

KERR-McGEE RADIOLOGICAL HEALTH PROGRAM
RARE EARTHS FACILITY
WEST CHICAGO, ILLINOIS

Kerr-McGee Chemical Corporation, upon evaluating various alternatives for the decommissioning or stabilization of radioactive material at its Rare Earths Division located in West Chicago, Illinois, has determined that many tasks are common to all plans being considered.

These tasks are defined as follows:

1. Segregation of all loose organic materials into radioactive and non-radioactive categories.
2. Disposal in local land fill of above non-radioactive material.
3. Packaging of the above radioactive material in preparation for shipment to a licensed low-level radioactive material waste disposal site. Packaging will be accomplished in accordance with NRC and DOT regulations. Caulking or plastic liners will be used to prevent leakage from wooden boxes. Only new exterior plywood will be used for construction of boxes.
4. Arrange for transportation and disposal of packaged material in accordance with NRC and DOT regulations.
5. Industrially clean interiors of buildings by:
 - a. Sweeping with industrial sweeping compounds.
 - b. Wet scrubbing - (except during Phase I-A).
 - c. Vacuum cleaning.

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6. Surfaces of items to be released for unrestricted use shall meet the criteria listed in Attachment A. Alpha counting techniques will be employed for these measurements determining "smearable" contamination.
7. Secondary structures (components, pipes and non-load bearing walls) will be surveyed for removable radioactive material using the "smear" test technique.
8. Using "smear" test results as a criterion, secondary structures will be decontaminated if practical, to minimize contamination spread during dismantlement. Only dry cleaning methods will be used during Phase I-A, thus the potential for accidental release of decontamination liquid does not exist during Phase I-A.

In those cases where radioactivity levels cannot be decreased, the affected areas will be painted for contamination control. Any material that is painted to fix the radioactivity is considered to be contaminated and will be disposed of accordingly.

9. Demolition Preparation

- a) Secondary structures within major buildings will be dismantled taking care to segregate contaminated from clean components.
- b) Clean components with the exception of metal, will be transported to a local landfill for burial. Clean metal may be sold as scrap. Such scrap and other clean items considered salvageable and marketable for unrestricted use will be identified to the NRC prior to release. The NRC will be informed as to the ultimate use of the material.
- c) Contaminated components will be packaged and stored for ultimate disposal.

10. Thorium Ore Handling System in Building No. 9

During manufacturing operations, thorium ore was received in Building No. 9. The ore was unloaded and transported to appropriate locations for processing. The transportation scheme was a conveyor and bag filter system located on top of the building. This system will be removed as follows:

- a) The bag filter will be disconnected and sealed to preclude dust release.
- b) The machinery associated with this system will be dismantled.
- c) The bag filter and system components will be lowered from the roof.
- d) All system components will be packaged as required by NRC and DOT requirements and regulations governing radioactive low-specific activity (LSA) materials.
- e) Packages will be shipped to a licensed disposal site for burial.

11. Disposal Site

Preparation of the disposal site will be accomplished as follows:

General Clean-Up

- a) Loose items and equipment, organic and other, will be surveyed for radioactive contamination.
- b) Organic radioactive LSA materials will be packaged and shipped to a licensed radioactive waste disposal site.
- c) Other materials which qualify as radioactive LSA materials will be stored for ultimate disposition.

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d) All clean materials, with the exception of metals, will be shipped to a local landfill. Clean metal may be sold as scrap. Such scrap and other clean items considered salvageable and marketable for unrestricted use will be identified to the NRC prior to release. The NRC will be informed as to the ultimate use of the material.

12. Rare earth compounds currently stored in Building 18 will be moved to Building 19, then Buildings 17 and 18 will be prepared for disposal in the following manner:

a) Buildings 17 and 18 will be industrially cleaned on the inside.

b) Roofs and walls will be carefully dismantled down to the concrete foundations.

c) Resultant waste materials will be separated into contaminated and uncontaminated areas.

d) Contaminated organic materials will be packaged and shipped to a licensed disposal site.

e) Ultimate disposal of the rare earth compounds in Building 19 will be accomplished by on-site encapsulation during Phase II.

Kerr-McGee Chemical Corporation has contracted with Chem-Nuclear Systems, Inc. (CNSI) to perform the above tasks under Kerr-McGee's source materials license No. STA 583.

Kerr-McGee will have an on-site representative who will report directly to the Kerr-McGee project manager. The Kerr-McGee Radiation Safety Officer or his designee will act as an advisor to the CNSI work force, will approve the radiological work permits, and will audit the operations for compliance with the radiological control program.

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CNSI will provide a Project Site Supervisor who will plan and direct the efforts of work during this project. CNSI will provide a Radiological Control Supervisor who will, with his staff, administer the radiological control program, which ensures compliance with 10 CFR 20 (See Attachment B, which lists the project organization and the manning levels).

Most of the work on the site will be of a radiological nature and will be performed under the radiological work permits using CNSI's basic radiological control program. (See Attachment C, Article 213).

All workers who routinely perform radiological work will be trained in accordance with the program defined in Attachment C, Article 106.

A training study guide is prepared for each individual's use.

CNSI will provide a fully-qualified Radiological Control Supervisor and two fully-qualified Radiological Control Technicians. These individuals will meet the requirements of Article 105,1.b(2) and Article 107 of Attachment C. The Radiological Control Supervisor will have complete authority to stop any operation because of unresolved industrial or radiological control questions. At least one Radiological Control person on-site will be trained in basic First Aid practices.

The CNSI Radiological Control group on site will be responsible for:

1. Maintaining an adequate supply of disposable anti-contamination clothing and expendable supplies.
2. Source checking radiation detection equipment.
3. Training of personnel.
4. Performing radiological surveys on all equipment, tools, vehicles, packages, and waste which leaves the area.
5. Maintaining daily dosimeter reading records.
6. Issuance of TLD's to all personnel who routinely work on site.
7. Maintaining the respiratory protection equipment.
8. Changing TLD's monthly, or more often if needed, in accordance with CNSI radiation alert system (Attachment C, Article 216).

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9. Maintaining logs, records, and reports as required to demonstrate compliance with the radiological controls program (Attachment C, Articles 121 and 122, as applicable).

All material which is released from the site as clean waste, sold as scrap, or disposed of in a local landfill shall be surveyed and determined to meet the criteria in Attachment A. Since this material can be contaminated with naturally occurring isotopes such as Potassium 40, Uranium 238, and Thorium 232, and their daughters, the release limit shall be that for insoluble Natural Thorium, the most limiting isotope. Any item salvageable and marketable for unrestricted use will be identified to the NRC prior to release. The NRC will be informed relative to the ultimate use of the material.

In most instances, the work will be performed in a manner which does not produce airborne radioactivity. Any airborne activity generated will be long-lived and insoluble. Air samples will be taken to determine the air particulate concentration. This will be confirmed by periodically collecting ten cubic meter air samples in the immediate vicinity of the workers and determining the gross alpha activity. In addition, six stations will be established for sampling airborne radioactivity around the perimeter of the site. A movable seventh air sampler will also be used to monitor the down-wind environment. Samples will be recounted due to the presence of the short-lived daughter products. In order to protect the workers, all personnel working within the buildings when dust may be generated will be required to wear half-face respirators. Personnel who may work in airborne concentrations in excess of 6×10^{-11} $\mu\text{Ci}/\text{m}^3$ Natural Thorium will be required to wear full-face respirators and in no instance will personnel be allowed to work in areas which exceed 50 times this control limit. Personnel who perform work in respirators shall have an annual physical examination. All respirator equipment shall be NIOSH approved. The NRC will be notified 30 days prior to utilization of appropriate protection factors afforded by the use of respiratory protective equipment in accordance with 10 CFR 20.103(c).

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Workers involved in demolition or decontamination work will be required to wear safety shoes, safety glasses, hard hats, and work gloves as a general precaution. Additional clothing and protective equipment may be prescribed on the Radiation Work permit.

Radioactive solid waste which is packaged in accordance with DOT regulations may be released from the site by completing the required Radioactive Shipping Record and short form Bill of Lading. This waste will be shipped via exclusive-use vehicle to a licensed waste burial site for disposal.

Radioactive liquids will be collected in containers and every reasonable effort shall be made to reduce radioactive contamination concentration to levels as low as reasonably achievable. Prior to being discharged, liquids will be analyzed by gross alpha counting techniques for degassed samples. Only the Kerr-McGee on-site Radiation Safety Officer or his designee can authorize such disposals to the environment. Liquid discharges shall be in accordance with 10 CFR 20. An effluent monitoring and control program will be provided for NRC approval prior to any off-site liquid discharge. Federal, State and local requirements for release of non-radioactive liquids will be complied with.

Emergency Response Plans

Arrangements will be made with a local hospital to accept and treat individuals who have radiologically contaminated injuries or who may be radiologically contaminated and require treatment. Arrangements will also be established with local fire departments, police departments and ambulance teams. Appropriate training for all emergency personnel will be administered and updated as required to include familiarization with site conditions and plans. In addition to emergency crews, training will be provided for the West Chicago city engineers to acquaint them with site conditions and plans.

Bioassay evaluations will be conducted in the unlikely event that one or more situations occur having the potential for an individual to receive a cumulative airborne exposure exceeding 520 MPC-hours in any calendar quarter (13 weeks).

Hygiene

Building No. 12 will be supplied with a change room, showers, eating facility, break room and restroom facilities.

Safety Procedures to Prevent or Minimize Accidents

Clean-up activities, building and structure dismantlement, and stabilization of the disposal site will be conducted in accordance with industrial safety criteria. Personnel will be trained for each work assignment. Hazardous areas will be identified and entry/exit will be controlled. Life lines or the "buddy system" will be used when work is in areas where a water hazard might exist. Roof structures weakened by age or weight of snow will be augmented by additional support to prevent collapse. Access to areas in which potentially harmful chemicals or acids are stored will be controlled. Removal and disposal of these substances will be in strict compliance with federal, State or local requirements. Appropriate lighting and ventilation will be provided to all work areas. Fire prevention practices such as compatible storage, good housekeeping and flame use rules will be followed regarding flammable and combustible materials. Fire extinguishing equipment will be available and personnel will be trained to use it properly.

Survey Instrumentation

The following types of instruments are available for determining dose rates, surface contamination levels, and airborne radioactivity.

Beta-gamma probes No. HP-270 and Beta probe HP-210 are used with meters No. E-120 and E-530, manufactured by the Eberline Instrument Company.

Alpha gas proportional survey instruments with No. PAC-4G meter and the AC-21 probe. These are also Eberline Company instruments.

An Eberline RGM-1 is a radon gas monitor.

Eberline air sample counter RD-13 with MS-3 scaler.

Reuters Stokes RSS-111 micro-R type meter for low-level gamma will be in use. This instrument has a NaI(Tl) crystal coupled to a photomultiplier.

ATTACHMENT A

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES ^a	AVERAGE ^{b,c,f}	MAXIMUM ^{b,d,f}	REMOVABLE ^{b,e,f}
U-nat, U-236, U-238, and associated decay products	5,000 dpm α /100 cm ²	15,000 dpm α /100 cm ²	1,000 dpm α /100 cm ²
Transuranics, Ra-226, Ra-228.	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	1,000 dpm/100 cm ²	3,000 dpm/100 cm ²	200 dpm/100 cm ²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	5,000 dpm $\beta\gamma$ /100 cm ²	15,000 dpm $\beta\gamma$ /100 cm ²	1,000 dpm $\beta\gamma$ /100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.			

^aWhere surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

^bAs used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate director for background, efficiency, and geometric factors associated with the instrumentation.

