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USEPA TECHNICAL REVIEW OF THE INITIAL REMEDIAL MEASURES PLANS SUBMITTED PURSUANT TO SECTION 1, COMPLIANCE PLAN

06/02/87

USEPA/DOE-FN
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LETTER

[redacted]

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

3439

REPLY TO THE ATTENTION OF:
5RA-14

JUN 0 2 1987

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

James A. Reafsnyder
United States Department of Energy
Oak Ridge Operations
P.O. Box E
Oak Ridge, Tennessee 37831

Dear Mr. Reafsnyder:

The United States Environmental Protection Agency (U.S. EPA) has completed its technical review of the initial remedial measures plans submitted pursuant to Section 1, Compliance Plan of the Federal Facility Compliance Agreement (FFCA). The detailed review was completed by PRC Environmental Management, Inc., and has received concurrence by U.S. EPA. The United States Department of Energy should modify the existing plans to incorporate PRC's findings and recommendations found in Attachment I.

Please submit the revised plans within thirty (30) days of receipt of this letter. If you have any questions, please contact Mr. William D. Franz, Chief, Environmental Review Branch at (FTS) 886-7500.

Sincerely yours,

Valdas V. Adamkus

Valdas V. Adamkus
Regional Administrator

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1.0 INTRODUCTION

PRC Environmental Management, Inc., received a work assignment from the U.S. EPA, Region 5 under the Technical Enforcement Support (TES) III contract to review documents prepared by U.S. Department of Energy (DOE) for the Feed Materials Production Center (FMPC) in Fernald, Ohio. The objective of reviewing the documents is to evaluate DOE's compliance with the Federal Facility Compliance Agreement (FFCA) that it signed with U.S. EPA.

PRC first reviewed the Federal Facility Compliance Agreement (FFCA) dated July 18, 1986, to understand the agreements between U.S. DOE and U.S. EPA. PRC then reviewed the following two documents prepared by U.S. DOE to determine if they complied with the requirements specified in the FFCA.

- Response to Item 1A of CERCLA Section, FFCA, September 16, 1986.
- Response to Item 1B of CERCLA Section, FFCA, August 17, 1986.

Response to Item 1A is related to FMPC operation and maintenance procedures of air pollution control equipment and work practice to control radioactive emissions from production material and the on-site waste storage facility to maintain all exposures as low as reasonably achievable (ALARA).

Response to Item 1B is related to a plan and implementation schedule to conduct interim remedial measures concerning two K-65 silos and thorium compound storage structures (plant 8 silo and bins). PRC understands these interim remedial measures will be maintained until such time as a long-term plan for the control and disposal of radium-bearing wastes and thorium compounds is developed and implemented.

These two documents are summarized in Section 3.0. The following additional documents were briefly reviewed to use as guidance or background material:

- Structural drawings of the K-65 silos and thorium storage structures
- Environmental Monitoring Annual Report for 1985, FMPC, May 30, 1986

- Response to Item G of Clean Air Act Section, FFCA, October 16, 1986
- 10 CFR 40.32(c), General Requirements for Issuance of Specific License
- 10 CFR 50, Appendix E, Emergency Planning and Preparedness for Production and Utilization Facility
- 40 CFR 112.7, Guidelines for the Preparedness and Implementation of a Spill Prevention Control and Countermeasures Plan
- Investigation of April 25, 1986 Radon Gas Releases from Feed Materials Production Center K-65 Silos, prepared by DOE Incident Investigation Board, June 27, 1986

2.0 SITE BACKGROUND

FMPC is a government-owned, contractor-operated facility located in Fernald, Ohio. The facility began operations in 1952 and was operated by National Lead of Ohio until early 1986. Westinghouse Materials Company of Ohio (WMCO) currently operates the facility for DOE. FMPC operations cover approximately 136 acres in the center of a 1050-acre site (see Figure 1).

The primary function of the FMPC facility is to manufacture metallic uranium fuel elements and target cores and other uranium products for use in production reactors operated for the U.S. DOE. In prior years, thorium was also processed. As a result of these processes, the plant has generated both radioactive and nonradioactive hazardous waste. The principal radionuclides present in waste materials generated by FMPC include uranium-238 (U-238), U-235, and thorium-232 (Th-232) with their respective decay chain daughter nuclides. Plutonium and fission products may also be present in the wastes.

