Applicant's response to NRC item 320.7R, Nov. 1981, CONCEPT Code.

Interrogatory 47

Describe in detail how the Staff independently has evaluated the reasonableness of the contingency cost figure in light of the past history of cost escalations of the CRBR.

Response

A) See response to Interrogatory 46. Also, the Staff contends that as work continues on the CRBR, the cost estimates become firmer and are less subject to cost contingencies. We note that project design work is about 90% complete and as of the end of fiscal year 1981, more than $500 million worth of hardware has been delivered or is on order with suppliers.

1/ C. R. Hudson II, Concept Users Manual, Oak Ridge National Laboratory, ORNL-5470, January 1979.

Interrogatory 48

What is the basis for the belief stated in the answer to Q 93?

Response

A) The original schedule no longer remains valid. The intervening delay in licensing activity has introduced considerable flexibility in the schedule as originally anticipated.

Interrogatory 49

How does the Staff justify its failure to include the residual risks discussed in answers 94-97 of Set 11 in the FES?

Response

A) The consequences of a class 9 accident are included in the FES. The response to Interrogatories 94-97 Interrogatory Set 11 stated that the discussion of the residual consequences would be discussed in the SER.

B) Final Environmental Statement, NUREG-0139 February 1977.

Interrogatory 50

With respect to each chapter in the FES (and the SSR), identify all persons who assisted in the preparation of the chapter and the extent of their contributions. Particularly delineate between supervisory personnel who made policy decisions and line personnel who actually conducted the relevant analyses and studies. Also identify any of the persons who disagreed with the final conclusion reached and the bases for their disagreements.

Response

A listing of preparers of the Site Suitability Report is in the Attachment to Interrogatory #50.

A) The FES was prepared and reviewd by the following persons. Their roles with respect to the specific sections are shown on the attached table according to the identification numbers given below:

1. E. Christopherson, Battelle Pacific Northwest Laboratory (PNL).
2. P. H. Leech, EPM, EP-2
3. W. H. Regan, Jr., Branch Chief, EP
4. V. A. Moore, ADEP
5. B. J. Youngblood, Branch Chief, EP
6. D. R. Muller, Deputy Director, DSE
7. R. E. Jackson, GSB
8. R. Baca, PNL
9. D. Dragnich, PNL
10. R. Codell, HMB
11. J. Goll, HMB
12. E. Markee, Jr., Section Leader, HMB
13. B. Klepper, PNL
14. W. Rickard, PNL
15. G. Gears, ESB
16. K. Gore, PNL
17. H. Berkson, ESB
18. K. McGinnis, PNL
19. J. Vetrano, PNL
20. J. Long, LMFBR

21. W. Whittinghill, Corps of Engineers, Nashville
22. R. Weller, ETSB
23. W. Burke, Jr., ETSB
24. B. Mercer, PNL
25. C. Kaplan, EPA, Atlanta
26. L. Bykoski, CBAB
27. W. Sandusky, PNL
28. R. Emch, RAB
29. F. Congel, RAB
30. T. Speis, LMFRB
31. D. Bunch, AAB
32. R. Denise, ADAP
33. F. Kantor, AAB
34. A. Marchese, LMFBR
35. A. T. Clark, NMSS
36. V. Hodge, NMSS
37. R. Bernero, NMSS
38. R. Cudlin, NRR
39. R. Priebe, ISEPB
40. D. Mathews, NMSS
41. D. Kasun, NMSS
42. J. M. Elliott, NRR
43. G. McCorkle, NMSS
44. J. Miller, NRR
45. R. Page, NMSS

46. R. Starostecki, LMFBR
47. H. Denton, DDSE
48. J. Roberts, CBAB
49. P. B. Erickson, OR
50. J. Harbour, RES
51. R. Reid, OR
52. R. Liikala, PNL
53. I. Dinitz, A&I
54. R. W. Houston, ISEPB
55. Paul Fine, CBAR

None of the persons identified above is known to disagree with the final conclusion reached in the FES, as expressed in Section 10.4.3, page 10-8.

