50-30
50-185

National Aeronautics and
Space Administration

John H. Glenn Research Center
Lewis Field
Plum Brook Station
Sandusky, OH 44870

NOV 19 2001

Reply to Attn of: 0500

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-001

Subject: Response to Request for Additional Information (Teleconference August 24, 2001)

The following responses are affirmed under 28 USC Section 1746. On August 24, 2001, a teleconference was held between NRC (Mendonca, Dragoun, DiMiglio, and Hughes) and NASA Glenn Research Center's Plum Brook Station (Polich and Moyers). The NRC posed four specific questions in the form of a verbal Request for Additional Information (RAI) regarding NASA GRC's proposed Decommissioning Plan for Facility Operating License Nos. TR-3 and R-93 for the NASA Plum Brook Reactor Facility related to the Decommissioning Plan Revision-1, dated March 26, 2001.

Enclosed are the responses to your request for additional information as verified by a follow-up teleconference on September 21, 2001. Revised pages (Revision 2) to the Decommissioning Plan are also enclosed and incorporates these responses.

The enclosed responses are true and correct to the best of my knowledge and belief. I declare under penalty of perjury that the foregoing is true and correct. Executed on the 19th day of November, 2001.

Donald J. Campbell
Director

Docket Nos. 50-30 and 50-185

2 Enclosures

A020

cc: (w/enclosures)
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NASA Glenn Research Center

Response to the Nuclear Regulatory Commission's Request for Additional Information (October 2001)

Enclosure 1

NASA Glenn Research Center Response to the Nuclear Regulatory Commission's Request for Additional Information (October 2001)

1. **Issue**: Discuss back-filling below-grade portions of decontaminated structures and its sequential relationship to NRC confirmatory surveys and License Termination.

Action: Revise the following section of the Decommissioning Plan:

Section 1.2.1, page 1-23, second paragraph, rewritten to read as:

"After evaluating alternatives for decommissioning the PBRF, NASA selected the alternative to decontaminate the PBRF to terminate the NRC licenses without restriction to allow unrestricted use. In accordance with decontamination goals, radioactively contaminated soil and equipment would be removed and surfaces would be decontaminated. Only after NRC completes reviews of PBRF survey results and performs, analyzes and favorably reports the findings of Commission surveys to PBRF, will the project backfill below-grade portions of buildings and structures with both demolition rubble having no radiological contamination and clean fill. Excavations also will be backfilled with clean fill. It is anticipated that the project will require backfilling, incrementally over the course of the project, thereby requiring multiple NRC survey reviews and site visits."

2. **Issue**: Discuss the presence of man-made isotopes in both the Pentolite Ditch and Plum Brook in terms of their relationship to the PBRF decommissioning and their proposed release from regulatory controls.

Action: Revise the following section of the Decommissioning Plan:

Section 2.2.2.4, page 2-15, add new fifth and sixth paragraphs:

Pentolite Ditch

"The presence of low concentration, man-made radionuclides in Pentolite Ditch are believed to be the result of effluent releases during PBRF operations. Sample results indicate that the external exposure pathway for the radionuclides in soil and sediment is controlling dose (and DCGL calculations) at PBRF outdoor locations. Sensitivity analyses indicate that an additional contaminated area such as Pentolite Ditch (6700 m^2) will not impact the DCGLs in the Decommissioning Plan, given the large area (102400 m^2) of the PBRF site used to derive the project's DCGLs. Soil and/or sediment locations associated with Pentolite Ditch that contain concentrations above the DCGLs will be remediated. An environmental monitoring Lower Limit of Detection (LLD) of 1 pCi/g Cs-137 in

sediment and soil from Pentolite Ditch will ensure detection of radionuclide contamination well below the DCGLs presented in the Decommissioning Plan."

Plum Brook

"No man-made radionuclides have been identified in Plum Brook above 1 pCi/g. An environmental monitoring Lower Limit of Detection (LLD) of 1 pCi/g Cs-137 in sediment and soil from Plum Brook will ensure detection of radionuclide contamination well below the DCGLs presented in the Decommissioning Plan."

3. **Issue**: Insure the Training Program includes training on the Quality Assurance Program as stated in other parts of the Decommissioning Plan.