Approximately 1700 curies of radium-bearing wastes are stored in two K-65 silos that are structurally unsound and are leaking radon and radon-decay products to the environment. Up to 350 metric tons of thorium are currently stored in a silo that also is structurally unsound. Failure of these structures would

FIGURE 1
SITE MAP

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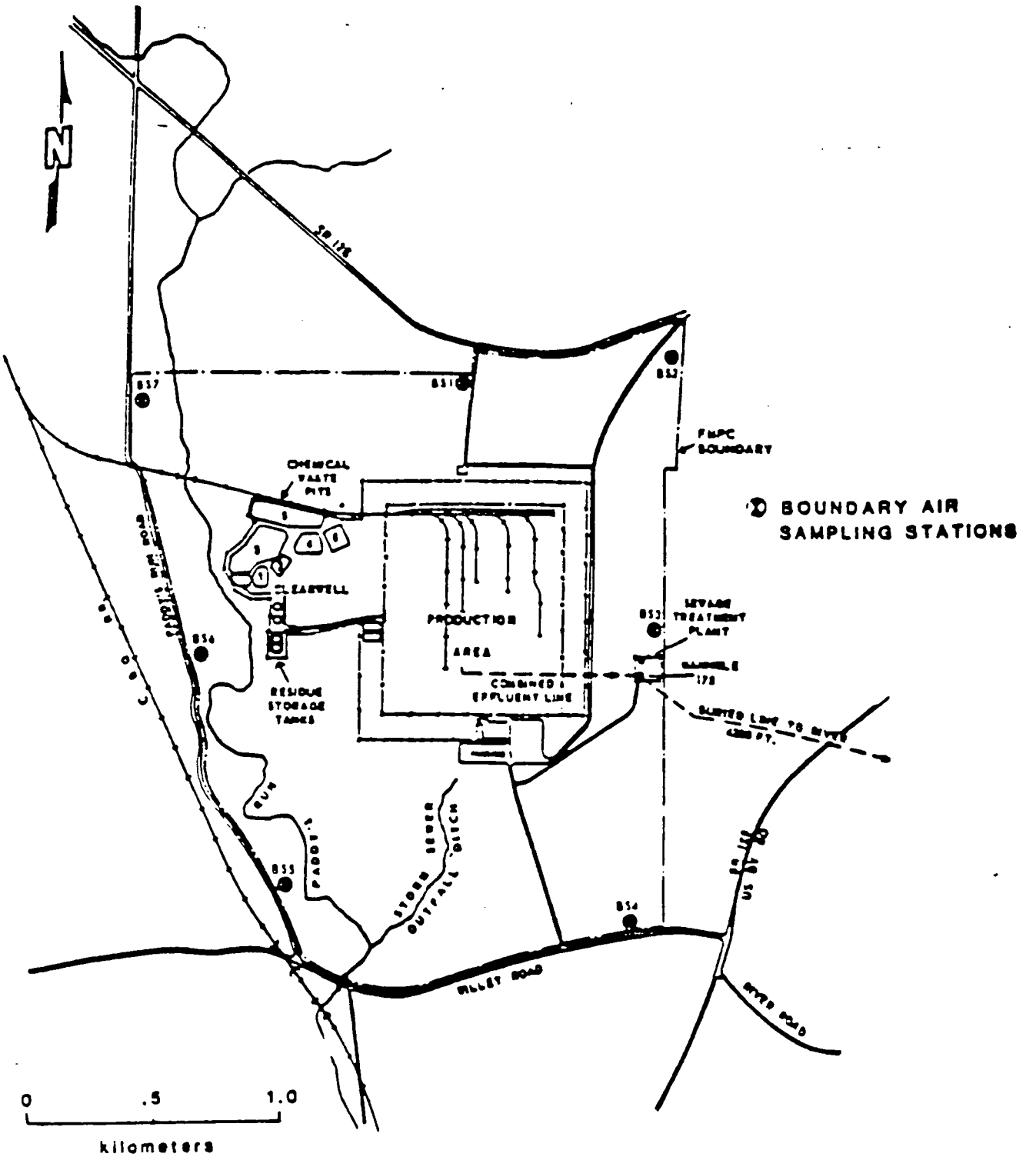

NOTE: Figure reproduced from Environmental Monitoring Environmental Report for 1985, FMPC

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release radioactive thorium compounds into the environment at levels that could be harmful to the surrounding communities.

