



**NUCLEAR ENERGY SERVICES**

**A UNIT OF QUALCORP**

April 12, 1985  
Refer to: WMS-463

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Mr. Lawrence F. Friedman, Ph.D., C.H.P.  
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Nuclear Materials Section B  
Division of Engineering and Technical Programs  
U.S. Nuclear Regulatory Commission - Region I  
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King of Prussia, PA 19406

Subject: NES Responses to NRC Transmittal,  
Dated March 27, 1985

Reference: (1) Docket No. 030-22060  
Control No. 03234  
  
(2) Telecon F. Trejo to L. Friedman  
April 11, 1985

Dear Dr. Friedman:

NES is submitting herewith in duplicate the responses to your latest comments concerning our application for a byproduct materials license. Your comment format structure has been repeated in these responses.

Attachment I contains our response to each of the five (5) questions. Attachment II contains the revised document pages per your discussion with Mr. F. Trejo.

We trust that review of the enclosed material will result in completion of the review cycle for our byproducts materials license application.

Mr. Francisco Trejo will be in contact with you to inquire about the status of the review and remains at your disposal should any additional information be required.

Sincerely yours,

NUCLEAR ENERGY SERVICES

John R. May  
General Manager  
Waste Management Services

JRM:ma  
Attachments

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ATTACHMENT I  
NES RESPONSES TO NRC TRANSMITTAL

DATED MARCH 27, 1985

- Q1. On page 21 of Document 82A8003, in the last paragraph of Section A, the phrase "if requested by the RSO" is confusing. Are bioassays only to be conducted at the option of the RSO? If so, please state the criteria the RSO will use to decide who will have bioassays. If not, clarify the meaning of this paragraph.
- A1. On page 21 of Document 82A8003, the phrase "if requested by the RSO" has been deleted. Yearly bioassays are mandatory for all NES radiation workers.
- Q2. On page 13 of Document 82A8008, in the calculation of MDL, the counter efficiency should be outside the root sign. Please submit a corrected copy of this page.
- A2. Page 13 of Document 82A8008 has been revised to move the counter efficiency value to outside the root sign.
- Q3. On page 16 of Document 82A009, paragraph 6, only the word "radioactive" need be marked on the inner package.
- A3. Page 16 of Document 82A8009 has been revised to state that "the word 'Radioactive' shall appear" on the inner package.
- Q4. On page 17 of this document, footnote 2, you still have reference to section numbers with no reference to a specific title of the Code of Federal Regulation.
- A4. Page 17 of Document 82A8009 has been revised to specify the title of the Code of Federal Regulation in all places.
- Q5. On page 4 of Document 82A8013, in the last paragraph of Section 4.1 and in Section 4.2, references to 10 CFR are incorrect and confusing. Please correct. I will be happy to discuss this with you by phone if this would be helpful.
- A5. Pages 3 and 4 of Document 82A8013 has been revised to correctly state proper requirements per your conversation with Mr. F. Trejo of April 11, 1985.

Docket No. 030-22060  
Control No. 03234

ATTACHMENT II  
REVISED DOCUMENT PAGES  
FOR  
NES RADIOLOGICAL SAFETY PROGRAM

<u>DOCUMENT</u>	<u>REMOVE EXISTING PAGES</u>	<u>INSERT NEW PAGES</u>
82A8003	21	21
82A8008	13	13
82A8009	16, 17	16, 17
82A8013	3, 4	3, 4

3. Doses received by other personnel doing similar work.

## 2.3 INTERNAL RADIOLOGICAL MONITORING

### A. Bioassay

The program for internal dose evaluation shall include the analysis of samples of urine and possibly feces. The Radiological Safety Committee (RSC) is responsible for administering the program and ensuring that employees receive evaluations at a frequency appropriate to their level of risk.

The RSC through the Radiation Safety Officer (RSO) shall require periodic and baseline bioassay sampling of radiation workers. The analysis shall consist of urine and fecal analysis for isotopic content, both quantitative and qualitative. In areas where uranium intake is possible, gamma spectroscopy and radiometric uranium analysis shall be performed on each sample.

Prior to termination of employment from NES, all personnel who at any time during their employment were designated as radiation workers shall be required to submit urine and fecal samples for assay as directed by the RSO.

In addition, all radiation workers shall be required to undergo bioassay once per calendar year if at any time during that year they worked in a controlled area or with radioactive materials.

### B. In-Vivo Counting

The RSC shall ensure that an adequate in-vivo counting program is in place and that employees are evaluated by in-vivo examination as dictated by their level of risk of internal exposure.

In-vivo counting shall be performed on all new employees whose job classifications requires them to be qualified as a radiation worker.