Action: Revise section 2.5, "Training Program", page 2-70 in the following manner:

Add new point in third paragraph, as the 23rd un-numbered bullet:

"Quality Assurance principles and requirements"

4. **Issue**: Remove the reference to "Emergency Plan" in section seven of the Decommissioning Plan since NASA has no requirement for "Emergency Planning" as defined in 10 CFR 50 Appendix E. The procedures are for industrial emergencies.

Action: Revise section 7, "Emergency Plan", page 7-1 in the following manner:

Replace fourth paragraph in section 7 with the following:

"While no emergency plan is required to deal with accidents involving fuel, a program for conventional emergencies has been put in place. These procedures address the responsibilities of all parties and the proper actions for a variety of situations, including:"

ENCLOSURE TO DECOMMISSIONING PLAN (REV-2)

FACILITY LICENSE NOS. TR-3 AND R-93

Replace the following pages of the Decommissioning Plan with the enclosed pages. The revised pages are identified by revision number and contain a vertical line indicating the area of change.

Remove Pages	Insert Pages
1-23	1-23
2-15	2-15, 2-15a
2-70,2-71	2-70, 2-71
7-1	7-1

Alternatives for terminating the PBRF license were analyzed using previous engineering studies. Confirmatory measurements of contamination at the PBRF were also made to confirm the earlier sample measurements. This characterization information is discussed in Section 2.2.2.1.

1.2.1 Reactor Decommissioning Overview

The PBRF is currently in protective safe storage under two possess-but-not-operate NRC licenses: (1) license TR-3 for the main test reactor and (2) license R-93 for the mock-up reactor. The PBRF is presently shut down; building entries are locked and buildings are contained within a locked fence. All process lines, including the primary cooling water system, have been drained, flushed, and isolated. The reactor fuel element assemblies, special nuclear material, and source material have been removed from the site. The reactor tank internals and waste in the Hot Dry Storage Area of the Hot Laboratory contain most of the radioactivity. Other than these areas, the remaining residual radioactivity at the PBRF is confined generally within equipment and piping. Much lower (several orders of magnitude lower) levels of radioactivity are contained in the support facilities. Characterization surveys show that environmental contamination is primarily in the Emergency Retention Basin, with lower levels in the Water Effluent Monitoring Station, Pentolite Ditch, and a spill area.

After evaluating alternatives for decommissioning the PBRF, NASA selected the alternative to decontaminate the PBRF to terminate the NRC licenses without restriction to allow unrestricted use. In accordance with decontamination goals, radioactively contaminated soil and equipment would be removed and surfaces would be decontaminated. Only after NRC completes reviews of PBRF survey results and performs, analyzes and favorably reports the findings of Commission surveys to PBRF, will the project backfill below-grade portions of buildings and structures with both demolition rubble having no radiological contamination and clean fill. Excavations also will be backfilled with clean fill. It is anticipated that the project will require backfilling, incrementally over the course of the project, thereby requiring multiple NRC survey reviews and site visits.

Buildings within the PBRF fence will be demolished and excavations and below grade areas will be backfilled and the areas covered. The major decommissioning tasks will include:

- Removing friable asbestos and lead paint
- Removing reactor internals and tank
- Removing the activated material in the Hot Dry Storage Area
- Removing loose equipment, fixed equipment and components, and piping in buildings and underground areas
- Removing activated portions of the concrete biological shield and other areas of contaminated concrete inside and outside of buildings
- Removing embedded piping (i.e., piping embedded in concrete)

- Removing contaminated soil and either leveling or backfilling the areas
- Conducting final status surveys of all affected areas after decontamination to verify that radioactive material has been removed to below the license termination criteria
- Demolishing the above grade portions of decontaminated buildings and other structures
- Backfilling the below grade portions of decontaminated buildings and in-ground structures
- Submitting reports to NRC that demonstrate compliance with the license termination criteria.

Cs-137 (4 to 11 pCi/g) and Co-60 (1 to 4 pCi/g). Table 2-4 compares the 1985 and 1998 survey results for the Water Effluent Monitoring Station building.