On July 18, 1986, U.S. EPA and DOE signed a Federal Facility Compliance Agreement (FFCA) for the FMPC facility to achieve compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and Clean Air Act (CAA). In addition, DOE will conduct a remedial investigation/feasibility study to determine the presence, concentration, and extent of any contamination and the appropriate remedial measures to be taken.

3.0 SUMMARY DESCRIPTION OF DOCUMENTS

To respond to Items 1A and 1B under "CERCLA Actions" of the FFCA, the U.S. DOE submitted two reports to EPA. The following sections summarize the two reports.

3.1 RESPONSES TO ITEM 1A

This report describes the FMPC operation and maintenance procedures for the dust collector and partial administrative policies to control radionuclide emissions from production operations and on-site waste storage facilities. This report states that the site has 203 emission points that have the potential to release radionuclides to the atmosphere. These emission points consist of vents from process storage vessels or hoods, stacks controlled by dust collectors, and wet scrubber stacks. Each production plant has standard operating procedures for the dust collectors in that building. These procedures describe the operation and inspections required for each dust collection device. In addition, separate procedures describe the manner in which maintenance is performed on each of these devices.

Attached to this report is a copy of FMPC's Standard Operating Procedure for Plant 4 Dust Collector (SOP 4-C-701) to show an example of the facility's procedures. The report also contains copies of periodic inspection reports for dust collectors (DC-4) and reports on changing bags in American Air Filter type dust collectors (43-C-7702). These documents serve as examples of FMPC's procedures for changing collector bags, routine maintenance, and preventive maintenance.

3.2 RESPONSES TO ITEM 1B

This report describes an interim control plan and implementation schedule, developed as part of the FFCA, to address the initial remedial measures required for the K-65 silos and the thorium storage structures. Remedial measures include: controlling radioactive emissions, including radon gas and decay products emissions; providing interim control to ensure the structural integrity of the containment structures; developing radon and decay products monitoring program for the fence line and off-site environs; and establishing measures to be undertaken in the event of an unplanned release to the environment.

To control radon gas and radon decay product emissions from the K-65 silos, various control measures are being considered and evaluated. Options under consideration include the following: a gas containment bag, water column absorption, solid media adsorption, and compressed tank storage. Actions to control emissions from the thorium compound storage structures include installing filtering devices and repackaging and/or over-packing the thorium compounds to make them suitable for long-term storage.

Remedial measures to ensure the structural integrity of the K-65 silos include installing center dome covers (completed February 1, 1986) and a fluid applied roofing system (in progress). Remedial measures recommended by Camargo Associates are in progress to ensure the structural integrity of the silo that contains thorium compounds. Other structures (storage bins) that contain thorium compounds have not been found to have structural deficiencies.

The radon and decay product monitoring program consists of a network of monitors surrounding the K-65 silos, at various locations along the site boundary, and at different site-specific locations.

This report also includes the site-wide emergency procedures to be followed in the event of a radioactive release from the K-65 silos and the thorium compound storage structures. The actions of this plan are intended to protect the health and safety of on-site and off-site personnel, limit or reduce any possible damage to the environment, and contain and recover any released radioactive material.

4.0 DOCUMENTS REVIEW

PRC reviewed the two reports prepared by the DOE for the FMPC facility. Our comments on these two reports are presented in the following sections.

4.1 OVERALL EVALUATION

PRC reviewed DOE's responses to Items 1A and 1B of the CERCLA Section of the FFCA to determine whether they meet the objectives stated in the agreement. We found them to be incomplete with regard to certain issues discussed below. The FFCA calls for FMPC to develop effective operation and maintenance procedures and work practices that will control radioactive emissions from production materials and from on-site wastes and that will maintain all exposures as low as reasonably achievable. In the Executive Summary of its report (response to Item 1A), U.S. DOE stated that its response to Section G of the Clean Air Act Section of the FFCA contains a detailed discussion of the operation and maintenance procedures for air pollution control equipment. PRC used this response to Section G as a reference throughout our review of the response to Item 1A.

The criteria that PRC used to review the response to Item 1A were (1) whether an operator can operate the emission control equipment by following the operation procedures described in the response, (2) whether the organizational structure and quality assurance procedures will ensure that the operators follow the approved operation and maintenance procedure, and (3) whether the operation and maintenance procedures are proper for the equipment in the facility.