TABLE

CLINCH RIVER BREEDER REACTOR
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10.4.2	18,19	55
10.4.3	1,2,18,19	55

FES SECTION	Prepared by	Reviewer/Supervisor 1,2,3,4,5,6,32,plus
11		
11.1		
11.1.1	2	
11.1.2	2	
11.1.3	1,2	
11.1.4	1,2,25	
11.1.5	1,2	
11.1.6	2,46	
11.1.7	20	
11.1.8	8,9,25	
11.2		
11.2.1	1,13,14	
11.2.2	1	
11.2.3	1	
11.2.4	1,16	
11.2.5	1	
11.2.6	1,18	
11.2.7	1	
11.2.8	7,46	
11.2.9	7	
11.2.10	24	
11.2.11	8,9	
11.2.12	8,9	
11.2.13	11	
11.2.14	11	
11.2.15	11	
11.2.16	11	
11.2.17	27	
11.2.18	13,14	
11.2.19	16	
11.2.20	18,19	
11.2.21	18,19	
11.2.22	18,19	
11.2.23	18,19	
11.2.24	18,19	
11.3.1	1	
11.3.2	20,2	30
11.3.3	20	30
11.3.4	8,9	
11.3.5	8,9	
11.3.6	8,9	
11.3.7	16,25	
11.3.8	22	23
11.3.9	22	23
11.3.10	22	23

FES SECTION	Prepared by	Reviewer/Supervisor 1,2,3,4,5,6,32,plus
11.3.11	22	23
11.3.12	22	23
11.3.13	22,24,27	23
11.3.14	22	23
11.3.15	22,24	23
11.3.16	28,29	23
11.3.17	22	23
11.3.18	22	23
11.3.19	22	23
11.3.20	22	23
11.3.21	22	23
11.3.22	22,24	23
11.3.23	35,36	37
11.3.24	22,35	23,37
11.3.25	35	37
11.3.26	35	37
11.3.27	24,25	
11.3.28	24,25	
11.3.29	24,25	
11.3.30	24,25	
11.3.31	24	
11.3.32	24,25	
11.3.33	24,25	
11.3.34	24	
11.3.35	24,25	
11.3.36	24	
11.4.1	2	
11.4.2	18,19	
11.4.3	18,19	
11.4.4	18,19	
11.4.5	13,14	
11.4.6	13,14	
11.4.7	13,14	
11.4.8	1	
11.4.9	1	
11.4.10	1,16	
11.4.11	2,25	
11.4.12	18,19	
11.4.13	18,19	
11.4.14	18,19	
11.4.15	18,19	
11.4.16	18,19	

FES SECTION	Prepared by	Reviewer/Supervisor 1,2,3,4,5,32,plus
11.4.17	1	
11.4.18	18,19	
11.4.19	24	
11.4.20	18,19	
11.4.21	18,19	
11.4.22	18,19	
11.4.23	18,19	
11.4.24	18,19	
11.4.25	18,19	
11.4.26	18,19	
11.4.27	18,19	
11.4.28	18,19	
11.4.29	18,19	
11.4.30	18,19	
11.4.31	18,19	
11.4.32	18,19	
11.4.33	18,19	
11.4.34	18,19	
11.4.35	18,19	
11.4.36	1,2.7	
11.5.1	1	
11.5.2	8,9	
11.5.3	1	
11.5.4	24	
11.5.5	24,25	
11.5.6	16	
11.5.7	8,9,27,16,18,25,29.	
11.5.8	16	
11.5.9	8,9	
11.5.10	8,9,16	
11.5.11	27	
11.5.12	27	
11.5.13	27	
11.5.14	24	
11.5.15	13,14	
11.5.16	13,14	
11.5.17	8,9	
11.5.18	24	
11.5.19	18,19	
11.5.20	18,19	
11.5.21	18,19	
11.5.22	18,19	
11.5.23	18,19	
11.5.24	28,29	
11.5.25	28,29	
11.5.26	28,29	
11.5.27	28,29	

