DEPARTMENT OF THE ARMY
US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
FORT MONMOUTH, NEW JERSEY 07703

ENVIRONMENTAL ASSESSMENT

AND

FINDING OF NO SIGNIFICANT IMPACT

FOR THE

AN/UDM-1A RADIAC CALIBRATOR SET

FORT MONMOUTH, NEW JERSEY

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I. OPERATIONS SECURITY (OPSEC) REVIEW

A. Security Verification

1. The Environmental Assessment (EA) and Finding of No Significant Impact for the AN/UDM-1A Radiac Calibrator Set supports a US Nuclear Regulatory Commission (NRC) license in accordance with requirements set forth in Army Regulation (AR) 200-2 and AR 385-11.

2. The information contained within this environmental documentation has been reviewed in accordance with OPSEC intentions/requirements in AR 530-1, and has been determined to be acceptable for public release.

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LISTING OF ABBREVIATIONS

AIRDC	US Army Ionizing Radiation Dosimetry Center
ALI	Annual Limit on Intake
AR	Army Regulation
Bq	Becquerel
CECOM	US Army Communications-Electronics Command
Ci	Curie
cm	centimeter
Cs-137	Cesium 137
DA	Department of the Army
DOD	Department of Defense
DOT	Department of Transportation
dy	day
hr	hour
lb	pound
ICRP	International Commission on Radiological Protection
LLI	Large Lower Intestine
m	meter
NRC	Nuclear Regulatory Commission
OPSEC	Operations Security
sec	second
SI	Small Intestines
Sv	Sievert
TM	Technical Manual
ULI	Upper Large Intestine
wk	week
yr	year

II. Finding of No Significant Impact

1. Transfer of the life-cycle management responsibilities for the AN/UDM-1A Radiac Calibrator Set from the US Army Armament, Munitions and Chemical Command to the US Army Communications-Electronics Command (CECOM) is proposed following NRC approval of the CECOM license application submission. The AN/UDM-1A Radiac Calibrator Set incorporates a single Cesium-137 (Cs-137) sealed source for use as a standard in the checking and calibration of various radiation detection instruments possessed by the Army. The AN/UDM-1A Radiac Calibrator Set has been successfully utilized by Army activities in the calibration of radiation detection instrumentation for at least the past 30 years and has exhibited previous successful use by the US Navy for some years prior to that. The Environmental Assessment supports the NRC license application and complies with AR 200-2, Environmental Quality, Environmental Effects of Army Actions, which requires the evaluation of any radionuclide proposed for use within Army activities.

2. The assessment provides complete dosimetric analysis for external/internal exposure which may be presented to both occupational and non-occupational individuals from highly improbable incidents causing the release of radioactivity to the environment. Included in this assessment are hypothetical scenarios involving source damage, improper disposal, installation (storage) fire and transport accident for evaluation of radiological/environmental impact. The dosimetric evaluations demonstrate air/water concentrations and exposure levels below regulatory requirements. The internal exposure presented individuals through various pathways have also been identified as below International Commission on Radiological Protection (ICRP) recommendations. Based on these findings, stringent military radiation safety policy and previous long-term successful use without documented hazard, the Environmental Assessment has concluded no dis-

cernable radiological health and/or environmental quality degradation. The Environmental Assessment is available for review upon request from: Commander, USACECOM, ATTN: AMSEL-SF-MR, Fort Monmouth, New Jersey 07703-5024.

III. Environmental Assessment.

A. Summary and Conclusion.

1. Concurrent with an application for an NRC license to receive, possess, use, store and transfer radioactive material, the following Environmental Assessment, supporting a Finding of No Significant Impact, has been prepared to maintain compliance with AR 200-2. The basic objective specified in this regulation is to perform all actions necessary to minimize adverse effects on the quality of the human environ without impairment of the Army mission.

2. The use, need and description of the AN/UDM-1A Radiac Calibrator Set, including maximum safety design specifications, are contained in the applicable supplements within the provided NRC license packet. The evaluation concludes and documents that there is no degradation or potential for degradation of the environmental quality or a significant radiological impact to occupational or public health resulting from the possession/storage of the AN/UDM-1A Radiac Calibrator Set.

