APS - 11/7/60

Mtg. 11/18/60

Vol 2

MATERIALS 12 WASTE RECOVERY & DISPOSAL

See also PFC. 4-Reg. Performance Bonds by Licensees

Materials 12 Waste Recovery & [illegible]osal

	Date	To	From	Class	Pgs.	No.	To	From	Class
1	11-14-62	American Smallfisheries Act	vee						
2	5-10-63	AEC 180/23 Low-Level Solid Radioactive Waste Burial Nuclear Eng. Co. Waste Burial	skw vee						
3	7-17-63	Oak Ridge Abbott Lab-.	vee						
4	11-12-64	AEC 180/24 Low-Level Wastes Release of Low-Level Aqueous Wastes	vee						
5	6-9-65	Ramey, Commissioner	et						
6	9-9-65	Atomic Storage Co.	vee						

EIGHTY-NINTH CONGRESS

Congress of the United States

House of Representatives

NATURAL RESOURCES AND POWER SUBCOMMITTEE
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS
RAYBURN HOUSE OFFICE BUILDING, ROOM B349-B
WASHINGTON, D.C. 20515

CAPITOL 5-4427

12

June 24, 1966

Dr. Glenn T. Seaborg
Chairman, Atomic Energy Commission of the U.S.
Washington, D. C. 20545

Dear Dr. Seaborg:

I enclose for your information three copies of House Report 1644 by the House Committee on Government Operations entitled: "1965 Survey on Disposal of Sewage and Industrial Wastes by Federal Installations."

The report is a follow-up of the Committee's 1964 survey of waste water discharges from Federal installations. It summarizes developments in legislative and executive actions during 1965 affecting water pollution control by Federal installations and evaluates the progress made in waste disposal practices at 341 Federal installations. The report contains 14 recommendations on pages 6 to 8.

These recommendations relate to your Agency's operations. The report also refers to specific installations under the jurisdiction of your Agency which are included among the 237 installations (Appendixes 1-7, pages 32-54) that have not yet established effective pollution abatement facilities. Recommendation 13 on page 7 of the report requests each Department and agency with installations in this category to "report to this committee, and to send a copy thereof to the Secretary of the Interior, not later than November 21, 1966, concerning its efforts to accelerate its program for accomplishing the remedial measures necessary to achieve full control and abatement of water pollution . . ."

6-24-66

The recommendation requests the Secretary of the Interior to review these reports and to send to the Committee not later than December 20, 1966, "his comments thereon and any proposals he may have for improving, accelerating, and expanding the plans and efforts of the respective agencies."

We would appreciate receiving, at an early date, your comments on the Committee's recommendations.

Sincerely,

Robert E. Jones

ROBERT E. JONES
Chairman
Natural Resources and Power Subcommittee

Enclosures

Materials - 1 - 2

bcc: SECY (2)
OGC (2)
OCR
HLPrice
CKBeck
MMMann
HLDoan
LJohnson
CLHenderson
WGDooly
JShafer

JUN 10 1966

Honorable Harley O. Staggers
House of Representatives

Dear Mr. Staggers:

I am pleased to furnish the information concerning an inquiry on nuclear power plants and radioactive waste disposal from Mr. Thomas Leach, Newburg, West Virginia, which you requested in your letter of May 17, 1966 to Chairman Seaborg.

The enclosed booklet, "Atomic Power Safety," published by the Atomic Energy Commission, discusses the handling of radioactive wastes at nuclear power plants starting on page 17. This section indicates that the radioactive waste concentrates removed from the reactor cooling water at nuclear power plants generally are shipped to an AEC approved site for burial or long-term storage.

In the past, some commercial disposals of small quantities of low-level radioactive wastes were made at sea at designated locations by AEC licensees; however, this practice has virtually disappeared due to economic factors.