Table 2-4. Summary of Survey Results for the Water Effluent Monitoring Station (1192)

Building/ Structure	Summary of 1985 Characterization Survey Results	1998 Confirmatory Survey	
		No. of Survey Measurements	Results
Water Effluent Monitoring Station (1192)	• Loose alpha contamination ranging from 0 to 2 dpm/100 cm^2 • Loose beta-gamma contamination ranging from 0 to 48 dpm/100 cm^2 • Direct radiation levels ranging from 0.004 to 0.04 mR/hr	• 8 direct beta measurements • 8 smears	• Three measurements were about 15,000 dpm/100 cm^2 • All others were less than 5000 dpm/100 cm^2

Pentolite Ditch

The Pentolite Ditch received all water from the Water Effluent Monitoring Station. Up to 30 cm (12 in.) of silt and soil in some areas along the Pentolite Ditch are radioactively contaminated. The contamination occurs primarily at the western end (near the Water Effluent Monitoring Station outfall), with a smaller amount near the eastern end (near the confluence with Plum Brook).

For the 1985 characterization, the Pentolite Ditch was divided into 9.1- × 9.1-m (30- × 30-ft) grids. A contact beta-gamma survey was performed at the center and four surrounding points in each grid. A silt sample was then collected at the center point and a soil sample was collected at the surrounding point that had the highest contamination level. The survey results indicated that portions of the ditch nearest the Emergency Retention Basin (i.e., the west end) and nearest Plum Brook (i.e., the east end) were contaminated with higher levels of contamination than in the other portions of the ditch. Samples from four shallow (3 m [10-ft]) cores indicated that contamination was confined to depths less than 15 cm (6 in).

Sampling indicated that soil from the bottom and the banks of the Pentolite Ditch had average gross beta activities of 40 and 110 pCi/g, respectively.

During the 1998 confirmatory survey, eight sediment samples were collected along the Pentolite Ditch. The analytical results showed that the total activity in the samples ranged from 10 to 30 pCi/g. Most of the activity is from natural K-40; the residual activity from Cs-137 ranged from 2 to 15 pCi/g and from Co-60 from 0 to 1 pCi/g. The 1998 average concentration (about 20 pCi/g) is lower than that measured in 1985 (75 pCi/g). This decrease could be due to several factors, including decay, fewer sample locations, and irregular distribution of the contamination.

"The presence of low concentration, man-made radionuclides in Pentolite Ditch are believed to be the result of effluent releases during PBRF operations. Sample results indicate that the external exposure pathway for the radionuclides in soil and sediment is controlling dose (and DCGL calculations) at PBRF outdoor locations. Sensitivity analyses indicate that an additional contaminated area such as Pentolite Ditch (6700 m^2) will not impact the DCGLs in the Decommissioning Plan, given the large area (102400 m^2) of the PBRF site used to derive the project's DCGLs. Soil and/or sediment locations associated with Pentolite Ditch that contain concentrations above the DCGLs will be remediated. An environmental monitoring Lower Limit of Detection (LLD) of 1 pCi/g Cs-137 in sediment and soil from Pentolite Ditch will ensure detection of radionuclide contamination well below the DCGLs presented in the Decommissioning Plan."

Plum Brook

"No man-made radionuclides have been identified in Plum Brook above 1 pCi/g. An environmental monitoring Lower Limit of Detection (LLD) of 1 pCi/g Cs-137 in sediment and soil from Plum Brook will ensure detection of radionuclide contamination well below the DCGLs presented in the Decommissioning Plan."

a) Be knowledgeable in radiation hazards and radiation protection.

b) Have successfully completed an orientation on the PBRF and the Decommissioning Project, as provided by the Reactor Manager/Decommissioning Project Manager.

2.1 Training Program

This section describes the training program that will be used during decommissioning of the PBRF. All field personnel (NASA and contractors) assigned to work at the PBRF will meet NASA training and certification requirements and applicable regulatory requirements. NASA employees and contractors will receive training on the decommissioning plan. More specific training for workers will be commensurate with their duties and responsibilities and the magnitude of the potential exposure to direct radiation and contamination. The objectives of training are five-fold: (1) provide workers with information about radiologically and chemically hazardous substances, sources and types, exposure routes, and effects, (2) provide information on the radiation protection program for the decommissioning activities to enable each worker to comply with safety and health rules and to properly respond to all conditions, (3) provide instruction in the fundamentals of radiation and chemical protection to enable workers to meet ALARA objectives, (4) provide information and training on personal protection equipment, monitoring instruments, and equipment available and how to use them, and (5) instruct workers about applicable Federal, State, and PBRF radiation protection rules concerning safety and health.