3. The implementation of sound radiation safety technique for operations involving the AN/UDM-1A Radiac Calibrator Set precludes any unnecessary radiation exposure to the occupational worker or the general public and excludes the consideration of any potential release to the environment. In determining radiological hazards to the radiation worker or general public, assessments for both internal and external exposures are presented. ICRP Publication 30 identi-

fies recommended Annual Limits for Intake (ALI) of various radionuclides for workers. These recommendations are based upon mathematical and biological parameters of the standard man for which exposure risk from a given radionuclide to an individual is acceptable. The recommendations are derived from specific quantities of radionuclides which have been identified as not leading to the inducement of a significant biological effect and are computed in terms of committed dose equivalent spanned over fifty years following the ingestion and inhalation of a unit activity of a specific radionuclide.

4. The AN/UDM-1A Radiac Calibrator Set is necessary in maintaining Army and federal compliance regarding the methodology and frequency of calibrating radiation detection instruments. Use of the calibrator set by Army and Navy activities for greater than 30 years without documentation of detrimental environmental/radiological effects, demonstrates the items adequacy regarding instrument calibration. Department of Defense (DOD) policy precludes the development of replacement items when existing items are available and adequate for functional needs. The successful past use of the AN/UDM-1A, with no adverse effects, negates its replacement and discontinuation of calibrator usages. The maximum committed internal dose equivalent for an occupational worker was determined to be 1.68E-02 Sieverts (Sv) or 1.68E+00 rem. This dose was presented to the Gonads, Small Intestinal (SI), Upper Large Intestinal (ULI) and Lower Large Intestinal (LLI) walls through the oral ingestion of 1.20E+06 Bequerels (Bq) (3.30E-02 millicuries (mCi)) of Cs-137 due to source leakage/damage. The ingested activity is 30 percent of the ALI given for oral ingestion and is below ICRP recommendations. Various hypothetical scenarios involving the release of radioactive material through various pathways were assessed for presented internal exposure with results summarized in Table A-1. The consideration of

external radiation exposure was made through theoretical calculations, actual radiation measurements and the lack of documented overexposures, as determined by film badge assignments to users/personnel involved with the AN/UDM-1A Radiac Calibrator Set. The complete derivation of the evaluations, identification of assumptions and comparison with ICRP recommendations and NRC requirements are provided at Part B of the Environmental Assessment document which presents possible modes of exposures and continues to identify, under the most severe conditions, minimal environmental and/or radiological impact associated with the AN/UDM-1A Radiac Calibrator Set.

TABLE A-1

Summary of Committed Dose Equivalent Limits to Various Organs
Subsequent to Hypothetical Scenarios

Hypothetical Scenario	Organ of Concern	Dose in Sieverts (rem)
Source Leakage/Damage (Oral Ingestion)	Gonads, SI, ULI, and LLI Wall	1.68E-02 (1.68E+00)
	Breast	1.44E-02 (1.44E+00)
	R. Marrow, Lungs, Thyroid and Bone Surface	1.56E-02 (1.56E+00)
Source Incineration (Inhalation)	Lungs, Gonads	6.54E-10 (6.54E-08)
	Breast	5.80E-10 (5.80E-08)
	R. Marrow	6.17E-10 (6.17E-08)
	Bone Surface, Thyroid	5.87E-10 (5.87E-08)
	SI, ULI and LLI Wall	6.76E-10 (6.76E-08)
Leaching into Public Drinking Reservoir (Oral Ingestion)	Gonads, SI, ULI and LLI Wall	4.62E-07 (4.62E-05)
	Breast	3.96E-07 (3.96E-05)
	R. Marrow, Lungs, Thyroid and Bone Surface	4.29E-07 (4.29E-05)
Installation Fire (Inhalation)	Lungs, Gonads	4.14E-08 (4.14E-06)
	Breast	3.67E-08 (3.67E-06)
	R.Marrow	3.90E-08 (3.90E-06)
	Bone Surface, Thyroid	3.71E-08 (3.71E-06)
	SI, LLI and ULI Wall	4.27E-08 (4.27E-06)
Transportation Accident (Inhalation)	Lungs, Gonads	3.04E-07 (3.04E-05)
	Breast	2.69E-07 (2.69E-05)
	R. Marrow	2.86E-07 (2.86E-05)
	Bone Surface, Thyroid	2.72E-07 (2.72E-05)
	SI, ULI and LLI Wall	3.14E-07 (3.14E-05)

B. Environmental/Radiological Impact of the AN/UDM-1A Radiac Calibrator Set.

1. The following paragraphs will present information and theoretical/actual data regarding the use and storage of the AN/UDM-1A Radiac Calibrator Set to identify non-existent to insignificant environmental and/or radiological impact.

a. A computerized theoretical dose evaluation was conducted by Science Applications Inc (SAI), for the AN/UDM-1A Radiac Calibrator Set to determine the radiological impact to operating personnel. The evaluation concludes that no radiological impact can be associated with the AN/UDM-1A Radiac Calibrator Set when used under normal operating conditions and following proper operating procedures. The theoretical evaluation identified a surface dose rate of 4.97E+00 millirem per hour (mr/hr) in the minus X direction with the source in the attenuated position and aperature plug inserted. Typical operator distance is approximately 152 centimeters (cm) (5 feet). The corresponding dose at this distance was calculated to be 4.20E-01 mr/hr. The computed surface dose rate in the minus X direction, with the source in the non-attenuated position and aperture plug inserted, was 9.36E-02 mr/hr, again the corresponding dose rate at typical operator distance of 5 feet in this mode was 9.58E-03 mr/hr. Actual physical measurements of the leakage radiation intensity emanating through the walls of the chamber were performed in April 1984 by CECOM health physics personnel in conjunction with AN/UDM-1A Radiac Calibrator Set operating personnel located at the Army Ionizing Radiation Dosimetry Center (AIRDC), Lexington, KY. The results of these actual measurements are provided in Table B-1. Measurements at the surface of the calibrator set in the minus X direction indi-

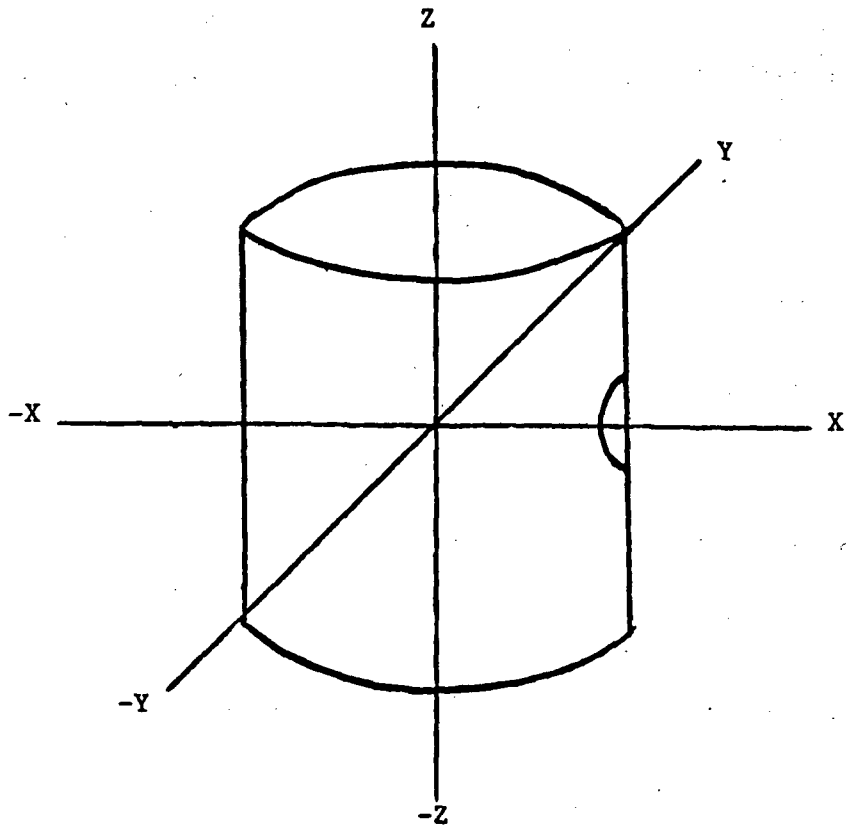
cated a radiation leakage intensity of 2.5 mr/hr. At 20 cm from the calibrator set, the radiation leakage intensity was found to be less than 1 mr/hr. Beyond 20 cm's the radiation leakage was negligible. If the maximum operator time is assumed to be 20 hrs/wk, 50 wks/yr, the total exposure presented to an operator located at the minus X surfaces of the calibrator set is 2.5 rem/yr. The actual use factor identified is approximately 15 hrs/wk. This would represent a total yearly whole body exposure of 1.87 rem which is approximately thirty-seven percent of the annual external whole body exposure limits stipulated in Title 10, Code of Federal Regulations (CFR), Part 20 and AR 40-14 for occupational radiation exposure.

TABLE B-1

Exposure Rate Determinations Utilizing
Radiation Detection Instrumentation
on the AN/UDM-1A Radiac Calibrator Set

Distance from AN/UDM-1A (cm)	Dose Rate (mr/hr) SBCP	SFCP	Dose Rate (mr/hr) Y axis	-Y axis	Dose Rate (mr/hr) Z axis	-Z axis
Surface	2.5	2.5	0.5	0.5	12.0	1.5
10	1.5	1.5	0.4	0.4	4.0	1.0
20	0.8	0.5	-	-	3.0	0.5

SBCP: Source Back (attenuated) closed port
SFCP: Source Forward (non-attenuated) closed post



2. To determine the radiological/environmental impact due to the storage/possession of the AN/UDM-1A Radiac Calibrator Set, hypothetical scenarios involving source damage, improper disposal, installation (storage) fire and transport accident are presented. The radiological assessments are based upon ICRP 30 data. Results are expressed in terms of the committed dose equivalent determined for organs with the greatest potential exposure risk resulting from highly improbable incidences causing inhalation and/or ingestion of radioactive material, i.e., Cs-137.

a. Source Damage Leading to Ingestion:

(1) The [2] Radiac Calibrator Set incorporates a single [7] source which is wipe tested for contamination (leakage) semi-annually and prior to calibration and shipment. The hypothetical scenario presented involves source damage during a leak testing procedure resulting in the ingestion of Cs-137 with the following assumptions:

(a) One percent of the total activity (1.3 Ci or 4.81E+10 Bq) is distributed within the radiation outport.

(b) Five percent of the distributed activity (65 mCi or 2.41E+09 Bq) is accessible for contamination.

(c) Five percent of the accessible contamination (3.25 mCi or 1.2E+08 Bq) is transferred to the individual.

(d) One percent (3.30E-02 mCi or 1.20E+06 Bq) is assumed to be orally ingested by the individual.

2. The tabulated committed dose equivalents are presented in Table B-2.

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TABLE B-2

Committed Dose Equivalents to Various Organs
Following Ingestion of Removable Contamination
From Source Leakage/Damage

Activity Ingested	Gonads, SI, ULI and LLI Wall	Breast	R. Marrow, Lungs, Thyroid and Bone Surface
1.20E+06 Bq (3.30E-02 mCi)	1.68E-02 Sv (1.68E+00 rem)	1.44E-02 Sv (1.44E+00 rem)	1.56E-02 Sv (1.56E+00 rem)

The total ingested activity of 1.20E+06 Bq (3.30E-02 mCi), represents 30 percent of the recommended ALI (4.0E+06 Bq) given for oral ingestion.

(3) It should be noted that source contamination/leakage problems of greater than 0.005 uCi have never been identified. Therefore, the aforementioned assumptions are extreme in consideration of the actual quantities available for contamination and subsequent ingestion. In addition, operator training and guidance indicated in the technical manual, precludes mishandling of the calibrator set and further ensures proper handling and leak testing procedures.

b. Improper Disposal in a Public Incinerator:

(1) The following assessment proposes incineration of an AN/UDM-1A Radiac Calibrator Set. This incident is considered highly improbable due to the calibrator size, weight, restricted access to storage/user areas and radioactive warning symbols attached to the calibrator housing.

(a) An [2] Radiac Calibrator Set containing [ ] is incinerated in a municipal incinerator processing 300 tons of refuse per day at fifty percent excess air.

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(b) Due to source encapsulation, only 1.00E-02 percent of the initial activity is released during the incineration process (f_s).

(c) The efficiency of the required air pollution control systems for particulates contained within the incinerating system is 90 percent (i.e., the fraction of Cs-137 which escapes the stack is 0.1 (f_r)).

(d) The aerodynamic mean activity diameter of the released particles is one micron.

(e) The number of individuals feeding one incinerator disposal route is also assumed to be the exposed population of 73,000 individuals.

(f) All the Cs-137 is released within a 24 hr period.

(g) Fifty percent excess of the theoretical volume of air required for complete combustion of one pound (lb) of refuse is 2.00E+06 cm^3/lb (V_a).

(h) The weight of refuse incinerated is 6.00E+05 lbs (W_r).

(i) The atmospheric dispersion coefficient (X/Q) is 2.00E-05 sec/m^3.

(2) The total activity released per day is given by:

$$Q = Q_i f_s f_r$$

(3) Based on the assumptions above, the total activity released per day is 4.81E+07 Bq (1.30E+00 mCi). The continuous release rate (Q') over a 24 hr period is 5.57E+02 Bq/sec (1.50E-05 mCi/sec).

(4) The concentration of Cs-137 in the stack gas (X_s) is given by:

$$X_s = Q/V_a W_r$$

The average 24 hr concentration of Cs-137 is 4.01E-05 Bq/cm^3 (1.08E-12 mCi/cm^3).

(5) Assuming a constant wind speed of one meter per second (m/sec) and moderately stable meteorological conditions, the maximum downwind concentration (X) is estimated by:

$$X = Q' (X/Q)$$

and, in this scenario, indicates a value of 1.11E-02 Bq/m^3 (3.00E-10 mCi/m^3).

(6) Assuming an average daily breathing rate of 20.0 m^3/dy, the maximum exposed individual would inhale 2.22E-01 Bq (6.00E-09 mCi) on the day of incineration. Conservatively assuming that the average person inhales an amount of Cs-137 equal to one-third of this concentration, the total activity inhaled would be 7.43E-02 Bq (2.00E-09 mCi).

(7) Committed dose equivalent limits using ICRP 30 dosimetric data are summarized in Table B-3. It is noteworthy to reiterate that realistic consideration of this scenario can be virtually eliminated based upon calibrator size, radiation markings and access to storage/user locations restricted to authorized personnel.

TABLE B-3

Committed Dose Equivalents to Various Organs Resultant From Inhalation of Cs-137 Following Source Incineration

Effected Group	Activity Inhaled	Lungs and Gonads	Breast	R. Marrow
Average Exposed Person	7.43E-02 Bq (2.00E-09 mCi)	6.54E-10 Sv (6.54E-08 rem)	5.80E-10 Sv (5.80E-08 rem)	6.17E-10 Sv (6.17E-08 rem)

Bone Surface and Thyroid	SI, ULI, and LLI Wall
5.87E-10 Sv (5.87E-08 rem)	6.76E-10 Sv (6.76E-08 rem)

Effected Group	Activity Inhaled	Lungs and Gonads	Breast	R. Marrow
Maximum Exposed Person	2.28E-01 Bq (6.00E-09 mCi)	2.01E-09 Sv (2.01E-07 rem)	1.78E-09 Sv (1.78E-07 rem)	1.89E-09 Sv (1.89E-07 rem)

Bone Surface and Thyroid	SI, ULI, and LLI Wall
1.80E-09 Sv (1.80E-07 rem)	2.07E-09 Sv (2.07E-07 rem)

(8) The maximum downwind concentration was estimated to be 1.11E-02 Bq/m^3 (3.00E-13 uCi/cm^3). The air concentration limit for unrestricted areas, as specified in 10 CFR Part 20, is given as 7.40E+01 Bq/m^3 (2.00E-09 uCi/cm^3) for soluble forms and 1.85E+01 Bq/m^3 (5.00E-10 uCi/cm^3) for insoluble forms. The calculated concentration is identified to be 1.50E-02 percent of the soluble limit and 6.00E-02 percent of the insoluble limit. This limit is based on the standard for non-occupational radiation exposure of 5.00E-03 Sv/yr (5.00E-01 rem/yr). The air concentrations resulting from this hypothetical scenario are identified as being below Federal and Army requirements and continue to demon-

strate insignificant to nonexistent environmental/ radiological impact.

c. Improper Radioactive Source Disposal Directly into a Public Landfill:

(1) Assume the remains from the AN/UDM-1A Radiac Calibrator Set incinerated in the previous scenario are transferred to a solid municipal waste landfill for disposal. The exposure of the surrounding population is through the ingestion of radiocontaminated groundwater that has leached from the burial site into the public drinking water supply. The following details the parameters assumed in evaluating the environmental impact and the radiological impact presented to the feeding population:

(a) One tenth of one percent of the total sealed source activity (A_t = 4.81E+09 Bq or 1.30E+02 mCi) leaches into the surrounding groundwater without further dispersion (f_{L1} = 1.0).

(b) Accounting only for the average precipitation infiltrate of ten inches per year, the total volume (V_L) of leachate generated per year from an average 25 acre landfill, based on US Environmental Protection Agency estimates is 6.76E+06 gallons per year (2.56E+10 cm^3).

(c) No significant dilution of the radiocontamination zone occurs from surrounding groundwater (f_{L2}=1.0).

(d) One percent of the radiocontaminated water is withdrawn for domestic water supply (f_{d1}) and five percent is consumed as drinking water (f_{d2}).

(2) The concentration of Cs-137 in the leachate (A_L) as it enters the zone of saturation is given by:

$$A_L = A_t f_{L1} f_{L2} / V_L$$

Under the above assumptions, the average Cs-137 concentration generated per year is 1.88E+05 Bq/m^3 (5.08E-06 uCi/cm^3).

(3) The amount of activity ingested (A_{ing}) as a result of radiocontaminated water in the drinking water supply can be estimated by:

$$A_{ing} = V_L f_{d1} f_{d2} A_L$$

The dietary intake by the surrounding population (73,000) is 2.40E+06 Bq (6.48E-02 mCi). The average individual dietary intake would be 3.30E+01 Bq (8.91E-07 mCi).

(4) The dose commitment to the maximally exposed individual is assessed with the assumption that the annual dietary intake of water (I_w) is 3.70E+05 cm^3 and consists entirely of groundwater contaminated with Cs-137 at the same concentration as calculated for leachate (A_L = 1.88E+05 Bq/m^3, 5.08E-06 uCi/cm^3) incorporated into the formula:

$$A_{ing} = I_W A_L$$

The total activity estimated to be consumed is 6.95E+04 Bq (1.87E+00 uCi). Committed dose equivalents due to leaching from a municipal solid waste landfill to public drinking water are summarized in Table B-4.

(5) The maximum permissible water concentration of Cs-137 in unrestricted areas, as specified in 10 CFR Part 20 is 7.40E+05 Bq/m^3 (2.00E-05 uCi/cm^3) for soluble forms and 1.48E+06 Bq/m^3 (4.00E-05 uCi/cm^3) for insoluble forms. The Cs-137 concentrations as assessed in the leachate are approximately 25 per-

cent of the soluble limit and 12.7 percent of the insoluble limit. It should be noted that the above calculations give no consideration to actual dispersion coefficients, deposition, or dilution factors which normally occur during groundwater transport and would tremendously decrease the already acceptable calculated levels.

TABLE B-4

Committed Dose Equivalents to Various Organs From Ingestion of Drinking Water Contaminated with Cs-137

Effected Group	Activity Ingested	Gonads, SI, ULI and LLI Wall	Breast	R. Marrow, Lungs, Thyroid and Bone Surface
Average Exposed Person	3.30E+01 Bq (8.91E-07 mCi)	4.62E-07 Sv (4.62E-05 rem)	3.96E-07 Sv (3.96E-05 rem)	4.29E-07 Sv (4.29E-05 rem)
Maximum Exposed Person	6.95E+04 Bq (1.87E+00 uCi)	9.73E-04 Sv (9.73E-02 rem)	8.34E-04 Sv (8.34E-02 rem)	9.03E-04 Sv (9.03E-02 rem)
Total Population	2.40E+06 Bq (6.48E-02 mCi)	3.36E-02 (3.36E+00 rem)	2.88E-02 Sv (2.88E+00 rem)	3.12E-02 Sv (3.12E+00 rem)

d. Installation Fire:

(1) The proposed incident involves an installation fire which occurs during storage enveloping an AN/UDM-1A Radiac Calibrator Set and causing release of Cs-137. The firefighting unit is familiar with the radioactive material storage area and has developed standard operating procedures including the use of protective clothing and self-contained respiratory devices, procedures limiting water usage and, if necessary, immediate evacuation of personnel from downwind areas. This hypothetical incident assumes the following for occupational involved personnel in the immediate vicinity performing firefighting operations:

(a) One Radiac Calibrator Set is engulfed by flames and releases 1.00E-02 percent of its total activity. One percent of the activity is deposited within the calibrator housing. One percent is then released as airborne particulates. The activity released during a one hour time interval is 4.81E+04 Bq (1.30E-03 mCi).

(b) The volume of air in the warehouse is estimated to be 1.23E+04 m^3 yielding 3.91E+00 Bq/m^3 (1.06E-07 mCi/m^3).

(c) The breathing rate of personnel involved is 1.20 m^3/hr.

(d) The total intake for each firefighter is 4.70E+00 Bq (1.27E-07 mCi) assuming no implementation of respiratory protective devices during the one hour period.

(2) The committed dose equivalents as calculated using ICRP 30 data are given in Table B-4. No additional estimates were included for the general public due to conservative dose equivalents derived for non-occupational indi-

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viduals in the immediate vicinity and dispersion factors which would further reduce dose commitments. It should be noted that no consideration in dose estimates for firefighters included ventilation of the building during extinguishment or the use of respiratory protective devices. The total inhaled activity is 7.80E-05 percent of the ALI recommendation for inhalation (6.00E+06 Bq). The air concentration (3.91E+00 Bq/m^3 or 1.06E+07 mCi/cm^3) when averaged over one year (365 days) is equivalent to 1.07E-02 Bq/m^3 (2.90E-13 uCi/cm^3). The concentration limits as specified in 10 CFR Part 20 are 7.40E+01 Bq/m^3 (2.00E-09 uCi/cm^3) for soluble forms and 1.85E+01 Bq/m^3 (5.00E-10 uCi/cm^3) for insoluble forms. The concentration limits derived in this evaluation are below ICRP recommended limits accounting for variation of individual doses, specifically 1.44E-02 percent of the soluble limit and 5.80E-02 percent of the insoluble limit. Further considerations, such as particle size, pathway and deposition parameters, also serve to reduce the calculated dose commitments.

TABLE B-5

Committed Dose Equivalents to Various Organs Following Inhalation of Cs-137 Due to Installation Fire

Activity Inhaled	Lungs and Gonads	Breast	R. Marrow
4.70E+00 Bq (1.27E-07 mCi)	4.14E-08 Sv (4.14E-06 rem)	3.67E-08 Sv (3.67E-06 rem)	3.90E-08Sv (3.90E-06 rem)

Thyroid and Bone Surface	SI, ULI and LLI Wall
3.71E-08 Sv (3.71E-06 rem)	4.27E-08 Sv (4.27E-06 rem)

(3) In the highly unlikely event of such an occurrence, procedures would be conducted with some awareness of the potential radiation hazards and would involve the use of protective breathing apparatus to reduce inhalation risks. The probability of an installation fire involving the AN/UDM-1A Radiac Calibrator Set approaches zero due to installation structural composition, fire walls between warehouse sections and firefighting units that would respond prior to any conceivable incorporation of units containing radioactive materials.

(4) In addition, the AN/UDM-1A Radiac Calibrator Set is primarily of lead construction and does utilize a NRC approved Cs-137 sealed source. These parameters above would insure the integrity of the radioactive material contained within the housing should the unlikelihood of an installation fire occur. The scenario also gives no consideration in the dose estimate to firefighters to include building ventilation during extinguishment.

e. Transportation Accident.

(1) Transportaton of the AN/UDM-1A Radiac Source Set is limited to transfer from the storage facility to an approved requisitioner. The transport scenario involves collision of the transporting vehicle resulting in fire and subsequent release of radioactive material to the environment. Inhalation risk will be considered the primary mode of exposure to individuals in the vicinity of the accident with the following assumptions:

(a) One [2] Radiac Calibrator Set, total activity [2] is involved in the accident.

(b) An activity of 1.00E-02 percent is instantaneously uniformly distributed within a hemispherical volume of 200 meters radius, yielding a total volume of 1.67E+07 m^3 with an activity per unit volume of 2.88E+01 Bq/m^3 (7.78E-07 mCi/m^3).

(c) The breathing rates of an individuals involved is 1.20 m^3/hr. Assuming the concentration of radioactive material to be constant and no evacuation of personnel takes place, the total activity inhaled in one hour is 3.45E+01 Bq (9.34E-07 mCi).