FES SECTION	Prepared by	Reviewer/Supervisor 1,2,3,4,5,32,plus
11.5.28	11	
11.5.29	28,29	
11.5.30	28,29	
11.5.31	2	
11.5.32	28,29,35	
11.6.1	28,29	
11.6.2	28,29	
11.6.3	28,29	
11.6.4	28,29	
11.6.5	28,29	
11.6.6	28,29	
11.6.7	28,29	
11.6.8	11	
11.6.9	16	
11.6.10	16	
11.6.11	8,9	
11.7.1	20,31	30,32
11.7.2	20	30,32
11.7.3	20	30,32
11.7.4	20	30,32
11.7.5	20	30,32
11.7.6	20	30,32
11.7.7	7,20	30,32
11.7.8	20	30,32
11.7.9	31	30,32
11.7.10	31	30,32
11.7.11	31	30,32
11.7.12	20	30,32
11.7.13	20	30,32
11.7.14	20	30,32
11.7.15	10	2,3
11.7.16	39	54
11.7.17	53	
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11.7.19	35,36	37
11.7.20	35,36	37
11.7.21	35,36	37
11.7.22	35,36	37
11.7.23	35,36	37
11.7.24	35,36	37
11.7.25	38,40,41	42,43,44
11.7.26	38,40,41	42,43,44
11.7.27	38,40,41	42,43,44
11.7.28	38,40,41	42,43,44

FES SECTION	Prepared by	Reviewer/Supervisor 1,2,3,plus
11.8.1	20	30,32
11.8.2	20	30,32
11.8.3	2,20	30,32
11.9.1	2	
11.9.2	2	
11.9.3	11	12
11.9.4	2	
11.9.5	2,35	37
11.9.6	50	
11.9.7	27	
11.9.8	8,9,16,25	
11.9.10	18,19,28,29	
11.9.11	46	
11.10.1	20	
11.10.2	28,29	
11.10.3	18,19	
11.10.4	1,2	
11.10.5	20	30,32
11.10.6	49,52	51
11.10.7	20	30,32
11.10.8	18,19	
11.10.9	18,19	
11.10.10	18,19	
11.11.1	35,36	37
11.11.2	35,36	37
		1,2,3,4,plus
11.11.3	35,36	37
11.11.4	35,36	37
11.11.5	35,36	37
11.12.1	40,41	
11.13	1,8,9,11,14,18,19,21,24	
Appendix D	34,36	37
Appendix E	40,41	43
Appendix H	25	

ATTACHMENT FOR INTERROGATORY #7

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
CLINCH RIVER BREEDER REACTOR PLANT PROJECT OFFICE
P. O. BOX U
OAK RIDGE, TENNESSEE 37830 File: 05.10

Docket No. 50-537

April 1, 1977

Mr. Roger S. Boyd, Director
Division of Project Management
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Boyd:

REVISED DESCRIPTION OF AND SCHEDULE FOR SITE PREPARATION ACTIVITIES TO BE CONDUCTED PURSUANT TO 10 CFR 50.10(e)(1)

Reference: Letter, D. R. Muller to P. S. Van Nort, dated June 4, 1974.

10 CFR 50.10(e) provides for the issuance by the Nuclear Regulatory Commission (NRC) of a Limited Work Authorization (LWA) to an applicant for a construction permit for a nuclear power reactor. In a letter to the Clinch River Breeder Reactor Plant (CRBRP) Project dated June 4, 1974 (Reference), the Directorate of Licensing (predecessor to NRC) provided guidance regarding material that will be needed in order for the Commission to consider whether or not to issue an LWA for the CRBRP. Following the letter's guidance, the CRBRP Project included with its application for a Construction Permit and Class 104(b) Operating License a description of and schedule for the work under 10 CFR 50.10(e)(1) that would be undertaken should an LWA be issued.

The "Schedule for and Description of Site Preparation Activities to be Conducted Pursuant to 10 CFR 50.10(e)(1)" submitted with the initial application October 15, 1974, has been revised by the Project. Forty-one copies of the revised description of and schedule for CRBRP LWA activities are enclosed. All the activities described which the Project presently anticipates would be performed in connection with an LWA fall under 10 CFR 50.10(e)(1). No activities falling under 10 CFR 50.10(e)(3)i are being requested at this time.

If there are any questions, please contact L. J. Kripps of my staff.

Sincerely,

Anthony R. Buhl
Assistant Director for Public Safety

PS:L:77:340

Enclosure:
Report (41)

cc w/encl: Service List
Standard Distribution
Licensing Distribution

CLINCH RIVER BREEDER REACTOR PLANT

Schedule for and Description of
Site Preparation Activities
to be Conducted Pursuant
to 10 CFR 50.10(e)(1)

U. S. Energy Research & Development
Administration
Project Management Corporation
Tennessee Valley Authority

Dated April 1977

1.0 INTRODUCTION

An updated description of and schedule for activities which the Clinch River Breeder Reactor Plant (CRBRP) Project presently anticipates would be performed under a Limited Work Authorization are included in Sections 2.0 and 3.0 below, respectively. This information was requested by the Directorate of Licensing (predecessor to the Nuclear Regulatory Commission) in a letter to the CRBRP Project dated June 4, 1974, and was previously submitted by the Project as part of the CRBRP license application on October 15, 1974. Specific information concerning these activities and their impact is contained in the Project's Environmental Report (primarily Section 4.1) and the PSAR (primarily Section 2.5 for excavation details).