PRC could not conduct a complete review of the effectiveness of the operation and maintenance procedures and work practices and of the structural integrity of the K-65 silos because DOE's response is incomplete. The response to Item 1A consists of three sections: the response, Attachment 1, and Attachment II. As a minimum, the following four items must be included in the response to the FFCA.

First, the response did not include a comprehensive operation and maintenance management program (plan), which is required under the FFCA. This program (plan) must consist of essential elements of an effective operation and maintenance program. These elements include management roles and control, operation and

maintenance organization, personnel training requirements, job descriptions and qualifications, quality assurance procedures, procedures for issuing work orders, procedures for monitoring performance of work, disciplinary policy for nonconformance with procedures and regulations, health and safety planning and policy, and record keeping procedures. This program must address the concerns and deficiencies stated in the June 27, 1986 report, "Investigation of April 25, 1986 Radon Gas Release From Feed Materials Production Center K-65 Silos," issued by the DOE Incident Investigation Board. For example, according to the report, 40 percent of the past maintenance work tasks were performed without proper authorization. DOE must describe management control and procedures that will stop all unauthorized maintenance work.

Second, the response did not address the issue of spill prevention and containment for critical areas such as the K-65 silos and thorium storage area. FMPC must prepare a spill prevention and containment plan, including items such as emergency response procedures, documentation, reporting requirements to governmental agencies and plant management, and public communication policy.

Third, the interim operation and maintenance procedures for the K-65 silos, thorium storage structures, and other critical areas were not included in the response. These interim measures are required to control the radioactive emission from the critical areas throughout the plant before all remedial measures are completed.

Fourth, DOE must describe its intent in preparing and submitting detailed operation and maintenance procedures for the K-65 silos and thorium storage structures upon selection of a remedial alternative. These operation and maintenance procedures must be considered in the selection of the appropriate remedial measure.

For the response to Item 1B, DOE must prepare and submit to EPA two structural analytical reports and associated relevant drawings for the K-65 silos that PRC recommended (see page 19, Section 5.0 of this report for details).

These comments must be addressed by DOE in the next submittal. This additional information will allow PRC to conduct a complete review of the

effectiveness of the operation and maintenance procedures and the structural integrity of the K-65 silos.

4.2 SPECIFIC DEFICIENCIES IN RESPONSE TO ITEM 1A

Our review comments regarding this document are presented in the same order as the response. DOE submitted its report in three sections: the response, Attachment I, and Attachment II. PRC's comments on the first two sections are divided into two subsections: general comments which identify the overall deficiencies, and specific comments or questions.

4.2.1 Response

This section of DOE's report discusses the overall operation and maintenance approach for the FMPC production and on-site storage facilities.

General Comments

- Table 1 does not adequately describe all potential air emission points and the emission control devices for each point. The table lists emission points by number but provides no description of any of the points. The table also suggests that emissions from many points, such as vents, are uncontrolled. FMPC states that these are minor emission points and that it will only conduct annual random air sampling of these points. U.S. DOE did not provide justification or data to support this approach. In addition, the table identifies scrubber systems for some emission points, but the text did not discuss any of these scrubber systems. Without a more complete description of radionuclide emission points and controls, it is impossible to evaluate the information in Table 1, nor is it possible to determine whether DOE's control practices are adequate.

- No evidence was presented in either the response to Item 1A or 1B to show that DOE complies with the emission standards in 40 CFR 61.92. Item A under the Clean Air Act Section of the FFCA (page 15) requires DOE to comply with these National Emission Standard for Hazardous Air

Pollutants (NESHAP). In this response, DOE should either provide this information or reference other documents that address this requirement. 3439

- Item F under the Clean Air Act Section of the FFCA requires DOE to provide, within 60 days, "a list of all environmental air monitoring equipment, including their location and the operation and maintenance (O & M) program designed to maintain the monitors at peak efficiency." Table 1 in the response provides some of this information but does not satisfy all the requirements of Item F. In this response, DOE should either provide this information or reference other documents that address this requirement.

- This report should describe the minimum qualifications, including training and experience requirements, for the operator of the dust collector equipment. Experienced operators who are familiar with the equipment or trained operators who have completed training on the operation of the specific equipment may be able to operate a piece of equipment with just an outline of operation procedures, such as those presented in this report. However, a more detailed operating procedure should be available as reference and aid in operating the equipment.