The NASA Decommissioning Project Manager will prepare a policy on the personnel training program and will maintain training records. The Project Radiation Safety Officer will participate in developing and approving training programs related to work involving radiation exposure. The PBRF Decommissioning Safety Committee will approve the safety training standards for PBRF workers.

All personnel assigned to work at PBRF will be given instruction in the fundamentals of radiation protection annually. The degree of instruction will be determined by work assignment and will ensure that workers understand how radiation protection relates to their jobs. The minimum training provided to any worker will include, but not necessarily be limited to, the following subjects:

- Principles of radiation protection
- Radiation monitoring techniques
- Radiation monitoring instrumentation
- Emergency procedures
- Radiation hazards and controls
- Concepts of radiation and contamination
- Provisions of 10 CFR Parts 19 and 20
- NRC license conditions and limitations

- Responsibilities of workers and supervisors
- Reporting requirements for workers
- Exposure control procedures
- Biological effects of radiation
- Radiation control zones procedures
- Radiation Work Permits
- Job Safety Analysis
- Environmental requirements and procedures including air, water, and soil
- Environmental management procedures
- Solid and hazardous waste management
- Confined space entry awareness
- Lead awareness
- Asbestos awareness
- Hazardous materials awareness
- Quality Assurance principles and requirements

Personnel will also be instructed in NASA's management commitment to implement ALARA, what ALARA means, why it is important, and how they implement it on their jobs.

Copies of applicable Federal regulations and PBRF radiation protection rules will be given to each worker. Workers will be tested upon the conclusion of training and retested on their understanding of the training each year.

Records of individual training and qualifications will be maintained and will include the trainee's name, training date, subjects covered during training, equipment for which training was received, written test results, and the instructor's name.

The Executive Safety Board (Figure 2-7) will be responsible for ensuring that the Decommissioning Safety Committee or Audit Team conducts reviews or audits so that certification requirements and minimum standards are met and for personnel training and certification documentation are proper and consistent with applicable requirements.

Contractors will be properly trained and properly licensed in their areas of expertise. In addition, they will receive the general training identified earlier in this section. For example, contractors performing asbestos abatement and disposal services will be trained in accordance with 29 CFR 1926.1101, 29 CFR 1910.1001, 40 CFR 61.140 – 61.157, and Chapter 3701-34 of the Ohio Administrative Code, as applicable. Contractors performing lead paint abatement services will be trained in accordance with 29 CFR 1926.62(e).

7. EMERGENCY PLAN

This section reviews the PBRF licensing history with respect to emergency plans and provides information that supports the conclusion that developing an emergency plan to support decommissioning activities is not required.

The PBRF has been in a standby mode for over 25 years. The facility was shut down in 1973 and the reactor fuel assemblies, all special nuclear material, and source material were removed; the fuel assemblies were transferred off site and much of the facility was decontaminated (NASA 1980b). An emergency plan was not prepared to support NRC-authorized demolition in 1981 (NRC 1981b) nor to support the change in the license status to a possession-not-operate status in 1987 (Dosa 1987). The NRC license was renewed in 1998 with no formalized emergency plan. Technical specifications, issued as part of the 1998 license renewal, require emergency procedures for emergencies arising from fire, floods, and tornadoes and procedure approval by the PBRF Safety Committee (Mendonca 1998).

Section 3.3 of this plan presents a conservative accident analysis that shows offsite impacts are much less than the 15 mrem whole body dose identified as the lowest action level in Table 1 of ANSI/ANS 15.16-1982, "Emergency Planning for Research Reactors." The offsite doses for the accident analysis are low for two reasons. First, the radionuclide inventory at PBRF is limited because the fuel has been removed and much of the facility has been decontaminated. Second, the operations associated with decontamination and decommissioning (localized cutting and decontamination of surfaces) are not the type that would result in large releases of material into the atmosphere.

While no emergency plan is required to deal with accidents involving fuel, the established and procedures for conventional emergencies has been enhanced. These procedures address the responsibilities of all parties and the proper actions for a variety of situations, including:

a) Medical Emergencies (including a contaminated injured worker)
b) Fire (in both radiological and non-radiological areas)
c) Severe Weather
d) High Airborne Radioactivity
e) Spills
f) Evacuation
g) Earth Quake

NASA has coordinated the response to various emergencies with the local community emergency responders, including the hospitals, police, and fire departments. Training sessions have been held. Formal written agreements have been signed as well to document the nature of support to be provided.