2.0 DESCRIPTION OF ACTIVITIES

2.1 Site Clearing, Grubbing, Stripping, and Grading

That portion of the Clinch River Site required for location of temporary and permanent facilities will be cleared, grubbed, stripped, and graded. Clearing will consist of removing trees, brush, shrubs, down timber, rotten wood, rubbish, other vegetation, and other objectionable material. Grubbing will include removing stumps, boulders, roots, matted roots, organic materials, and debris. The stripping operations will include removal and storage of existing topsoil. And finally, grading will be done to achieve the required elevations.

Figure 2.1-1 shows the limits of the areas to be cleared, grubbed, stripped, and graded which will total approximately 205 acres (includes approximately 35 acres for on-site quarry and crushing facility).

2.2 Excavation and Filling

Excavation and filling will be done in the immediate vicinity of the main plant area to establish the design grade, permit the construction of access and temporary roads, provide laydown and storage areas, and to prepare for the primary excavation of plant structures. The principal excavations and associated activities such as dewatering will be conducted for the Reactor Containment Building (RCB), Reactor Service Building (RSB), Steam Generator Building (SGB), Intermediate Bay (IB), Auxiliary Bay (AB), Control Building (CB), Diesel Generator Building (DGB), Emergency Cooling Tower and Water Storage Basin and related pipelines, and all Balance of Plant (BOP) structures and piping. The estimated quantities of material to be excavated are shown in Table 2.2-1.

On completion of the excavation for the RCB, RSB, SGB, IB, AB, CB, and DGB, the foundation area will be covered by a coating of gunnite and fill concrete as necessary to prevent breakdown of the siltstone due to prolonged exposure. The excavation for the Turbine Generator Building will be backfilled to the desired elevation.

Excavation at the on-site quarry will commence to create a stockpile of concrete aggregate and Class A fill.

2.3 Construction of Temporary and Permanent Plant Facilities

The following temporary and permanent facilities are anticipated to be constructed under an LWA:

a. Access roads and temporary on-site roads.
b. Construction parking areas.
c. On-site railroad system and extension of existing railroad spur to the site.
d. Contractors' work and storage areas.

e. Utilities: (1) construction power and lights; (2) compressed air; (3) water (from Bear Creek Road Filtration Plant); (4) telephone; and (5) sewage treatment.
f. Concrete batch plant.
g. Sewage treatment plant and craft toilet.
h. Erection of construction facilities including offices, warehouses, shops, and visitors' overlook.
i. Fire protection system (will include portions of permanent system).
j. Site drainage system including holding ponds.
k. Barge unloading facility.
l. Borrow and stockpile areas.
m. On-site quarry and crushing facility (pending Final Project decision).

3.0 SCHEDULE

The sequence of activities to be conducted following NRC issuance of an LWA is provided in Figure 3.0-1. An actual date for receipt of an LWA is dependent upon the timely completion of the environmental and site suitability hearings. The schedule of activities will, however, commence immediately upon an LWA being granted.