- This report should provide specifications such as capacity, type of filter, horsepower, and model number for each piece of equipment related to control of radioactive emissions. This type of information will be useful for maintaining an inventory of critical spare parts of the equipment, ordering spare parts, and determining the efficiency of the operation.

- DOE did not discuss the policy and structure within its organization and quality assurance program which will ensure the operating and maintenance procedures that will be followed by its employees.

- DOE did not provide a brief description of various dust collector systems, including source of air, special design features of the unit, and relationship with other systems, if any. This type of information will provide the operator with the operational objective of the equipment and overview of the design of the equipment.

Specific Comments

- o Discussion
  - This section states that there are 203 emission points at FMPC. However, Table 1 lists more than 203 emission points (Page 1, Paragraph 1).
  - DOE should include a copy of the Plant Test Authorization (PTA) (Page 2, Paragraph 5).
- o Conclusion
  - In this section of the report, DOE states that differential pressure monitors will be inspected once per shift, which is inadequate. Page 8 of the response to Item G of the Clean Air Act Section states that the monitors will be checked every hour. This inconsistency requires clarification.

4.2.2 Attachment I

In attachment I, DOE provides a sample SOP for dust collectors in Plant 4.

General Comments

- o The operating procedures described in the SOP appear to be an outline and do not list detailed step-by-step procedures for the operation of various components and instruments of the dust collector. This procedural outline will be useful to experienced operators who are familiar with the operation of various components of the collector, but detailed step-by-step procedures should be available for training and reference. If detailed procedures are addressed in other documents, DOE should at least reference them here.
- o The starting procedures for similar types of equipment are different, such as those for G-4-12 and G-4-13 dust collectors. The response did not explain the reason for the different procedures. DOE should provide a

brief description of each system to explain the different operating procedures.

- The shutdown instructions for the 11 dust collectors do not direct the operator to notify the other operators of areas that the dust collector serves to shut down operation. However, the operator emergency shutdown instruction directs the collector operator to notify the affected service area to shut down. These different approaches require clarification.

- The locations of the motor control circuit, instrumentation control circuit, and instrumentation and controls for each collector need to be identified.

- The response needs to state that the motor control panel, which powers the motors of various components of the system, should be tagged "Out of Service" for equipment maintenance.

- DOE does not describe the starting procedures for the differential pressure recorder and controller, nor does it describe the procedures used to set the set points for differential pressure recorder and controller.

- The report should describe the startup and shutdown sequences of the various components of the collector and identify the interlock and fail-safe features of the collector.

- If there is another position, such as "Manual," on the "Auto" selector switch, DOE should describe the different mode of operation. PRC could not determine if the dust collector is running when the selector switch is being set on "Auto" since the "Start" pushbutton of the exhaust blower has been pressed already.

- The report should clarify whether the operator could be exposed to dust during visual inspection of drums during filling.

In each of the following areas, DOE should revise its report as noted.

- o Description of operation and equipment
  - Add "Manufacturer" as the heading for the second column on Table 1 (page 1).
  - Insert "None" in the "Associated Collector" column on Table 1 if there is none (page 1).
- o Industrial Health and Safety Requirements
  - Identify the approved model numbers for the specific type of cartridges to be used on the respirator (page 3, step 6).
  - Clarify whether the respirator is a full-face piece or half-mask (page 3, step 6).
  - Clarify whether the "buddy system" is applicable when entering the bag house enclosure (page 3, step 11).
  - Identify the followup actions, if any, after the filing of a minor event report (page 3, step 13).
- o Procedure
  - Clarify whether the operator is to check the alarms or the high and low differential pressure settings (page 3, step 1.1).
  - Identify the recorder chart (the description implies it is the differential pressure recorder and controller chart) (page 3, step 1.1).

- Describe the shakedown procedures and state how long shakedown should last.

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- Describe the procedures for checking the instruments (page 4, step 2.1.1).

- Describe the procedures for adjusting the flow to the stack sampler (page 4, step 2.4).

o G-4-1 Wheelabrator Dust Collector

- Describe the operation of the shaker cycle. State whether the cycle is controlled by a timer that can be adjusted by the operator and how the operator can determine if the shaker cycle is complete (Page 5, step 3.6.9).

- Describe the procedure for checking the dust level in the hopper. State whether there is a sight-glass (Page 5, step 3.6.10).

o G-4-2 Turner - Haws Dust Collector

- Describe the starting procedures and the normal operating sequence of the screw conveyor and rotary valves (page 6, step 4.4).