Sincerely yours,

Original Signed by C. K. Beck

Harold L. Price
Director of Regulation

Enclosure:
As stated above

REG	OGC	DML	DRL	DIR REG.	OCR
WGDooly:er					
CLHenderson	Shapar	Johnson	Doan	HLPrice	
6/7/66	6/ /66	6/ /66	6/ /66	6/ /66	6/ /66

90-01-9

Materials · 13

NATIONAL ACADEMY OF SCIENCES
NATIONAL RESEARCH COUNCIL

2101 CONSTITUTION AVENUE, WASHINGTON, D. C. 20418

May 18, 1966

Dr. Glenn T. Seaborg, Chairman
United States Atomic Energy
Commission
Washington, D. C. 20545

Dear Dr. Seaborg:

On behalf of Dr. Seitz, I am forwarding a copy of the report of the NRC Committee on Geologic Aspects of Radioactive Waste Disposal prepared at the request of the Division of Reactor Development and Technology of the AEC. Twenty additional copies are being forwarded separately to the Division for its use.

The Committee has carried out its assignment under the general direction of our Division of Earth Sciences, which has approved the report for distribution.

Sincerely yours,

John S. Coleman

John S. Coleman
Executive Officer

Enclosure

cc: Dr. J. Hoover Mackin
Mr. John E. Galley
Dr. E. F. Cook

5-18-?

We very much regret having to make this decision and will continue to watch this matter. Should operating conditions change, we will reopen the matter and, if warranted, request competitive bids for disposal of Richland wastes. At that time, we would be most happy to consider California Nuclear, as well as other firms that perform these services.

At your request I am returning the copy of your incoming April 12, 1966, letter from Mr. McLain.

Please let me know if you desire any further information.

Sincerely yours,

SIGNE

General Manager

Enclosures:
As stated filed date Archie - 5-13-66

bcc: General Manager (2)
AGM
Congressional Relations (2)
Secretary (2)
OBIC
OGC

Materials - 12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

JUN 9 1966

Honorable Henry M. Jackson
United States Senate
~~Washington, D. C.~~

Dear Senator Jackson:

Thank you for your letter of April 25 attaching a copy of an April 12 letter of Mr. Stuart McLain, President, California Nuclear, Inc., describing his interest in handling a portion of the low level radioactive waste generated at the AEC's Richland site and his concern over not having received an official response on this subject. The information which Mr. McLain presented to us on January 11 was most helpful. As a result we initiated a comprehensive study of waste management operations at Richland.

These studies were recently completed. They show that the costs of the services which could be provided by California Nuclear are considerably greater than the costs of continuing to perform this service ourselves. I am enclosing copies of letters to Mr. McLain and Mr. Glenn C. Lee, Secretary, Tri-City Nuclear Industrial Council, informing them of our decision. The Tri-City Nuclear Council has also been very helpful on this matter. These letters explain the situation in greater detail.

The Atomic Energy Commission has been very active in the development and use of the nuclear industry in the United States in order to strengthen free competition in private enterprise. While we would like to utilize the services of California Nuclear in accordance with our desire to use private industry wherever possible and in recognition of California Nuclear's sincere efforts to establish themselves in the Richland area, we must also be responsive to the need for economy in Government. In this case the difference in cost could not justify the use of commercial facilities.

6-9-66

MAY 1 3 1966

Mr. Stuart McLain, President
California Nuclear, Inc.
2323 South Ninth Street
Lafayette, Indiana

Dear Mr. McLain:

As a result of your discussions on January 11, 1966, with the Office of Economic Impact and Conversion, relating to the waste disposal activities at Richland, the staff has reviewed our method of operation from the standpoint of the feasibility of making these wastes available to California Nuclear and the costs of utilizing the services of California Nuclear as compared with the costs associated with the existing in-house waste management operation.

While the AEC has a policy of utilizing commercial facilities whenever available, our review showed that there was a considerable difference in costs between using our own facilities and those offered by your company. Therefore, we have reluctantly had to conclude that we should continue to dispose our low level solid wastes in our own facilities.