LIMITS OF CLEARING & GRUBBING
CRBRP

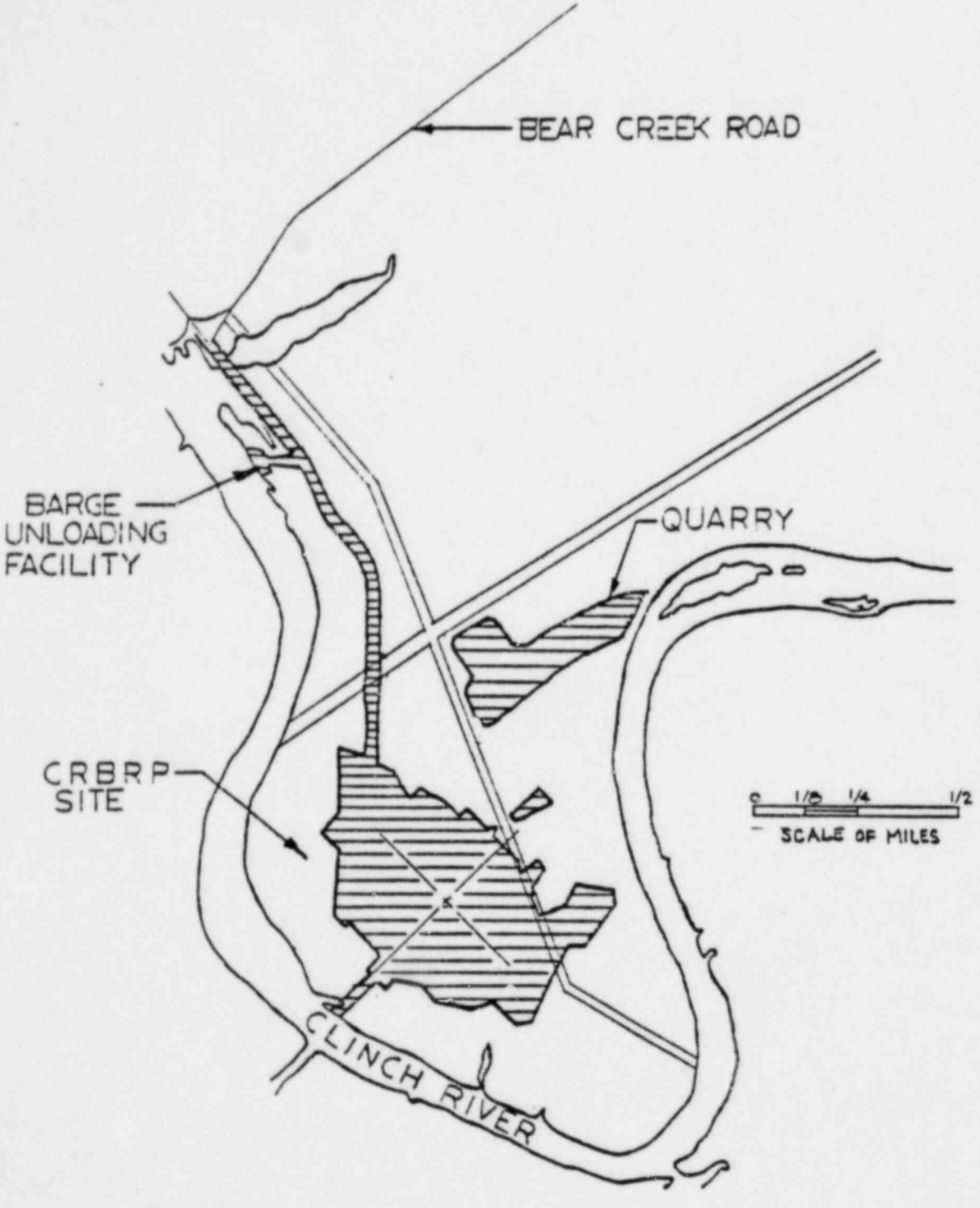


FIG. 2.1-1

TABLE 2.2-1

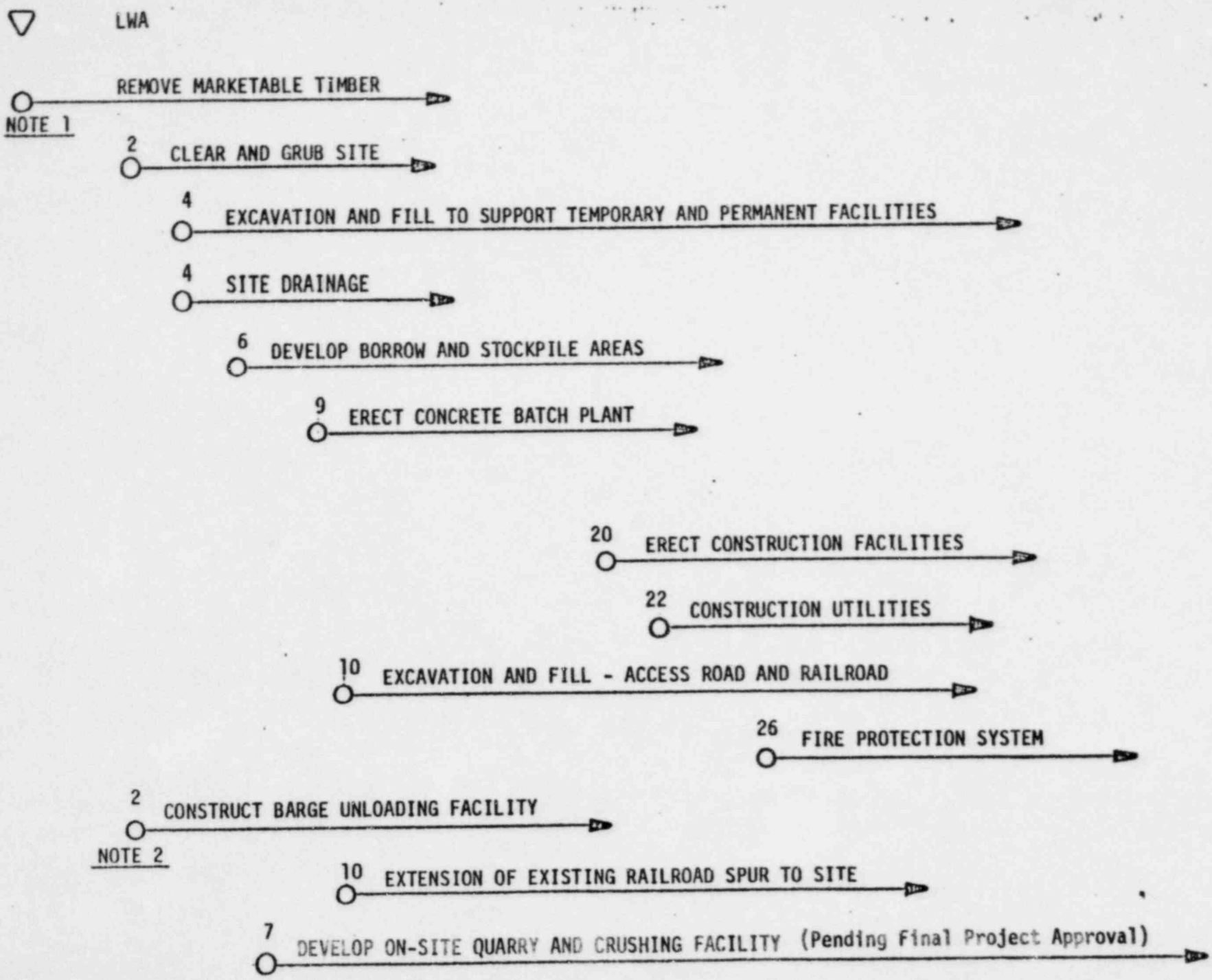
CLEARING, GRUBBING, AND STRIPPING OF TOPSOIL		∿ 205 acres**
EXCAVATION, AS FOLLOWS:	Common (overburden and weathered rock)	2,330,000 cy*
	Competent (sound) rock	791,000 cy*

*Excluding on-site quarry excavation.

**Includes ∿ 35 acres for the on-site quarry and crushing facility.

FIGURE 3.0-1, SEQUENCE OF ANTICIPATED LWA ACTIVITIES

NOTES: 1. 7○—DENOTES WEEKS BEYOND LWA
2. ENVIRONMENTAL RESTRAINT ALLOWS DREDGING FROM AUGUST TO MARCH



ATTACHMENT FOR INTERROGATORY #50

SITE SUITABILITY REPORT PREPARERS

I. INTRODUCTION AND SUMMARY	R. Starostecki, DPM
II. DESIGN CHARACTERISTICS	
A. Facility Design	A. Marchese, DPM
B. Fast Reactor Experience	J. Meyer, DPM J. Long, DPM
C. Key Aspects of the System Design	
1. Reactor Shutdown System	M. Tokar, CPB F. Litton, MTEB
2. Piping Integrity	S. Pawlicki, Chief, MTEB H. Holz, DPM F. Litton, MTEB
3. Fuel Failure Propagation	J. Meyer, DPM
4. Residual Heat Removal	R. Starostecki, DPM A. Marchese, DPM
D. Containment Design Considerations	
1. Sodium Hazards	J. Long, DPM
2. Dose Mitigation	J. Long, DPM T. Speis, Chief, LMFBR
3. Containment Design	P. O'Reilly, DPM F. Congel, RAB H. Holz, DPM T. Speis, Chief, LMFBR R. Starostecki, DPM
4. Accomodation of Core Melt	P. O'Reilly, DPM F. Congel, RAB H. Holz, DPM T. Speis, Chief, LMFBR R. Starostecki, DPM
III. GEOGRAPHY AND DEMOGRAPHY OF SITE ENVIRONS	
A. Site Discription	W. Bivans, Section Leader, HMB D. Bunch, Chief, AAB
B. Population Distribution	D. Bunch, Chief, AAB
C. Nearby Industrial	D. Bunch, Chief, AAB C. Farrell, AAB