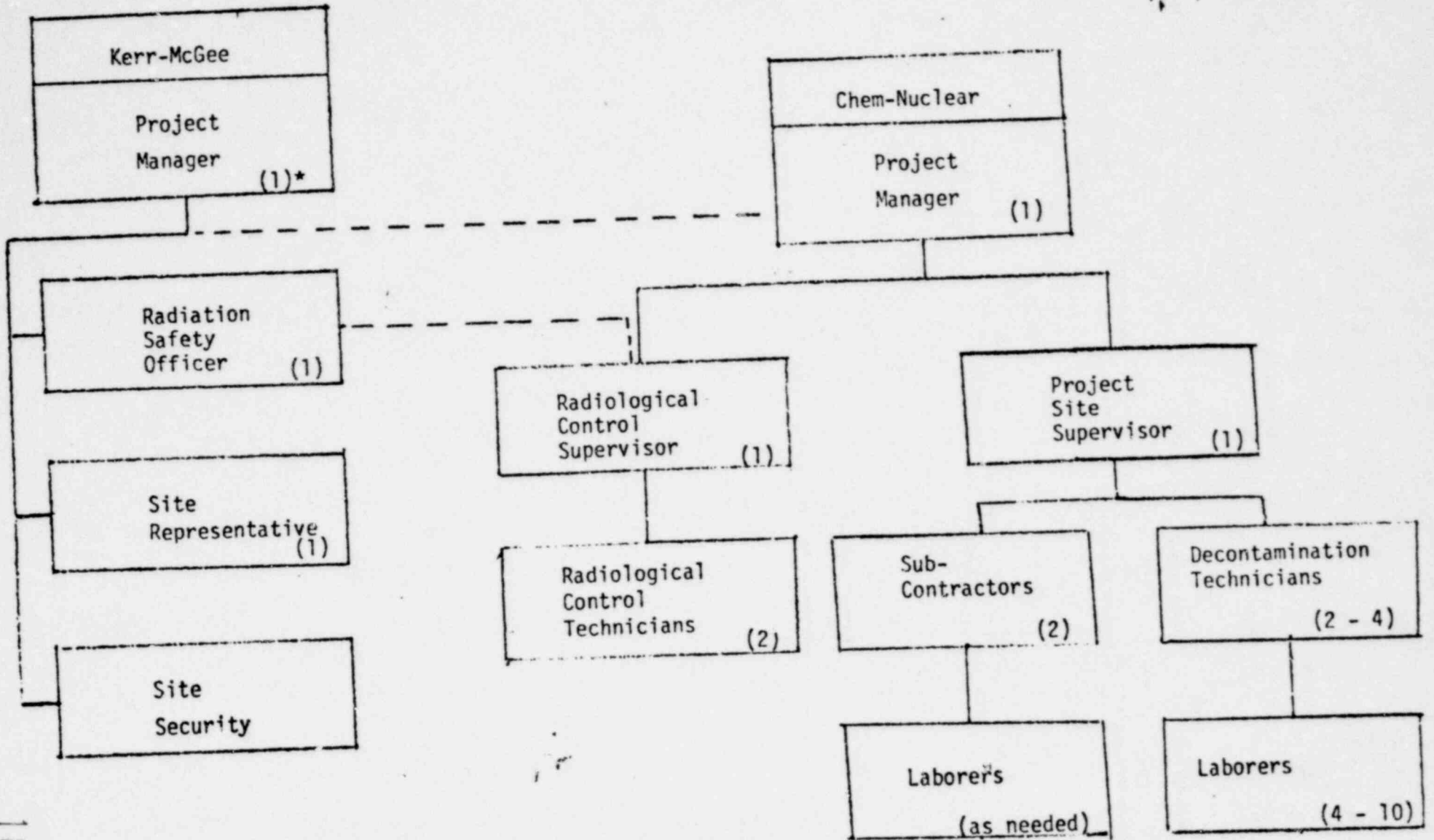
^cMeasurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived from each such object.

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ATTACHMENT A (cont.)

- ^dThe maximum contamination level applies to an area of not more than 100 cm².
- ^eThe amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.
- ^fThe average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.
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ATTACHMENT B
PROJECT ORGANIZATION



*Estimated number of personnel

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ATTACHMENT C

CHEM NUCLEAR
SYSTEMS INC.
DECOMMISSIONING

RAD CON POLICY
AND SAFETY
MANUAL

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RADIOLOGICAL HEALTH PROGRAM REVISIONS

The following is an item by item listing of revisions to the Kerr-McGee Radiological Health Program Plan in response to NRC comments of August 16, 1979. All items, with the exception of Item 9, "Personnel Qualifications" have been addressed in the body of the revised plan. Each item is discussed below:

1. Items identified for release or unrestricted use: This item is discussed on page 2, 9b, page 4, 11d and page 6.
2. Liquid discharges: This information can be found in task 8, page 2 and on page 7 in the section on radioactive liquids.
3. Environmental airborne monitoring: This item is covered in the airborne monitoring section on page 6.
4. Materials to be shipped off-site for licensed burial: Task 10, page 3, of the Phase IA activity describes disposal of the thorium ore handling system and bag filter. Item 5 of our July 31, 1979 letter of transmittal for the Radiological Health Plan infers that only organic materials will be shipped to a licensed disposal site. This inference was an oversight. With the exception of the bag filter system only organic radioactive material will be shipped off-site. The rationale for shipping the bag filter system to a licensed disposal site is as follows: The bag filter system is essentially a sealed enclosure containing dust from natural thorium. The plan calls for the system to be disconnected and sealed to preclude dust release. This results in a void inside the bag filter system which, if buried on the West Chicago Disposal Site, could rust and collapse and therefore jeopardize the integrity of the clay capsule. Based on this, the bag filter system will be packaged and shipped in accordance with NRC and DOT requirements and regulations.
5. Interim storage of radioactively contaminated materials: Reference to dismantlement of building 19 during Phase IA was an error. This was corrected prior to submittal of our overall Decommissioning and Stabilization plan. The rare earth compounds currently stored in building 18 will be moved to building 19 along with any other contaminated material throughout the facility which could be exposed to weather waiting for final disposition. Building 19 will serve as the storehouse for these materials until their disposal in Phase II at which time building 19 will be dismantled. Item 12, page 4 of the plan has been revised to address this.
6. Respiratory protection program: This item is discussed on page 6 in the paragraph on air monitoring.

7. Survey instrumentation: The plan has been revised to reflect the types of instruments to be used in surveys. See page 9.

8. Smear surveys for removable contamination: Item 6 of the plan has been revised to reflect the appropriate information.

9. Personnel qualifications: With regard to this item it is felt that inclusion of individual names and personal qualifications in a public document could be construed as an invasion of privacy. The plan states on page 5 that Radiological Control personnel will be fully qualified in accordance with article 105, I.b.(2) and article 107 of attachment C. Article 105, I.b.(2) reads in part; . . . "Experience shall also be considered in the selection of radiological control supervisors." Article 107 is the Radiological Control Personnel Training Standard. The individuals in question are: Mr. George Williams, Radiological Control Supervisor, Messrs. Owen Sullivan and Norman Livergood, Radiological Control Technicians. The qualifications of these individuals are documented and are available for your review.

10. Emergency Responses: This information is contained in the Emergency Response Plan paragraph on page 7.

11. Industrial cleaning and decontamination of secondary structures: No solutions, agents or detergents will be used in Phase IA clean up operations. This item is addressed in task 5, page 1 and task 8, page 2 of the plan.

12. Liners for wooden boxes: Task 4 of our letter of July 31, 1979 specified that residual lumber from the dismantlement of buildings 17, 18 and 19 will be used to construct boxes for packaging contaminated material. Subsequent to that letter, the lumber was found to be unsuitable for construction of boxes and the plan has been revised to reflect that only new exterior plywood will be used. This is reflected in task 3, page 1 of the plan.

13. Corrections and remarks: (a,b) The typographical error ($6 \times 10^{+11}$ vs 6×10^{-11}) has been corrected and the pages have been numbered.

(c) Regarding attachment C, only those sections or articles referenced in the plan apply to our Phase IA efforts.

(d) See page 8 of the plan for a discussion of safety procedures.