The differences in cost between those quoted by your firm and ours are largely due to the low-volume of wastes and the part-time nature of the Richland waste management operation. We are able to use the personnel and equipment involved for other programs and, thus, able to greatly reduce fixed costs. We regret that we have had to make this decision, but feel that in this instance authorizing the large extra expenditure to have the waste processed commercially would not be in the best interests of the Government.

If operating conditions and costs should change in the future, the Atomic Energy Commission will be happy to consider your company along with the other firms that operate private waste disposal businesses.

If there is any further information you desire on this matter, it is suggested that you contact Mr. Donald G. Williams, Manager of our Richland Operations Office.

Sincerely yours,

SIGNED, R. E. HOLLINGSWORTH

General Manager

5-13-66

Mr. Glenn C. Lee, Secretary
Tri-City Nuclear Industrial
Council, Inc.
P.O. Box 2608
Pasco, Washington 99302

Dear Mr. Lee:

Thank you for your letter of March 30, 1966, to Mr. Ohlke, regarding the waste disposal activities at Richland and, in particular, the possibility of having some of these wastes handled by California Nuclear, Inc.

Mr. Stuart McLain discussed this matter with AEC staff in detail on January 11, 1966. We have carefully considered the information he presented as well as the fact that California Nuclear is the only firm that has taken advantage of the availability of land for the development of private nuclear enterprises in the Richland area. Our review of the costs of utilizing the services provided by California Nuclear as compared with AEC operations shows that the costs of commercial burial would be significantly higher than the cost of continuing this service in-house.

As you are aware, the Commission has been very active in the development and use of our nuclear industry so as to strengthen free competition in our private enterprise system. However, we must also be responsive to needs for economy in the Government, and in this case, the additional costs of using commercial services were too great to be in the best interests of the Government. We regret to have had to make this decision not only because of the vigorous efforts of California Nuclear to establish a new operation in the Hanford area but also because of the excellent cooperation we have received from the Tri-Cities Nuclear Industrial Council.

If operating conditions and costs change in the future, the Atomic Energy Commission will be happy to consider proposals for California Nuclear as well as those from other firms that operate private waste disposal businesses.

A copy of my letter to Mr. McLain informing him of the results of our study is attached for your information. If you desire any

5-13-66

further information on this matter, we suggest that you contact Mr. Donald G. Williams, Manager of our Richland Operations Office.

Sincerely yours,

SIGNED, K. E. FIELDS

General Manager

Attachment:
As indicated

Materials -12

~~OFFICIAL USE ONLY~~

Reference & Reproduction Branch

Copy - Germantown

UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: May 11, 1966

FROM : W. B. McCool, Secretary

SUBJECT: AEC 180/25 - RICHLAND WASTE DISPOSAL ACTIVITIES - CALIFORNIA NUCLEAR

SECY:JCH

1. At Information Meeting 583 on May 6, 1966, the Commissioners approved the General Manager's recommendation that no change be made in the disposal practices at Hanford because of increased costs as discussed in Mr. Ryan's April 29, 1966 memorandum (AEC 180/25).

2. It is our understanding the Office of Economic Impact and Conversion is taking the required action.

cc:
Commissioners
General Manager
Deputy General Manager
Assistant General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for Admin.
Asst. Gen. Mgr. for Operations
Asst. Gen. Mgr. for Plans & Prod.
Asst. Gen. Mgr. for R&D
Asst. to General Manager
General Counsel
Dir., Congr. Relations
Dir., Economic Impact & Conversion
Dir., Ind. Participation
Dir., Inspection
Dir., Production
Controller

cy filed O-M-6.

5-11-66

~~OFFICIAL USE ONLY~~

Materials & waste disposal

STATE OF WASHINGTON

OFFICE OF THE GOVERNOR

OLYMPIA

DANIEL J. EVANS
GOVERNOR

May 9, 1966

Mr. Donald G. Williams, Manager
Atomic Energy Commission
Richland Operations Office
P. O. Box 550
Richland, Washington

Dear Mr. Williams:

All of us in Washington are indeed pleased and impressed with the fine progress that has been made in the segmentation and diversification programs which have resulted in bringing into the State many new activities and corporations.

State government has a continuing and vital interest in developing the nuclear economy of the State and, as you know, does in fact lease 1,000 acres of Hanford land for developmental purposes.

In this regard, I would like to suggest that strong and timely consideration be given to the disposal of some of the Commission's low-level radioactive wastes to private firms for burial.

Please let me know if at any time I can be of assistance to you in this or any other nuclear endeavor.

Sincerely,

Daniel J Evans

Daniel J. Evans
Governor

DJE:ry

cc: Mr. Robert Philip, President
Tri-City Nuclear Industrial Council
P. O. Box 692
Pasco, Washington

5-9-66

cc: Doctor Glenn T. Seaborg, Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Mr. John C. Ryan, Assistant Director
Office of Economic Impact and Conversion
U. S. Atomic Energy Commission
Washington, D. C. 20545

Mr. Ernest B. Tremmel, Director
Division of Industrial Participation
U. S. Atomic Energy Commission
Washington, D. C. 20545

The Hon. Warren G. Magnuson
United States Senator
Senate Office Building
Washington, D. C.

The Hon. Henry M. Jackson
United States Senator
Senate Office Building
Washington, D. C.

Mr. Donald F. Koch, Executive Director
Office of Nuclear Energy Development
Department of Commerce and Economic Development
General Administration Building
Olympia, Washington

OFFICIAL USE ONLY

May 4, 1966

AEC 180/25

COPY NO. 35

ATOMIC ENERGY COMMISSION

INFORMATION MEETING ITEM

AEC 180/25

RICHLAND WASTE DISPOSAL ACTIVITIES - CALIFORNIA NUCLEAR

Note by the Secretary

The General Manager has requested that the attached memorandum of April 29, 1966, by the Assistant General Manager for Operations, with attachments, be circulated for consideration by the Commission at an early Information Meeting. It should be noted that Senator Henry M. Jackson and Glenn Lee of the Tri City Nuclear Industrial Council have written to AEC expressing interest in the California Nuclear request as indicated in the attached.

W. B. McCool

Secretary

DISTRIBUTION	COPY NO.
Secretary	1,24-29
Commissioners	2 - 6,30-33
General Manager	7 - 8
Deputy Gen. Mgr.	9
Exec. Asst. to GM	10-11
Asst. GM for Admn.	12
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5-4-66

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27
5010-107

UNITED STATES GOVERNMENT

Memorandum

TO : R. E. Hollingsworth
General Manager

DATE: April 29, 1966

THRU : John A. Erlewine, AGMO

FROM : John C. Ryan, Acting Director
Office of Economic Impact and Conversion

SUBJECT: RICHLAND WASTE DISPOSAL ACTIVITIES - CALIFORNIA NUCLEAR

In accordance with your memorandum of February 9, 1966, the Richland Operations Office has studied the waste disposal activities at Richland to determine whether or not it is feasible to segregate the classified and unclassified waste as well as the cost being incurred by the AEC at the present time. The results of the Richland study are set forth in the attached memorandum dated April 7, 1966 from Donald G. Williams, Manager, Richland Operations Office, to John A. Erlewine, AGMO.

It is noted that RLO has determined that, while it is feasible to segregate unclassified waste, they recommend no change be made in the disposal practices at Hanford because of the increased costs. While the Richland report does not so state, it should be recognized that (1) one of the primary reasons for the cost differences between AEC burial and commercial burial is that the AEC operation is essentially a part-time operation. People presently involved in the waste disposal operation are, for the most part, required for other service functions performed at Richland, and even if a portion of the waste was handled commercially, there would be no reduction in employment or in AEC expenditures; and (2) any cost incurred for commercial burial would represent an additional expenditure on the part of AEC.

The AGMPP, the Division of Production, the Office of the Controller, and this Office, concur with the recommendations of RLO. As the Controller and the Office of the General Counsel have pointed out, the cost comparisons were made pursuant to the provisions of Bureau of the Budget Bulletin 60-2 rather than BOB Circular A-76. Richland is presently revising the AEC cost comparisons so as to conform with the provisions of A-76; however, it is clear that the revised cost calculations will neither have a significant effect on AEC costs nor cause Richland to revise its recommendations.

The Division of Industrial Participation recommends that we consider releasing for private burial the 25,000 cubic feet of waste which is generated each year at the 300 Area laboratory operations. DIP believes that such a step would be a positive indication of the Commission's sincere desire to foster the commercial segment of our nuclear economy.

At the time the 1,000 acres at Richland were leased to the State of Washington, it was clear that a low level waste disposal operation was contemplated. However, there was no mention at that time, nor any commitment by AEC, to have utilization of the State-leased land for disposal of AEC-generated waste.

California Nuclear, Inc. entered into a contract with the State of Washington for the lease of 100 acres for the purpose of burying waste generated by the private nuclear industry. In fact, one of the reasons given by the State for the selection of California Nuclear was that its estimates for the volume of private work to be obtained were greater than the one other proposer to the State of Washington.

Actually, California Nuclear, through no fault of its own, was hampered by litigation in the State of Washington. This litigation started in late 1964 and ended in February 1966. The representatives of California Nuclear indicated that the litigation had prevented the Small Business Administration from approving a loan to the company. However, even though the litigation was withdrawn in February 1966, Mr. Williams ascertained from the Spokane Office of the SBA, on April 18, 1966, that negotiations were continuing between SBA and California Nuclear but to that date no formal application for a loan had been made by the company.

The company has submitted bids to LRL and Atomics International but in both cases a competitor, located in Nevada, was the successful bidder. The inability of California Nuclear to obtain such contracts has, in fact, been the major factor to the company's present position. The president of California Nuclear, Stuart McLain, has indicated it will be necessary to close down the West Coast operations unless AEC offers some assistance. It is significant to note that at no time has the company indicated that it intends to go out of the waste disposal business but rather that it intends to relocate closer to the potential market.

The company recognizes that even if AEC were to offer any of its waste at Richland for private burial, competition would have to be solicited.

According to the best information available, the volume of private waste to be generated at Richland in the next three to five years is less than 5,000 cubic feet. Accordingly, it is clear that for the Richland venture to be profitable it still will be necessary for California Nuclear to obtain work from sources other than AEC waste at Richland.

The Tri-City Nuclear Industrial Council has urged that the AEC give some consideration to assisting California Nuclear. The views of the Council are set forth in the letter dated March 30, 1966, from Glenn C. Lee to C. C. Ohlke. Also attached are the comments received from the staff divisions and offices.

In view of the fact that the California Nuclear venture is the only one to utilize the land leased by the State of Washington, you may wish to call this matter to the attention of the Commission.

In all probability, if we were to endeavor to "sole source" the procurement recommended by the Division of Industrial Participation, Nuclear Engineering, Inc., which is now operating in Nevada, would strongly protest. The Nevada organization formed a Washington subsidiary and was responsible for the litigation in the State of Washington which has caused many of California Nuclear's previous problems.

Attachments:

"A"	April 7, 1966 memorandum to AGMO from Mgr. Richland Operations Office
"B"	April 25, 1966 memorandum to Dir. OEI&C from Dir. DIP
"C"	April 22, 1966 letter to Dir. DIP from President, California Nuclear, Inc.