(2) The committed dose equivalents to various organs, using ICRP 30 data, are given in Table B-6. The air concentration of 2.88E+01 Bq/m^3 (7.78E-07 mCi/m^3) averaged over one year (365 days) is 7.89E-02 Bq/m^3 (2.13E-12 uCi/cm^3). The concentration limits as specified in Part 20 of 10 CFR are 7.4E+01 Bq/m^3 (2.00E-09 uCi/cm^3) for soluble forms and 1.85E+01 Bq/m^3 (5.00E-10 uCi/cm^3) for insoluble forms. The calculated values are approximately 1.06E-01 percent and 4.26E-01 percent of the concentration limits specified for soluble and insoluble forms, respectively. A large reduction in the inhaled activity and resultant

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committed dose equivalents would occur if wind dispersion and evacuation of personnel from radiocontaminated areas was performed.

TABLE B-6

Committed Dose Equivalents To Various Organs Due To Inhalation of Cs-137 Following Transportation Accident

Activity Inhaled	Lungs and Gonads	Breast	R. Marrow
3.45E+01 Bq (9.34E-07 mCi)	3.04E-07 Sv (3.04E-05 rem)	2.69E-07 Sv (2.69E-05 rem)	2.86E-07 Sv (2.86E-05 rem)

Thyroid and Bone Surface	SI, ULI and LLI Wall
2.72E-07 Sv (2.72E-05 rem)	3.14E-07 Sv (3.14E-05 rem)

(3) The probability of a transportation accident occurring as hypothesized, is highly improbable. Since its inception into the DOD system, the AN/UDM-1A Radiac Calibrator Set has not been involved in any type of transportation accident which resulted in the release of its radioactive contents. Transporting/packaging of the calibrator set is in accordance with applicable DOT regulations. Any conceivable damage to the calibrator in transit would be of a minimal nature and would not result in the release of radioactive material to the environment. Upon observation of any damage, appropriate action would be taken to isolate the unit for return and/or disposal.

(4) Table A-1 summarizes resultant committed dose equivalents to various organs from the proposed hypothetical scenarios. The occupational worker is identified as receiving the maximum internal exposure through oral ingestion of source material as a result of source leakage/damage. Each proposed incident, although highly improbable, demonstrates internal exposure levels below these recommended by ICRP or regulatory standards. Additionally, the total intake of Cs-137 estimated for the presented scenarios are based upon general assumptions which are in gross excess of more realistic parameters. An assessment utilizing actual parameters would identify internal exposures to be orders of magnitudes less than those indicated. This predication, coupled with properly implemented radiation safety procedures and strict operational guidelines, virtually eliminates the association of a radiological/environmental impact with the use/storage of the AN/UDM-1A Radiac Calibrator Set.

C. References:

1. International Commission on Radiological Protection, Publication 26, Recommendations of the International Commission on Radiological Protection, Pergamon Press, New York, adopted 1977.

2. International Commission on Radiological Protection, Publication 30, Limits for Intakes of Radionuclides by Workers, Pergamon Press, New York, Adopted 1978.

3. Technical Manual 11-6665-217-15, Organizational, DS, GS and Depot Maintenance Manual, Radiac Calibrator Set, AN/UDM-1A, August 1967.

4. Army Regulation 385-11, Safety, Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal and Radiation Safety), 1 May 1980.

5. Army Regulation 700-64, DLAM 4145.8, NAV SUPINST 4000.34B, AFR 67-8, MCO P4400.105C, Radioactive Commodities in the DOD Supply Systems, 19 April 1985.

6. Army Regulation 40-14, Control and Recording Procedures for Occupational Exposure to Ionizing Radiation and Radioactive Materials, 15 March 1982.

7. US Department of Health, Education and Welfare, Radiological Health Handbook, Public Health Service, Rockville, Maryland, 1970.

19 November 1985

ADDENDUM

to

Environmental Assessment (EA) and Finding of
No Significant Impact For The
AN/UDM-2 Radiac Calibrator Set, October 1983

1. Amend page 9, paragraph 3 of above EA to read:

...."Unit description, authorized user qualifications, location, control of calibrator use, accountability, transfer and ultimate disposal are outlined in the applicable supplements contained within the provided NRC license packet."

Instead of:

...."Unit description authorized user qualifications, location, control of calibrator use, accountability, transfer and ultimate disposal are outlined in Part B."

2. Enclosures 1, 2 and 3, as identified at the Table of Contents to the above EA, are not included. These enclosures will be made available during the period of this NRC license application, upon request from: USACECOM, ATTN: AMSEL-SF-MR, Ft. Monmouth, NJ 07703-5024.