## ATTACHMENT I

- MDL Calculation (minimum detectable limit)

$$MDL = \frac{3}{(\text{counter efficiency})} \sqrt{\frac{\text{total background counts}}{(\text{total count time})}}$$

1

2

- Calculation of smear results

$$\text{Net CPM} = \frac{\text{total counts-smears}}{\text{total count time}} - \frac{\text{total background counts}}{\text{total count time}}$$

$$\frac{\text{DPM}}{100 \text{ cm}^2} = \frac{\text{net CPM}}{\text{counter efficiency}}$$

- Calculation of air sample results

$$\begin{aligned} \text{concentration} \\ (\text{Ci/ml}) = & \frac{\frac{\text{total observed counts}}{\text{total count time (min.)}} - \frac{\text{total background counts}}{\text{total count time}}}{(\text{counter efficiency}) (\text{sample volume}) (2.22 \times 10^6 \text{ dpm/Ci})} \end{aligned}$$

- Calculation of counting error

$$(95\% \text{ confidence}) = 2 \frac{\text{source CPM}}{\text{count time}} + \frac{\text{background CPM}}{\text{count time}}$$

1. Activity limits per package and, if appropriate, per instrument or article;
2. The materials must be packed in strong, tight packages that will not leak ANY of the radioactive material during conditions normally incident to transportation;
3. The radiation level at any point on the external surface of the package cannot exceed 0.5 millirem per hour;
4. The external surface of the package must be free of significant removable contamination;
5. For instruments or articles, the radiation level at 4 inches from any point on the surface of the unpackaged instrument or article may not exceed 10 millirem per hour; and
6. A prescribed description of the contents on a document which is in or on the package or forwarded with it. The word "Radioactive" shall appear clearly on the inner package surface or - if there is no inner package - on the outer package surface.



TABLE 2  
ACTIVITY LIMITS FOR LIMITED QUANTITIES, INSTRUMENTS AND ARTICLES

Nature of Contents <sup>1/</sup>	Instruments and Articles		Materials
	Instrument and article limits <sup>1/</sup>	Package limits	Package limits
Solids			
Special form	$10^{-2}A_1$	$A_1$	$10^{-3}A_1$
Other forms	$10^{-2}A_2$	$A_2$	$10^{-3}A_2$
Liquids			
Tritiated water			
< 0.1 Ci/liter	-	-	1,000 curies
0.1 Ci to 1.0 Ci/l	-	-	100 curies
> 1.0 Ci/liter	-	-	1 curie
Other liquids	$10^{-3}A_2$	$10^{-1}A_2$	$10^{-4}A_2$
Gases			
Tritium <sup>2/</sup>	20 curies	200 curies	20 curies
Special form	$10^{-3}A_1$	$10^{-2}A_1$	$10^{-3}A_1$
Other forms	$10^{-3}A_2$	$10^{-2}A_2$	$10^{-3}A_2$

<sup>1/</sup> For mixture of radionuclides see 49 CFR 173.433(b).

<sup>2/</sup> These values also apply to tritium in activated luminous paint and tritium absorbed on solid carriers.

Refer to 49CFR 173.421 through 49CFR 173.424 of 49 CFR for the complete requirements pertaining to these materials.

The U.S. Postal Service has revised its rules for mailable radioactive materials. The mailable amounts of material are one-tenth the values listed in the DOT regulations. Other additional restrictions apply to mailable materials and the Postal Regulations should be consulted for complete specifications.



## RCP - 9.0

**RADIOLOGICAL SAMPLE SHIPMENT PROCEDURE****1. SCOPE**

The objective of this procedure is to set forth measures to control the packaging and shipping of radioactive or potentially radioactive samples.

**2. GENERAL**

This procedure must be used to prevent violation of federal regulations and limitations. Samples shipped via this procedure are not for purposes of commercial distribution by way of production, packaging, repackaging, or transfer of byproduct material or any commercial purposes whatsoever. Samples are to be shipped via this procedure strictly for the purpose of radiological assay.

2

**3. RESPONSIBILITIES****3.1 PROJECT RADIATION SAFETY OFFICER**

Review plans for sample shipment. Assure that complete documentation is kept on each sample and each shipment in the project file. All documentation shall be submitted to the Radiation Records Control Officer for storage. Perform audits to assure compliance with this procedure.

**3.2 PROJECT MANAGER/HEALTH PHYSICS SUPERVISOR**

Responsible for the execution of this procedure and the completion and storage in the calculation notebook of all appropriate shipping papers and records.

**4. REQUIREMENTS****4.1 EXEMPT QUANTITIES**

Samples of radioactive material which have an activity less than or equal to 0.002 microcuries/gram are exempt from D.O.T. regulations of transport.



Samples defined as per 49 CFR 173.421 as "limited quantity" are exempt from the requirements of that subpart and from the specification packaging, shipping paper and certification, marking, and labeling requirements of that subchapter if they meet the requirements stated therein. These requirements include:

- a. transport in strong-tight packages that will not leak any of the contents during conditions normal to transportation
- b. radiation level < 0.5 millirem/hr at all exterior points
- c. removable contamination < 49 CFR 173.443 (a) limits
- d. the outside of the innerpackage (on the outside of the package if no inner package exists) shall be marked "Radioactive"
- e. quantity < 15 grams U-235 (except as per 49 CFR 173.424)
- f. meets all additional requirements of 49 CFR 173.421-1

NES will determine whether the receiver of a radioactive sample has a current byproduct materials possession license. If such a license is in effect at the receiving facility, NES will request and obtain a copy of said license prior to sample shipment and/or transfer. If the receiver does not possess a license, NES will determine if the quantity is small enough to allow receipt at the intended facility in accordance with the exempt quantity criteria described in 10 CFR 30.18 and listed in 10 CFR 30.71, Schedule B.

#### 4.2 GREATER THAN EXEMPT QUANTITIES

Quantities of radioactive materials in excess of the DOT limitations of Section 4.1 of this procedure, shall be packaged and shipped in accordance with RCP-5.0, "Guidelines for Radioactive Waste Disposal". Materials in excess of exempt quantities shall be transferred in accordance with 10 CFR 30.41.