- Insert the high setting on Table 2 for G-4-1 (page 7).

o G-4-4 Turner - Haws Dust Collector

- Clarify whether the rotary valve should be shut when replacing the filled drum with an empty drum (page 8, step 5.8.6).

o G-4-5 Turner - Haws Dust Collector

- Clarify the statement "Start collector G-4-11 per paragraph 11" (page 9, step 6.5.1) Paragraph 11 is for G-4-13.

- G-4-7 Turner - Haws Dust Collector

  - Describe the starting procedures for plenum temperature recorder (page 10, step 7.4).

  - Describe the automatic aspect of the flapper valve (page 10, step 7.5).

  - Describe the procedure to turn on the air to air lock valves. State whether there is a pressure gauge to measure the air line pressure or any control to regulate flow of air.

- G-4-11 Hoffman High Volume Dust Collector

  - Describe the procedure to check the capacity of the "reject dust" packaging hopper (page 12, step 9.8.1).

  - Describe the procedures to return the system "to normal operation" (page 12, step 9.8.6).

  - Clarify the dust transfer operation from hopper to drum. Step 9.8.6 implies that the hopper is empty (page 13, step 9.8.11).

- G-4-13 Mikro-Pulsaire Dust Collector

  - Describe the bag cleaning operation (page 14, step 11.3).

  - Describe the procedure to turn on the main exhauster blower and air supply to the bag cleaning mechanism (page 14, steps 11.4 and 5).

  - Identify when to empty the dust collector and when to restart the collector (page 14, step 11.8).

- o G-4-14 Day Dust Collector

  - Describe the procedure to turn on the rotary valve (page 15, step 12.4).

  - Identify whether there is any alarm to detect the malfunction of the screw-conveyor rotary valves and vibrators (page 15, step 12.8.1).

- o G-4-15 Mikro-Pulsaire Dust Collector

  - Describe the bag cleaning operation (page 15, step 13.3).

  - Describe the procedure to turn on the air supply to the bag cleaning mechanism (page 15, step 13.6).

- o Stack Monitor Alarm

  - Describe the procedures for checking proper operation of the stack monitor (page 19, step 14.2.2.1.1).

  - Identify who is responsible for conducting the normal analysis of the soiled filter (page 19, step 14.2.2.1.1).

  - Add a statement such as "Shut down the dust collector main exhaust blower" to step 14.2.7.6 (page 20).

4.2.3 Attachment II

This section includes the maintenance standard, sample maintenance record forms, and sample SOP for changing bags in air filters.

- o Maintenance Standard

  - Clarify whether "Adhere to repairs in dust . . ." description under the Safety Reminder is applicable to Steps 3 and 4 on the NLO, Inc. Maintenance Standard.

- o NLO - FMPC Manufacturing Standard Industrial Health & Safety Requirements

  - Identify the locations such as motor control panel and local "Start" switches to be locked out and tagged (page 1, step 2).

4.3 SPECIFIC DEFICIENCIES IN RESPONSE TO ITEM 1B

DOE's response to this item is divided into two sections. One addresses the K-65 silos and the other addresses the thorium storage structures.

4.3.1 K-65 Silos

General Comments

- o The response generally addresses the requirements of Item 1B of the CERCLA Section of the FFCA, but the level of detail and supporting information and documentation are inadequate, even considering the short turnaround time required (30 days).

- o The response does not show that DOE has made an effort to address the overall K-65 silo problem. Each task is considered singly.

- o Priority is not established for the proposed tasks to implement the remedial measures.

Specific Comments

- o Sections 1.0 - 3.0, Summary, Introduction, Background

  - These three sections provide insufficient information concerning the silos. DOE should provide further detail in the background section.

  - This section of the response should specify DOE guidelines for radon monitoring and indicate the results of FMPC's radon monitoring program from September 30, 1984, to present (page 1, paragraph 3).

- o Section 4.0 Interim Control of Radioactive Emissions from K-65 Silos

  - This section, as well as Section 6.0, does not adequately assess the strength and disposition of the source of the radon problem. DOE did not estimate or determine the source strength, nor did it identify the most mobile and health adverse species of radionuclides.

- o Section 4.2, Discussion of Radon Concentration in the K-65 Silos

  - DOE's assumptions in this section are reasonable.

- o Section 4.3, Discussion of Thermal Expansion of the Gases Within K-65 Domes

  - DOE calculated a 2.3 percent thermal expansion of gas for a 10° F rise in temperature. This appears to be overestimated by about 17 percent when calculated for an ambient temperature of 20° C (68° F). The 2.3 percent gas expansion would be correct at an ambient temperature of about -40° C (-40° F). DOE should clarify whether this overestimation of gas expansion is to allow for a safety factor.

- o Section 4.4, Discussion of Feasibility Study for Controlling Radon Emission from the K-65 Silos

  - Section 4.4 includes a discussion of four alternatives for controlling radon emissions. A fifth possible solution might be a temperature control system for the silos.

  - The four interim controls discussed consider limited, essentially passive control systems. In part, these limitations reflect DOE's underlying assumptions that radon transport is dominated by outgassing caused by cyclic (daily) thermally induced pressure loading. Diffusion of radon through the dome, cylinder, and their interface have not been but should be considered.

- This section does not include estimates of retention time related to source strength, source generation, and requisite decay time. Therefore, it appears that no estimate of the size or capacity of the radon emission control system is made. 3439

- The section describes the basic data collection activities that are being undertaken. However, DOE did not explain how it will determine whether these data are sufficient to design or select a control/containment system.

- Any containment system should be kept relatively simple and problem free in design. DOE should consider using active systems, such as an applied vacuum, if possible, to keep pressures in the silos slightly below external atmospheric pressure. This would allow an infusion of air and minimize escape of gases. Since radon gas is very dense (more than seven times the density of air), it will concentrate in the lower portions of the silo's gas phase. However, before applying any negative pressure in the silo, DOE must check its effect on the structural integrity of the silo.

- DOE also should address whether the proposed systems take into account possible contamination by other radioactive elements. Complications may rise if a radon removal system becomes contaminated by radium, thorium, or other radioactive elements in dust or other vectors which must be present.

o Section 4.5, Recommendations Based on Conceptual Designs

- Item 1 states that a neoprene membrane will be completed. The neoprene membrane is expected to affect temperature and pressure fluctuation in the silo. However, DOE should be able to calculate the approximate temperature and pressure changes which would occur in the silos, prior to completion of membrane installation. Any system actually installed to capture radon must be designed to cover a wide range of gas volumes and also have an adequate margin of safety.

- Item 2 requires that a temperature and pressure monitoring system be installed to collect data and to design a radon control system. We believe that reasonable estimates of the temperature and pressure are sufficient to begin preliminary design of the K-65 radon emission control system.

- Each of the four possible control systems discussed in this document appears to have advantages or disadvantages, and these should be enumerated in the subsequent design documents. It should be possible for DOE to begin preliminary design work immediately based on available information from this facility and elsewhere.

o Section 5.0 Controls to Ensure Structure Integrity of the K-65 Silos

- The remedial measures taken only provide limited control in ensuring the structural integrity of the seriously deteriorated and unstable dome.

- DOE should analyze the silo with existing loads (dead load, contents, and earth embankment (DL + C + E) to find stresses in the original dome structure and the "changed" structure caused by reduction of dome thickness and loss of prestressing wires, as found by Muenow and Associates, Inc. (M & A). We do not know how M & A determined the percentage of post-tensioned wires remaining in the wall (page 10, assumption 3). The report should be detailed enough to allow thorough review.

- DOE should analyze the new 30-foot diameter dome using dead load plus live load (DL & LL) because the ring load on the existing concrete dome may be critical. Camargo Associates, Ltd. (CAL) used 20 psf as the live load on its model (page 7, second to last paragraph). However, drawing S-1 dated June 23, 1986 indicates 25 psf. This contradiction should be clarified, and the correct value should be used for the above analysis. Again, the report should be detailed enough to allow thorough review.

- It is unclear whether M & A actually determined the five items listed in Section 5.3 on page 9. The report only states that "the following information can be determined." 3439

- In Section 5.5.3. Items 2 and 3 on page 13 indicate limitations and precautions to be taken in emptying the silos. These precautions should be posted for the operator's benefit.

- A potential active measure that could be considered is venting the existing domes and covering them with inflatable domes. This would limit dynamic load and somewhat contain radon emissions.

o Section 6.0 Radon Monitoring Program

- The monitoring program only minimally addresses off-site and site boundary monitoring for radon. Radon daughters are not sought.