D. Site Suitability Source Term	H. Holz, DPM F. Congel, RAB J. Meyer, DPM T. Speis, Chief, LMFBR R. Denise, Assistant Director D. Bunch, Chief, AAB R. Boyd, Director, DPM B. Rusche, Director, NRR
IV. PHYSICAL SITE CHARACTERISTICS	
A. Meteorology	E. Markee, Section Leader, HMB
B. Hydrology	R. Codell, HMB W. Bivans, Section Leader, HMB L. G. Hulman, Chief, HMB
C. Geology and Seismology	R. Jackson, Section Leader, GSB
D. Foundation Engineering	L. White, HMB L. Heller, Section Leader, HMB T. Yamashita, Corps of Engineers, L.A. District
APPENDIX A	A. Marchese, DPM

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
U.S. DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF JOHN K. LONG

I, John K. Long, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Nuclear Engineer, Research Systems Branch, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatories #2, #17 through #40, #48, #49 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

JOHN K. LONG

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF PAUL LEECH

I, Paul Leech, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Project Manager, Clinch River Breeder Reactor Program Office, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatories #5, #6, #7, #50 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

_____
PAUL LEECH

Subscribed and sworn to before me
this day of April, 1982.

_____
Notary Public
My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF MICHAEL KALTMAN

I, Michael Kaltman, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Regional Planning Analyst, Siting Analysis Branch, Division of Engineering, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatory #9 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

Michael Kaltman

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF EDWARD F. BRANAGAN, JR.

I, Edward F. Branagan, Jr., being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Radiological Physicist, Radiological Assessment Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatories #10, #13, and #14 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

Edward F. Branagan, Jr.

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF RICHARD BECKER

I, Richard Becker, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Reactor Engineer, Clinch River Breeder Reactor Program Office, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatories #2, #17 through #40, #48 and #49 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

Richard Becker

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF JOHN V. NEHEMIAS

I, John V. Nehemias, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Senior Health Physicist, Radiological Assessment Branch, Division of Systems Integration, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatories #11, #12, #15 and #16 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

John V. Nehemias

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY PROJECT MANAGEMENT CORPORATION TENNESSEE VALLEY AUTHORITY	)	Docket No. 50-537
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF HOMER LOWENBERG

I, Homer Lowenberg, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Chief Engineer, Office of Nuclear Material Safety and Safeguards.

2. I am duly authorized to participate in answering Interrogatory # 17a of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

HOMER LOWENBERG

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY PROJECT MANAGEMENT CORPORATION TENNESSEE VALLEY AUTHORITY	)	Docket No. 50-537
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF SIDNEY FELD

I, Sidney Feld, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as an Economist, Antitrust and Economic Branch, Division of Engineering, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatories #44, #45, #46 and #47 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

Sidney Feld
SIDNEY FELD

Subscribed and sworn to before me
this 27th day of April, 1982.

Patricia L Maloney
Notary Public
My Commission expires: 7/1/82

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNITED STATES DEPARTMENT OF ENERGY	)	Docket No. 50-537
PROJECT MANAGEMENT CORPORATION	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	
(Clinch River Breeder Reactor Plant)	)	

AFFIDAVIT OF RICHARD M. STARK

I, Richard M. Stark, being duly sworn, state as follows:

1. I am employed by the U.S. Nuclear Regulatory Commission as a Project Manager, Clinch River Breeder Reactor Program Office, Office of Nuclear Reactor Regulation.

2. I am duly authorized to participate in answering Interrogatory #50 of the 19th Set and I hereby certify that the answers given are true to the best of my knowledge.

RICHARD M. STARK

Subscribed and sworn to before me
this day of April, 1982.

Notary Public

My Commission expires: