ARM1.940805.133

JUL 14 1958

MEDDH XXXXX

Authorization for use of Radioisotopes on Volunteers
Request for by Commanding Officer, U.S. Naval Radiological Laboratory

CCml0

TSG

[redacted]

Lt Col Timmerman/65983/bjm

1. References:

a. Chief of Staff Memo 385, dated 30 June 1953.

b. Request for use of radioisotopes on human volunteers by the Commanding Officer, U.S. Naval Radiological Laboratory (attached).

2. Per paragraph 8, reference a., above, proposed project using human volunteers has been carefully reviewed. Experimental design indicates close control and supervision by competent personnel. The medical officer responsible for the medical aspects of the project will be Captain A. R. Behnke, Jr., MC, USN. The project is designed to determine the contaminability characteristics of personnel (and clothing) exposed to contact with beta-radiation emitters when operating as combat troops in a fallout area.

3. It is considered that this project will provide information urgently required in the event of future combat operations in fallout areas.

4. Recommend approval of basic request, reference b., above.

FOR THE SURGEON GENERAL:

1 Incl
OCS RS dtd 3 Jul 58
w/Case No. 1329

BRYAN C. T. FENTON, Colonel, M.C.
Executive Officer

F W Timmerman
F. W. TIMMERMAN, Lt Colonel, MC
Asst Chief, Research and Development Division

Handcarried
14 Jul 58

Top

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SECURITY CLASSIFICATION (If any)

DISPOSITION FORM

FILE NO.	SUBJECT
MEDCE-OH	Use of Radiosotopes on Human Volunteers, NRDL

TO	FROM	DATE	COMMENT NO. 1
Special Assistant for Nuclear Energy Chief, Professional Div Chief, Research and Development Div IN TURN	Chief, Preventive Medicine Division	11 June 1958 Col Hall/mb/66867	

1. This appears to be a primary research and development problem of direct concern to the Research and Development Division, which should take final action.

2. There appears to be no opportunity for gross overexposure in this experiment.

3. Preventive Medicine Division interposes no technical objection to the conduct of the project.

1 Incl
BUMED ltr, 2 incls, 6 June 58

JOHN R. HALL, JR, Colonel, MC
Preventive Medicine Division

MEDNE SUBJECT: Use of Radiosotopes on Human Volunteers, NRDL

TO	FROM	DATE	COMMENT NO. 2
✓Chief, Professional Div Chief, Research & Dev Div Chief, Prev Med Div IN TURN	Spec Asst for Nuc Energy	12 Jun 58 Col Maupin/65957	

1. Agree with Comment No. 1

2. This is a worthwhile project which will give verification I believe to our ideas on the subject. There is however enough skepticism in some quarters to render the subject controversial.

3. The design indicates close control and supervision by competent personnel therefore I recommend concurrence in the proposal.

1 Incl
n/c

CLINTON S. MAUPIN
Colonel, M.C.
Special Assistant
for Nuclear Energy

DD FORM 1 FEB 50 96 REPLACES NME FORM 96, 1 OCT 48, WHICH MAY BE USED

U. S. GOVERNMENT PRINTING OFFICE : 1952 O - 906875

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MEDDR

SUBJECT: Use of Radiosotopes on Human Volunteers, NRDL

TO: Chief, Research & Development Div
Chief, Prev Med Div
IN TURN

FROM: Chief, Professional Div

DATE: 12 June 1958

COMMENT NO. 3
Col Isherwood/62395

1. Concur in Comment No. 2.

2. Recommend granting of authorization for this project by the Department of the Army to the Commanding Officer, U. S. Naval Radiological Defense Laboratory.

Incl
n/c

SAM F. SEELEY
Brigadier General, M. C.

MEDDH

TO: Chief, Preventive Medicine Division

FROM: Chief, Research & Development Division

DATE: 13 June 58

COMMENT NO. 4

Concur in previous Comment, and in the granting of authorization for this project by the Department of the Army to the Commanding Officer, U. S. Naval Radiological Defense Laboratory.

Incl
n/c

for R. L. HULLINGHORST
Colonel, MC

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29 JUN 1958

FIRST ENDORSEMENT on BuMed ltr M8-2/NRDL Ser 5123 of 26 Jun 58

From: Secretary of the Navy
To: Secretary of the Army

Subj: Authorization for use of radioisotopes on volunteers, request for by Commanding Officer, U.S. Naval Radiological Laboratory

1. Forwarded with the request that basic correspondence be approved.

Richard Jackson
RICHARD JACKSON
Assistant Secretary of the Navy

OSA 700.2 6-26-58

Copy to:
BuMed
BuShips, Code 348
CO USNRDL

18-22 July 1994
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U.S. NAVAL RADIOLOGICAL DEFENSE LABORATORY
SAN FRANCISCO 24, CALIFORNIA

730-112
ALS:ams
23 May 1958

U.S. Atomic Energy Commission
Division of Civilian Application
Licensing Branch
Washington 25, D.C.

Attention: Mr. E. Eugene Fowler

Gentlemen:

Reference is made to our AEC Byproduct Material License No. 4-487-3, in which the maximum amount of Lanthanum 140 the Laboratory is authorized to possess at one time is 25 curies.

The Laboratory is presently planning an experimental project entitled, "Development of Reclamation Procedures for Land Targets," to be held at a deactivated Army base, Camp Stoneman, Pittsburg, California. Test requirements are such that it will be necessary to have as much as 200 curies of Lanthanum 140 in standby storage or in use at one time. Therefore, it is requested that the possession limit for Lanthanum 140 under License No. 4-487-3 be increased from 25 curies to 200 curies.

For your information an abstract of the experimental procedures to be used during the project is enclosed. Lanthanum 140 will be used as a radioactive tracer in these studies. An abstract of the radiological safety controls that will be applied to the use of this material is also enclosed.

Further reference is made to Condition No. 15 of License No. 4-487-3, "Byproduct material shall not be used in or on human beings, products distributed to the public, or field applications." Our isotope supplier has questioned the proposed use of Lanthanum 140 as possibly falling under "field applications." We would appreciate, after review of the enclosures, your concurrence that this is a controlled laboratory use and not a field application as the term is defined in the license.

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DEPARTMENT OF THE NAVY
BUREAU OF MEDICINE AND SURGERY
WASHINGTON 25 D.C.

IN REPLY REFER TO
BUMED 74:PFD:dfp
M8-2/NRDL
Serial: 5123
26 June 1958

From: Chief, Bureau of Medicine and Surgery
To: Secretary of the Army
Via: Secretary of the Navy

Subj: Authorization for use of radioisotopes on volunteers, request for by Commanding Officer, U. S. Naval Radiological Defense Laboratory

Encl: (1) Copy of CO USNRDL, San Francisco 24, Calif. Air Mail ltr to SecNav, via BUMED, of 28 May 1958, same subject, with enclosures thereto, and copy of BUMED 1st end. thereon of 6 June 1958
(2) Copy of CO USNRDL ltr 730-112 AIS:ams to U. S. Atomic Energy Commission, Div. of Civilian Application Licensing Branch, Washington 25, D. C. of 23 May 1958 with enclosures thereto

1. By enclosure (1), the Commanding Officer, U. S. Naval Radiological Defense Laboratory, requests authorization for use of radioisotopes (La^{140}) on human volunteers in support of a project to be performed by the U. S. Naval Radiological Defense Laboratory under Department of the Army Project Order Allotment 99178/58, and supplies data to support this request.

2. Enclosure (2) contains supplementary information pertaining to procurement of La^{140}.

3. Since it is expected that most of the volunteers involved in subject project will be Army personnel, it is requested that authorization be granted by the Department of the Army to the Commanding Officer, U. S. Naval Radiological Defense Laboratory to use radioisotopes on Army volunteers as indicated in paragraph 2 of enclosure (1).

4. Attention is invited to paragraph 6 of enclosure (1).

B. W. Hogan
B. W. HOGAN

Copy to:
BUSHIPS, Code 348 w/o encls
CO USNRDL w/o encls

SO 6 27 14

1706

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730-112
ALS:ams
21 May 1958

In order to expedite authorization approval, in case it might be necessary, we are applying, by separate correspondence, for the necessary authorization to accomplish objective (d), Condition 15, of License 4-487-3, which involves the human use aspect.

We shall be glad to supply any further information you may require.

Very truly yours,

R. E. Harris

R.E. HARRIS
Commander, USN
Acting Commanding Officer
and Director

Enclosures:
Development of Reclamation Procedures for Land Targets
Rad-Safety Measures for Land Target Reclamation Study

Copy to:
BuShips (348) w/encl
BuMed (74) "

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ABSTRACT

DEVELOPMENT OF RECLAMATION PROCEDURES FOR LAND TARGETS

INTRODUCTION

A series of experiments is planned for the period 15 August to 15 October 1958 at Camp Stoneman, Pittsburg, California, to evaluate land target reclamation techniques.

The specific objectives are:

a. To determine the relationship between recovery effectiveness and those factors affecting operational efficiency in order to define optimum performance characteristics of the basic decontamination procedures.

b. To develop new reclamation techniques for land targets with emphasis on waterless decontamination procedures such as motorized sweeping, vacuum cleaning, etc.

c. To determine the influence of various soil characteristics and repeated method applications on the effectiveness of the basic land reclamation techniques.

d. To determine the contaminability characteristics of personnel (and clothing) exposed to contact beta radiation emitters when operating as combat troops.

Contaminant Materials

A synthetic fallout material consisting of a radioisotope (Lanthanum 140) and a bulk carrier material will be dispersed over the test area in such concentrations (grams per square foot) to simulate the mass of material that would be deposited under actual fallout conditions.

The facilities at the MTR, Arco, Idaho, will be used to produce the Lanthanum 140. Two grams of La_2O_3 will be encapsulated in quartz capsules and irradiated in a neutron flux of 10^{14} $n/cm^2/sec$ for a time sufficient to produce approximately 6 curies of Lanthanum 140 on the day it is to be used at the test site.

The Lanthanum 140 will be prepared in solution for mixing with the bulk carrier material from behind a concrete block shielding wall by means of a pair of master slave manipulators.

The dry fallout simulant will be prepared by combining the Lanthanum 140 solution and the bulk carrier material in a modified transit mix truck. Slurry fallout simulant will be prepared by combining the Lanthanum 140 solution and the slurry mixture in a modified Chemical Corp. decontamination truck.

Ens. (2)

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Dry simulant will be dispersed over the test areas by a spreader mounted on the rear of a dump truck. The slurry simulant will be applied through spray nozzles mounted on the rear of the decon. truck. The wet and dry simulant will be applied to roofing areas by means of hand drawn dispersers.

Test Procedures

1. To acomplish objective (a), the synthetic fallout, both dry and slurry type, will be applied to asphaltic concrete and Portland cement concrete areas, each 40' x 200' in size and to roofing areas 40' x 40' in size. The decontamination tests will be made with street flushers and fire hoses with several variations of use. Before and after radiation measurements will be made to determine decontamination effectiveness.

2. To accomplish objective (b), the synthetic fallout (dry and slurry) will be applied onto 40' x 200' asphaltic concrete areas and waterless or near-waterless decontamination methods will be used. These include the use of street sweepers, vacuum cleaners, air brooms, etc.

3. To accomplish objective (c), the synthetic fallout will be applied to a 50' x 50' section in the center of a 100' x 400' land test area. Decontamination methods used will be surface removal by road scrapers and plowing.

4. To accomplish objective (d), the synthetic fallout will be applied to two 100' x 100' land areas and troops will be maneuvered through the area. The degree of clothing contamination experienced will be evaluated.

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ABSTRACT

RADIOLOGICAL SAFETY MEASURES FOR LAND TARGET RECLAMATION STUDY

RADIOLOGICAL SAFETY OPERATIONS

Radiological safety monitors will be present during the preparation and dispersal of the synthetic fallout material and during decontamination operations. The rad-safe group will be directed by a health physicist who will serve as a staff advisor to the project officer. The mission of the rad-safe group will be to advise the project officer on rad-safe measures and to minimize radiation exposure to project personnel, and provide necessary rad-safe support (personnel decontamination center, environmental monitoring, etc.).

Environmental Monitoring. Continuous air sampling will be conducted at the boundary of the controlled area during all test operations. Water run-off will be collected in retention pits and will be sampled prior to release to the environs.

RADIOLOGICAL SAFETY TRAINING

A radiological safety training course will be presented to the military personnel assigned to the project. The course will be sufficient to familiarize the personnel with the land target studies and rad-safe procedures, as applicable.

BASIC RADIOLOGICAL SAFETY STANDARDS

The rad-safe standards will be derived from "Radiological Safety Regulations,"[1] of the Navy Bureau of Medicine and Surgery and from the Atomic Energy Commission "Standards for Protection Against Radiation."[2] The maximum permissible exposure (MPE) will be 3.0 r per 13 weeks not to exceed 5 r for the operation provided the lifetime accumulated exposure of personnel does not exceed (N-18) x 5 rem where N is the individual's age.[3] The maximum permissible concentration (MPC) for Lanthanum 140 air and surface contamination are taken from the Federal Register, 10 CFR Part 20. The MPC's for skin, clothing and equipment contamination are derived from the USNRDL Health Physics Division's MPC's for routine and special operations.[4] Table 1 tabulates the maximum permissible limits to be used in this operation.

---

1 NavMed P-1325 (Rev. 1951)

2 AEC Federal Register, 10 CFR Part 20, January 29, 1958

3 National Committee Radiation Protection, Statement of 8 Jan 1957

4 "Principles of Radiation and Contamination Control" Manual, Review Draft, Fall 1957, Chapter 4.

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Exh B

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RADIOLOGICAL SAFETY FACILITIES AND EQUIPMENT

Personnel Dosimetry. Film badges will be used to document the whole body gamma and beta exposure received by personnel participating in the land target studies. Self-reading pocket ionization chambers will also be used for monitoring the daily personnel exposure. Visitors will be issued film badges to record their radiation exposure. Special wrist film badges will be issued to measure hand exposures as necessary.

Portable Monitoring Equipment. Portable radiac equipment will be used for radiation and contamination monitoring, a Cobalt 60 source will be used to check the gamma calibration of the instruments at the test site. Table 2 lists the available radiac equipment.

Personnel Decontamination Center. A two story Army barracks at the test site will be used as a Personnel Decontamination Center and Rad-Safe Center. It will be located near the test area making it convenient for the processing of all personnel entering and leaving the test area. Standard clothing and equipment will be issued for use as protective clothing. Table 3 lists the protective clothing requirements for processing 75 to 100 personnel per day based on a 2 day laundry cycle.

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TABLE 1

TABULATION OF MAXIMUM PERMISSIBLE LIMITS

1. Personnel MPL

(a) Radiation exposure per 13 weeks

	Gamma	Beta
Whole body	3.0 r	15 rad
Hands and feet	15 r	30 rad

(b) Aerosol Activity: Occupational - 4×10^{-6} μc/cc
Environmental - 1×10^{-7} μc/cc

(c) Food and potable water: Food and water showing any contamination will not be consumed.

(d) Water to environs - 0.1 μc/ml

	MPC	Berkeley 2750 Contamination Meter Indication for MPC
(e) Skin contamination	1,000 d/m/cm^2	500 c/m

2. Clothing MPC

(a) Personal

General clothing; fixed	1,000 d/m/cm^2	500 c/m
Shoes, fixed	10,000 d/m/cm^2	5,000 c/m

(b) Rad-safe clothing for uncontrolled use

Coveralls, fixed	1,000 d/m/cm^2	500 c/m
Gloves, hats, etc.; fixed	5,000 d/m/cm^2	2,500 c/m
Shoes; fixed	10,000 d/m/cm^2	5,000 c/m

(c) Rad-safe clothing for controlled use

Coveralls; fixed	50,000 d/m/cm^2	25,000 c/m
Gloves, hats, etc.; fixed	100,000 d/m/cm^2	50,000 c/m
Shoes; fixed	250,000 d/m/cm^2	---

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TABLE 1 (Cont'd)

TABULATION OF MAXIMUM PERMISSIBLE [illegible]

	MPC	Berkeley 2750 Contamination Meter Indication for MPC
3. Equipment MPC		
(a) Final Clearance		
Fixed	10,000 d/m/cm^2	5,000 c/m
Removable	5,000 d/m/12 in^2 wipe	2,500 c/m/12 in^2 wipe
(b) Operational Clearance		
Fixed	100,000 d/m/cm^2	50,000 c/m
Removable	50,000 d/m/12 in^2 wipe	25,000 c/m/12 in^2 wipe

4. Radioactive Sample Shipments

(a) Courier shipments: DOD Aircraft.	Gamma radiation level to be 1 r/hr at the surface of the container with removable contamination 5,000 d/m/12 in^2 wipe (2,500 c/m on Berkeley 2750 contamination meter).
(b) Common carrier:	All radioactive shipments by common carrier to conform with ICC Regulations.

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TABLE 2

RECOMMENDED STOCK LEVEL FOR RADIAC EQUIPMENT

1. Contamination Meters	
AN/PDR-27F	12 each
G.M. Side-window (Berkeley 2750-1)	9 each
2. Dose Rate Meters	
AN/PDR-18	2 each
AN/PDR-T1B	2 each
Cutie Pie (El-Tronics Model CP3DM)	6 each
3. Personnel Dosimeters	
Film badges (DuPont film 555 and 510)	1500 each
Pocket Ionization Chambers, self-reading, 0-200 mr	75 each
Pocket Ionization Chambers, self-reading, 0-5 r	20 each
Pocket Ionization Chamber Charger	4 each
4. Aerosol Samplers	
Portable spot aerosol samplers	6 each
Continuous constant flow suction units	4 each
5. Laboratory Radioassay Equipment	
Scaler	2 each
Count Rate Meter, 1615-B	2 each
G.M. Detector, end-window	1 each
G.M. Detector, side-window	1 each

6. Miscellaneous counting standards and calibration sources.

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TABLE 3

PROTECTIVE CLOTHING REQUIREMENTS

Item	Quantity Stocked
Coveralls	300
Shoes	80
Socks	300
Caps	200
Hoods	50
Gloves, cotton, short	300
Gloves, cotton, rubber-dipped	50
Gloves, rubber or Neoprene, heavy	50
Gloves, rubber, Surgeons	100
Booties, plastic	300
Boots, rubber; sizes: 11, 12, 13 (16 each)	48
Shields, face	20
Masks, assault	24
Canisters, spare (for assault masks)	24
Bags, laundry	24
Shirts-T	300
Shorts	300
Towels, bath	300
Gear, foul weather (Rain Parka and trousers)	10
Suit, all plastic	4

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BUMED-74:FFD:cgz
M8-2/NRDL
Serial: 5115

[illegible] June 1958

FIRST ENDORSEMENT on USNRDL, San Francisco 24, Calif. ltr 933-114 RHB:mej to SecNav via BUMED (Code 74) of 28 May 1958

From: Chief, Bureau of Medicine and Surgery
To: Secretary of the Navy

Subj: Authorization for use of radioisotopes on human volunteers; request for

Ref (d) SecNav ltr to BUMED of 18 Aug 1956—Authorization for experimental use of La^{140} on human volunteers for skin decontamination studies; request for

1. Forwarded. It is recommended that the basic request for authorization be approved.

2. By reference (d) the Secretary of the Navy authorized the use of La^{140} to contaminate the skin of volunteers in order to determine the most efficacious method of decontamination. This was in support of a Department of the Army project conducted by the U. S. Naval Radiological Defense Laboratory.

3. In the basic correspondence the Commanding Officer, U. S. Naval Radiological Defense Laboratory now requests authorization for the use of volunteers in a project to be accomplished under a Department of the Army Project Order in which it is proposed to determine the contaminability characteristics of personnel exposed to contact with beta-radiation emitters when operating as combat troops in a fall-out area. Proposed procedures, including that of respiratory protection, have been reviewed and the residual hazard is minimal; the anticipated doses to personnel fall within the maximum permissible whole body exposure.

4. In view of the participation by Army personnel, copies of the basic correspondence and enclosures have been forwarded to the Surgeon General, U. S. Army, with a request for Department of the Army authorization for use of radioisotopes on volunteers as desired by the Commanding Officer, U. S. Naval Radiological Defense Laboratory.

5. Upon approval and return of basic correspondence and enclosures to this office, the Chief, Bureau of Medicine and Surgery will further process the application forms (AEC-313 and AEC-313a) as required by the Isotopes Extension, Division of Civilian Application, U. S. Atomic Energy Commission.

O. D. YARBROUGH
Assistant Chief for Research and Military Medical Specialties

Copy to:
BUSHIPS (Code 348)
CO, USNRDL
SC (Army)

-2- Part of Enc. (1) to SC Army ltr

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[illegible]

[illegible] 114
[illegible]

[illegible]

[illegible] Chief, [illegible] of [illegible] Surgery [illegible]

[illegible] human volunteers,

[illegible] Conference [illegible] Alpen, [illegible], Buried [illegible]

[illegible] Hunter [illegible]

[illegible] of application forms AEC-[illegible] and AEC-313a with [illegible]

[illegible] with reference [illegible], request [illegible] authorization to use the radioisotope La^{140} in the proposed research [illegible] of Declamation Procedures for [illegible] work will be [illegible] under [illegible] of Army [illegible] proposed [illegible] volunteer army, [illegible] study, [illegible] accordance [illegible] of the experiment will [illegible] volunteers [illegible] written [illegible] be obtained [illegible].

[illegible] addition to [illegible] the Department of the Army is furnishing personnel to assist the project. [illegible] of the volunteers in this experiment are expected to be [illegible] personnel, [illegible] requested that [illegible] of Medicine and Surgery coordinate with Army Surgeon Generals Office in this authorization request.

[illegible]. The complete details of isotope use are given in enclosure (1) supplement (1). The experiment will be conducted by engineers experienced in the use of radioisotopes, who have had previous experience with this type of work, except that contact with the La^{140} was incidental to the purpose of the previous work. For any one run the deep tissue gamma radiation dose will be less than 0.2 rad and the beta-gamma radiation dose to the skin will be less than 2 rad. The number of runs in which each volunteer will be permitted to participate will be determined in accordance with reference (b).

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933-114
RHB:mcj

4. The following named trained physicians are members of the Laboratory Staff and will be available at all times for consultation:

Capt. A. R. BEHNKE, Jr., MC, USN, a physician trained in internal medicine; has wide experience in physiological research.

ROBERT A. MEMILL, M.D., Emeritus Professor of Radiology, Stanford University Medical School.

5. After review by cognizant Bureaus and if the request is approved, it is requested that enclosure (1) be forwarded to the Atomic Energy Commission, Isotopes Branch, Division of Licensing and Regulations, 1717 H Street, N.W., Washington 25, D.C., for the purpose of obtaining AEC approval of this proposed use of the subject radioisotopes.

6. As pre-test work should be initiated within one month, and the field test will begin in August, it would be appreciated if this request were expedited.

J.H. McQUILKIN

Copy to:
BuShips, Code [illegible] (w/o encl (1))

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[illegible]

[illegible] Washington, D. C. [illegible] Oak Ridge [illegible] Division of Civilian [illegible] Commission [illegible] receive an AEC Byproduct [illegible] An AEC Byproduct Material [illegible] Code of Federal Regulations Part 20 and the [illegible] subject on File 19 Code of Federal Regulations Part 20

1. NAME AND STREET ADDRESS OF APPLICANT

Naval Radiological Defense Laboratory
San Francisco 24, California

2. NAME AND STREET ADDRESS OF WHICH BYPRODUCT MATERIAL WILL BE USED

Camp Roberts
Pittsburg, California

3. DEPARTMENT TO USE BYPRODUCT MATERIAL

Scientific

4. INDIVIDUAL USER(S) Name and title of individuals who will use or [illegible] byproduct material. Give training and experience in Items 8 and 9.

[illegible] Sarter
Project Officer, Operation Stockpile II

[illegible] Black
Medical Surveyor, [illegible]

5. PREVIOUS LICENSE NUMBER(S) If this is an application for renewal of a license, please indicate and give license number.

Additional information may be found on file with Byproduct Material License 4-41[illegible]

6. RADIATION PROTECTION OFFICER Name of person responsible for radiation safety. If not of other than individual user. Attach resume of his training and experience in Items 8 and 9.

A. L. Dietti
Chairman, Radioisotope Committee
(See supplement 1a, paragraph 1, Item 16).
Refs: [illegible] 73, 20, Amendment 4 Dec [illegible]
w/att Form AEC-313 and supply

7. BYPRODUCT MATERIAL Elements and mass number

Ca^{45}
A

8. CHEMICAL AND PHYSICAL FORM Give chemical form and physical form (liquid, solid, gas, etc.)

[illegible]

9. CHEMICAL AND PHYSICAL NATURE OF MATERIAL OF EACH CHEMICAL FORM OR MIXTURE Give chemical name or symbol, state of matter (solid, liquid, gas), and other chemical and physical properties (such as melting point, solubility, etc.)

[illegible] soil [illegible] of the soil.

10. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. Describe [illegible] of the byproduct material in a fashion that [illegible] source will be stored and or used.

Ca^{45} will be used as a tracer of soil in determining the contamination characteristics of personnel operating on combat troops. (See supplement 1b.

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[illegible]	Also see Supplement 2, Item 8	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	
[illegible]	Unknown at Calibrate [illegible]	[illegible]	
[illegible]	[illegible]	Lecture [illegible] Series	

9. EXPOSURE WITH RADIATION (Actual use of radioactive materials in animals) Also see Supplement 2, Item 9

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPOSURE WAS CARRIED	DURATION OF EXPOSURE	[illegible]
La-140	6000 mc/run	Camp Stoneman I	2 months	As tracer to [illegible]
Y-90	500 mc/run	[illegible]	1 month	As tracer to [illegible]
Sr-90	2000 mc/run	[illegible]	2 months	I.e. [illegible]

10. RADIATION DETECTION INSTRUMENTS (Use supplement sheets if necessary)

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE	[illegible]
Cutie pie	[illegible]	[illegible]	[illegible]	
A/[illegible]	[illegible]		[illegible]	
[illegible]		β [illegible]	[illegible]	
NaI Scintillation Data Log		γ	[illegible]	
NaI Scintillation Dowell Detector	[illegible]	γ	[illegible]	

11. METHOD EMPLOYED AND THE RESULTS OBTAINED [illegible]
Co 60 and Ra sources calibrated by [illegible]. [illegible] rate meters; daily, by γ counting of prepared standard [illegible]

12. TECHNIQUES OF TISSUE AND BIO ASSAY [illegible] USED [illegible]
See Supplement 2, Item 5, Item 12. [illegible] film [illegible] against U and Ra standards and processed by standard [illegible] and alternate controls.

RESULTS TO BE SUBMITTED ON SUPPLEMENTARY SHEETS

13. [illegible] [illegible] 90% to be covered by [illegible] percent of Ra 226.

14. [illegible]

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APPLICATION FOR BYPRODUCT MATERIAL LICENSE

SUPPLEMENT A — HUMAN USE

If byproduct material is for human use (internal administration of byproduct material, or the radiation therefrom to human beings) complete this supplement and attach to the application for byproduct material license

1 (a) USING PHYSICIAN'S NAME

None

(b) NAME AND ADDRESS OF APPLICANT (If different from 1(a))

U.S. Naval Radiological Defense Laboratory
San Francisco 24, California

2 THE USING PHYSICIAN INDICATED ABOVE IS LICENSED TO DISPENSE DRUGS IN THE PRACTICE OF MEDICINE BY A STATE OR TERRITORY OF THE UNITED STATES, THE DISTRICT OF COLUMBIA, OR THE COMMONWEALTH OF PUERTO RICO

CIRCLE ANSWER — YES — NO

3 A STATEMENT OF USING PHYSICIAN'S CLINICAL RADIOISOTOPE EXPERIENCE (PAGE 3 OF THIS SUPPLEMENT) IS SUBMITTED IN SUPPORT OF THIS APPLICATION. IF ANSWER IS NO, USE PAGE 2 OF THIS SUPPLEMENT TO EXPLAIN OR REFER TO OTHER APPLICATION OR RELATED DOCUMENTS ON WHICH THIS INFORMATION APPEARS

CIRCLE ANSWER — YES — NO

PROPOSED DIAGNOSIS OR TREATMENT

4 (a) DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED INCLUDING SPECIFIC CONDITIONS OR DISEASES TO BE DIAGNOSED OR TREATED (Use page 2 if necessary)

As a tracer of soil in determining the contaminability characteristics of personnel operating as combat troops.

(b) CHEMICAL FORM ADMINISTERED

La-140 adsorbed onto soil.

(c) DESCRIBE PROCEDURES WHICH WILL BE OBSERVED TO MINIMIZE HAZARD FROM HANDLING, STORAGE, AND DISPOSAL OF THE BYPRODUCT MATERIAL

Full radiological safety precautions will be observed, including monitoring to determine radiation levels, time limits will be set at short enough intervals to prevent overexposures, respiratory protection will be used until proven unnecessary by constant air sampling; no storage or disposal problems due to short half-life.*

(d) DESCRIPTION AND SKETCHES OF SPECIAL DEVICES TO BE USED FOR ADMINISTERING BYPRODUCT MATERIAL TO HUMAN BEINGS ARE ATTACHED (LITERATURE REFERENCES WILL SUFFICE)

CIRCLE ANSWER — YES — NO

* See also supplement 1, para. 4.

(2) ON FILE WITH THE ISOTOPES EXTENSION

REFER TO APPLICATION NO

CIRCLE ANSWER — YES — NO

5 PROPOSED DOSAGE SCHEDULE

(a) In millicuries for internally administered byproduct material other than discrete fixed sources, and in roentgens or rads, as appropriate, for internal or external irradiation from discrete fixed sources (gold seeds, cobalt needles, etc.) state separately for each condition or disease (use page 2 if necessary)

Dosages will be minimum necessary to record on sensitive films placed on external body surfaces (skin). Activity range will be from minimum of 0.001 uc/cm² to maximum of 0.1 μc/cm², corresponding to total maximum deep tissue dose of 200 mrad. Details are in supplement 1.

(b) INVESTIGATIVE PROPOSAL FOR EXPERIMENTAL, NEW OR UNUSUAL HUMAN USES IS ATTACHED (Attachment should include outline of conditions to be evaluated, including data from animal studies and, or abstract of literature reference if any, number and type of patients (i.e. age group, moribund, etc.))

CIRCLE ANSWER — YES — NO

6 IF BYPRODUCT MATERIAL WILL NOT BE OBTAINED IN PRECALIBRATED FORM FOR ORAL ADMINISTRATION OR IN PRECALIBRATED AND STERILIZED FORM FOR PARENTERAL ADMINISTRATION, DESCRIBE IDENTIFICATION, PROCESSING, AND STANDARDIZATION PROCEDURES

No oral administration.

7 THE PROPOSED USE OF BYPRODUCT MATERIAL HAS BEEN, OR WILL BE, APPROVED BY THE MEDICAL ISOTOPE COMMITTEE.

CIRCLE ANSWER — YES — NO

HOSPITAL FACILITIES FOR INDIVIDUAL PRACTICE USE ONLY

8 (a) THE APPLICANT HAS COMPLETED ARRANGEMENTS FOR A HOSPITAL TO ADMIT RADIOACTIVE PATIENTS WHENEVER ADVISABLE

CIRCLE ANSWER — YES — NO

(b) A COPY OF INSTRUCTIONS TO BE FURNISHED TO THE HOSPITAL AS TO RADIOLOGICAL SAFETY PRECAUTIONS TO BE TAKEN AND AVAILABLE INFORMATION IN ADMINISTRATION IS ATTACHED

CIRCLE ANSWER — YES — NO

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This page may be used for provisional notice of [illegible] Please [illegible]

See Supplement 1

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Supplement (1) to Ar[illegible] [illegible]

Subj: [illegible] of [illegible] 140 [illegible] soil on human volunteers in connection with [illegible] studies

[illegible] of the [illegible] in the Department [illegible] Army Research Program "[illegible] targets is to determine [illegible] (clothing) exposed to contact with beta-[illegible] when [illegible] combat troops in a fallout area.

2. Preliminary Studies - Approximately [illegible] of soil containing 1 uc/gm of La140 will be placed within [illegible] on the [illegible] of 2 civilian and 2 military volunteers and remain [illegible] a period of six hours. The experiment will enable the determination [illegible] relationships between the [illegible] mass loading [illegible] the skin, the specific [illegible] readings [illegible] the soil, and the dosimeter [illegible] exposure.

[illegible] will [illegible] up to 15 test runs with [illegible] a [illegible] individuals. [illegible] phase - this includes [illegible] radiation [illegible] typical [illegible] for the [illegible] prescribed maneuvers, [illegible] with a portable [illegible] exposed on the [illegible] the distribution and [illegible]

[illegible] will be used to establish test conditions for the other runs and [illegible] that the maximum permissible radiation exposure [illegible] personnel will not be exceeded. The conditions of Run A have been set to give radiation dosages at the lower limit of film detectability. Runs B and C will be used to bring the radiation level up by steps to the point of good instrumentation. Run C will be required only if dosage estimates have been so conservative that Run B does not give quantitative results. (The radiation dosage required for quantitative results is expected to be [illegible] to 1000 mrad beta). Table I gives anticipated dosages to soldiers participating in Runs A, B, and C if required. Appendix A gives the test conditions and computations for these runs.

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Table 1 Anticipated Dosages to Personnel During Initial Test Runs. Body of Table Gives Dosage in mrad.

Run No.		Maneuvering	Monitoring	Dosimetry	Total
A	deep dose (γ)	.60	.26	1.3	2.2
	skin dose (β+γ)	9.3	3.1	15.3	28
B	deep dose (γ)	6.0	2.6	13	22
	skin dose (β+γ)	93	31	153	280
C (if req'd)	deep dose (γ)	43	19	93	155
	skin dose (β+γ)	663	219	1093	1975 mr

The maximum permissible whole body exposure for a single exposure period is 3000 mr gamma and 15000 mrad beta.

Appendix A gives the method of computation.

4. The contamination of and dosage to personnel participating in the test runs will be controlled by the following means:

a. Synthetic fallout: The La^{140} is produced from high purity La_2O_3 by neutron irradiation and is checked for radiochemical purity prior to field tests. Lot 731, which will be used for these tests showed a 40 hr half-life after 14 half-lives and the gamma spectra revealed no impurities. The solubility of the radionuclides was found to be less than 0.1 percent for 1 gram of synthetic fallout in 100 ml water. Each irradiated lot is assayed when received to insure a controlled specific activity which ranges from 1 microcurie/gram to 10 microcurie/gram.

b. The test area will be monitored to determine gamma radiation intensity before the maneuvering period, and the total time interval for maneuvering will be set short enough to assure a gamma dosage considerably below the MPE (see Table 1).

c. Pocket ionization chambers and dosimeter film badges will be worn throughout the test runs to give a continuous indication and a permanent record of dosage.

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d. In order to prevent inhalation of the synthetic fallout, gas masks (Mark 9) shall be worn during the preliminary runs, A, B, and C. After each of these runs, the filter [illegible] will be given to the Radiological Safety representative for evaluation. The use of gas masks for the remainder of the runs will be contingent upon the Rad-Safe representative's recommendation.

e. A Radiological Safety representative will be present during the test runs to assess and advise the project officer on the radiological situation.

f. The monitoring period, with its thorough radiation survey of the soldier, will be used to determine if prompt showering is advisable and to determine the time required for film exposure during the dosimetry period.

g. Soldiers will not be released from the test area before showering and Radiological Safety monitoring.

h. Excretory specimens from the soldiers will be collected and radiation-counted to determine the magnitude of internal "contamination".

i. All men participating in these tests will be thoroughly informed as to radiological health aspects of their participation in this test. Written statements of voluntary participation will be obtained from each man.

[illegible]. The following paragraphs give information to Supplement that given on ALC-313 (2-57). The item numbers refer to corresponding item numbers of ALC-313 (2-57).

Item 8. Training and experience of individual users is as follows:

[illegible]. D. Sartor has been a member of the Scientific Staff of USNRDL for [illegible] years. During this time he has received much experience and informal training in the principles and practices of radiation protection and monitoring techniques and instruments through his participation in the weapons tests. In addition, has taken 3 units of formal training from University of California Extension in atomic physics, including nuclear processes and measurements. At USNRDL, Mr. Sartor was in attendance at a seminar and lecture series conducted by Dr. E. L. Alpen on the biological effects of radiation.

R. H. Black has been a member of the Scientific Staff of USNRDL for 5 years. During this time he has received much experience and informal training in the principles and practices of radiation protection and monitoring techniques and instruments through his participation in the weapons tests. In addition, has taken 5 units of formal training from University of California Extension in nuclear physics, including nuclear processess and measurements. At USNRDL, Mr. Black was in attendance at a seminar and lecture series conducted by Dr. E. L. Alpen on the biological effects of radiation.

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Item 9. Mr. Sartor's experience with the use of radioisotopes, in addition to operating crews in areas contaminated by the fallout from weapon tests, includes:

a. La^{140}, 6000 mc/run at Camp Stoneman for 2 months, where the La^{140} was used as a tracer for soils.

b. Y^{90}, 500 mc/run at San Bruno for 1 month, where the Y^{90} was used as a tracer for soil.

Mr. Black's experience with the use of radioisotopes, in addition to operating crews in areas contaminated by the fallout from weapons tests, includes:

a. Y^{90}, Sr^{90}, 2000 mc/run at USNRDL in a process of separating Y^{90} from Sr^{90}.

b. Mfp, 100 mc/run at USNRDL in decontamination experiments

Item 11. Co^{60} and Ra sources calibrated by Bureau Standards. Weekly calibration on a range for monitoring equipment; daily, for scintillators.

Item 12. DuPont Duopak 555 and 510 films using U and Ra calibration, processing and controls as per DuPont instruction.

0-200 mr and 0-5r self reading dosimeters will be issued to all persons exposed to radiations from La^{140}.

Facilities will be available for radioanalysis of urine specimens.

Item 14. (a) A. L. Baietti, Chairman, Radioisotope Committee at USNRDL since 1951; Head, Health Physics Division at USNRDL since March, 1953 to date; 2 years as Head, Radiological Safety Branch, USNRDL; 4 months as Radiological Physicist, Assistant Head, Health Physics Branch, USNRDL; 8 months as Vacuum Engineer, Carbide and Carbon Chemical Corp., Oak Ridge, Tenn.; 5 months as Physicist at Tennessee Eastman Corp., Oak Ridge; 2-1/4 years as Physicist, Kellex Corp., New York; 2 months as Senior Engineer with Jackson and Moreland Co., Boston, Mass.

(b) The following named trained physicians are members of the Laboratory Staff and will be available at all times for consultation:

Capt. A. R. Behnke, Jr., MC, USN, a physician trained in internal medicine; has wide experience in physiological research.

Robert R. Newell, M.D., Emeritus Professor of Radiology, Stanford University Medical School.

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Item 15. The area contaminated by the La^{140} traced soil will be controlled for 3 months. As La^{140} has a 40 hrs half life, this will give a decay to 10^{-15} the original isotope level, which is ample decay for permitting unrestricted access.

Enclosure (1) to ltr 933-114 RHB:mcj

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APPENDIX A DOSAGE COMPUTATION, ETC.

TABLE A-1 TEST CONDITIONS

	Run A	Run B	Run C
Specific activity of traced soil	0.1 $\mu c/gm$	1 $\mu c/gm$	2 to 10 $\mu c/gm$
Mass loading of traced soil on terrain	20 gm/ft^2	20 gm/ft^2	20 gm/ft^2
Maneuvering time	1/2 hr	1/2 hr	1/2 hr
Monitoring time	1/2 hr	1/2 hr	1/2 hr
Dosimetry time	5 hr	5 hr	5 hr

TABLE A-2 ASSUMPTIONS USED IN COMPUTING DOSAGES

Assumptions	Effect on Dosage Estimate	Computation Affected
Gamma energy is 2 Mev	slightly conservative	all γ
Test area is an "infinite field"	conservative	γ bath
Beta "bath" dosage can be computed from the contact β formula	high conservative	β bath
Mass loading of soil on skin is 5 mg/cm^2	very conservative	β-γ skin
Mass loading of soil on clothes is 5 mg/cm^2	very conservative	β-γ clothes
Dosages to a particular tissue area delivered simultaneously from different sources are cumulative	no effect on estimate	all total
Dosages from clothing can be computed as if the soil were in contact with skin	conservative	β-γ clothes

METHOD OF COMPUTION

The reference used for computations is J. D. Teresi and A. Broido, "Estimation of the Gamma Dose Associated with Radioactive Fallout Material", USNRDL-TM-18 (1954).

For the computation of dosages to an individual during a test run, the following formulae and nomenclature will be used:

$I_\gamma = K_\gamma AE$ for gamma (1)

$I_\beta = K_\beta A$ for beta (2)

$D = It$

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A = activity level ($\mu c/cm^2$)
D_γ = dosage for gamma (r)
D_β = dosage for beta (rad)
E = γ photon energy (Mev)
K_γ bath = 0.16
K_γ clothes = 0.26
K_γ skin = 0.26
K_β bath = 5.5
K_β clothes = 5.5
K_β skin = 5.5
I_γ = dose rate γ (r/hr)
I_β = dose rate β (rad/hr)
t = time (hr)

Equations (1) and (3) combined give

$$D_\gamma = K_\gamma AET$$

Run A During Maneuvering

Gamma dosage from terrain

$$D_\gamma \text{ bath} = 0.16 \times 20\ g/ft^2 \times 1\ ft^2/930\ cm^2 \times 0.1\ \mu c/gm \times 2\ Mev \times 1/2\ hr$$
$$D_\gamma \text{ bath} = 0.344 \times 10^{-3}\ r$$

Similarly:

$$D_\gamma \text{ clothes} = 0.26 \times .005 \times 0.1 \times 2 \times 1/2 = 0.13 \times 10^{-3}\ r$$
$$D_\gamma \text{ skin} = 0.26 \times .005 \times 0.1 \times 2 \times 1/2 = 0.13 \times 10^{-3}\ r$$
$$D_\gamma \text{ TOTAL} = 0.60 \times 10^{-3}\ r$$
$$D_\beta \text{ bath} = \frac{5.5 \times 20 \times 0.1 \times 1/2}{930} = 5.9 \times 10^{-3}\ rad$$
$$D_\beta \text{ clothing} = 5.5 \times .005 \times 0.1 \times 1/2 = 1.4 \times 10^{-3}\ rad$$
$$D_\beta \text{ skin} = 5.5 \times .005 \times 0.1 \times 1/2 = 1.4 \times 10^{-3}\ rad$$
$$D_\beta \text{ TOTAL} = 8.7 \times 10^{-3}\ rad$$

During Monitoring

$$D_\gamma \text{ clothing} = 0.26 \times .005 \times 0.1 \times 2 \times 1/2 = 0.13 \times 10^{-3}\ r$$
$$D_\gamma \text{ skin} = 0.26 \times .005 \times 0.1 \times 2 \times 1/2 = 0.13 \times 10^{-3}\ r$$
$$D_\gamma \text{ TOTAL} = 0.26 \times 10^{-3}\ r$$

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D_β clothing	= 5.5 x .005 x 0.1 x 1/2	= 1.4×10^{-3} rad
D_β skin	= 5.5 x .005 x 0.1 x 1/2	= 1.4×10^{-3} rad
D_β TOTAL	=	2.8×10^{-3} rad

<u>During Dosimetry</u>

D_γ skin	= 0.26 x .005 x 0.1 x 5	= 1.3×10^{-3} r
D_β skin	= 5.5 x .005 x 0.1 x 5	= 14×10^{-3} rad

The dosages from Run B and C will be x10 and x70 the dosages from Run A, as the only change in conditions is the specific activity of the soil for Run B, and it is x10 and x70 the specific activity used for Run A.

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