- On-site monitoring, particularly at or near the source, would provide additional assurances to detect radiation emissions. Again, as in Section 4.0, little or no effort has been made to estimate, identify, or monitor the sources of radon emissions from the silos and across the site to the boundary.

- The design of the monitoring stations is efficient and selective for measuring radon 222 isotope. As noted by DOE documents, no outside power source is needed, so the detector is not subject to power outages or surges. FMPC is using an track technique which relies on gross track counts to detect radon gas only. This is an adequate, economical method because radioactive gases other than radon are unlikely to be found at the monitoring stations.

- Even though the effects of exposure to radon gas are long term, DOE does not justify its sampling frequency of 3 months.

- DOE should reference and justify the conventional EPA conversion factor of 0.5 to convert detected radon concentrations to the working level (WL) (page 16, paragraph 2). The conversion factor of 0.5 is for indoors; the outdoor factor is 0.1 to 0.2. 3439

- DOE should substantiate the statement that two residences are far enough from the site to serve as background monitoring locations (page 16, paragraph 6).

- DOE should define "LCM" used in the table on page 17.

- DOE should provide results of its radon 222 monitoring program. On page 17, paragraph 1, the report states that the program began in 1980, but on page 1, the report states it began in 1984. DOE should clarify this discrepancy.

o Section 7.0, Emergency Procedures for Unplanned Radioactive Release

- These procedures cover a wide range of conditions and necessary actions and communications. However, the authority, timing, and precise nature of the actions are not well-defined or integrated. A more thorough, systematic effort of identifying and describing these procedures would seem appropriate. DOE should also include EPA on the regular accident notification list.

o Section 7.4, Emergency Response Level Classification Guideline

- DOE should include how it will determine the concentration when using the equipment (geiger counters, proportional counters, and so on) at the site (what meter readings correspond to projected or estimated dose).

- o Section 7.6.2 Response to Intermediate or Major Radioactive Material Releases

  - This section is extremely sketchy. For instance, DOE does not mention what it will use to survey surrounding areas, or who will use it. No criteria are presented for "personal safety equipment . . . required for re-entry," nor is the location of equipment stated. DOE presents no information on personnel training for coping with emergencies or on any tests, including practice drill (annual or otherwise) of the emergency plans. Other details that should be included are noted in Part IV, "Content of Emergency Plans," of 10 CFR 50, Appendix E.

4.3.2 Thorium Storage Structures

In general, PRC's comments on the K-65 silos (Section 4.1) apply to the thorium storage structures as well. Exceptions are noted below.

- o Sections 1.0 - 3.0, Summary, Introduction, Background

  - These sections are more thorough than those in the K-65 silos report. However, DOE still did not estimate the radon source in any quantitative sense.

- o Section 4.0, Interim Emission Controls

  - This section provides a minimal discussion, but more detailed than in the K-65 silos discussion. Overall, this section is adequate.

- o Section 5.0, Controls to Ensure Structural Integrity of the Thorium Structures

  - DOE's approach to the investigation and remedial procedures recommended seems to be appropriate. However, without seeing the

analysis and design calculations, PRC cannot review the remedial work as shown on drawing S-1 dated June 23, 1986.

5.0 CONCLUSIONS AND RECOMMENDATIONS

PRC completed the review of DOE's responses to Items 1A and 1B of the CERCLA section of its compliance agreement with U.S. EPA. PRC found that these responses did not meet the required objectives of the agreement.

The objective of Item 1A is to develop effective operation and maintenance procedures and work practices to control radioactive emissions and to maintain all exposures as low as reasonably achievable. Our review identified several deficiencies as described in Sections 4.1 and 4.2 of our report.

The objective of Item 1B is to develop and provide U.S. EPA with a plan and implementation schedule for the initial remedial measures concerning the K-65 silos and the thorium compound storage structures. DOE's response generally addresses the requirements under the agreement. However, the level of detail and supporting information and documentation is inadequate. Several questions and discrepancies identified by PRC need to be answered or clarified.

We recommend that U.S. DOE incorporate the additional information and revise its responses to address the comments identified in Section 4.0. DOE should then resubmit the report to EPA for review. PRC especially recommends that DOE conduct the two structural analyses of the K-65 silos as noted in Section 4.3 of our report. PRC is unable to evaluate the structural integrity of these silos without this information.