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

ATTACHMENT "A"

UNITED STATES GOVERNMENT

Memorandum

TO : John A. Erlewine
Assistant General Manager for Operations

DATE: APR 7 1966

FROM : D. G. Williams, Manager
Richland Operations Office

SUBJECT: WASTE DISPOSAL ACTIVITIES (YOUR MEMO, 2/9/66)

OR:RBS

We have studied our waste disposal activities with regard to the possibility of contracting for burial of our unclassified dry waste, and we have determined the following:

1. Segregating the unclassified dry waste from the classified waste in the 100 and 300 Areas is feasible.
2. The volume of such unclassified dry waste is about 208,000 cu.ft. per year.
3. Our current costs for waste disposal are $130,000 per year.
4. Annual costs for commercial disposal would be $294,000 consisting of $154,000 for packaging, monitoring and transporting by AEC contractor and the contractor's burial charge of $140,000.
5. Annual costs for commercial disposal including transportation by the disposal firm would be $276,000.

Therefore, due to the increased cost, we do not recommend a change in disposal practices at Hanford.

We have concluded that the low level wastes (less than 10 curies/cu.ft.) offer the only practical quantities to be considered for disposal by this means. This low level waste constitutes about 95 per cent of our dry waste from 100 and 300 Area operations. The high level waste (above 10 curies/cu.ft.) can be hazardous, and it would require a major engineering study to adequately scope the equipment and handling costs for transport to a commercial contractor for burial. Therefore, we believe that high level waste should continue to be buried by the operating contractors in the burial site closest to point of generation.

The 100 and 300 Area low level dry waste is practically all unclassified, while all of the 200 Area waste is considered classified since the predominant contaminants are fission products which could reveal radiation history. All the 100 Area classified waste is high level.

Each reactor has its own burial grounds except N reactor, which uses the DR burial grounds. Part of the dry unclassified waste generated in the 300 Area is buried in two sites near the area, one for fuel preparation and one for the laboratory operation. The balance of the 300 Area dry unclassified waste, about 25,000 cu.ft. per year composed of material contaminated with long half-lived isotopes, is presently transported to the 200 Area disposal site, which is adjacent to the local commercial disposal grounds.

Our annual cost for delivery to the commercial disposal site is estimated at $154,000. Included in this cost is the added handling, transportation and $9,500 for amortization of $95,000 additional capital investment for containers and liners. The added cost for commercial burial of 208,000 cu.ft. of waste per year would be $140,000, based on the stated fee (California Nuclear's letter to Mr. E. B. Tremmel dated 1/8/66) of $.625 per cu.ft. FOB the burial site plus $.05 per cu.ft. for State of Washington charge. The total annual cost for this procedure would be $294,000 compared to total current annual cost of $130,000 for packaging, monitoring, transportation and burial. Application of BOB Bulletin 60-2 would have an indicated total cost for commercial burial of $297,000 and a total cost of $133,000 for current disposal.

A commercial contract for burial on state land including transportation by the commercial processor from each area would have an indicated annual cost of $276,000. Included in this cost is $85,500 for packaging, $15,000 for monitoring, and $9,500 for amortization of $95,000 additional capital investment for containers and liners. Also included is the transportation and burial cost of $166,000 if done commercially. This is based on the transportation and burial fee (California Nuclear's letter to Mr. E. B. Tremmel dated 1/8/66) of $.75 per cu.ft. plus $.05 per cu.ft. for the State of Washington charge and assumes that the packaging and shipping containers would be the same as those that we would use. Application of BOB Bulletin 60-2 would have an indicated total cost for commercial transportation and burial of $278,000 and a total cost of $133,000 for current disposal.

Our packaging of waste does not conform to ICC regulations, and it is not believed that the ICC regulations are applicable. However, it is possible that ICC regulations or some similar state regulations might be imposed on a commercial contractor transporting and burying our wastes. The containers and liners referred to above for $95,000 are proposed as an improvement needed to transport 100 Area low level waste the longer distance to the commercial burial site. The 300 Area waste packages are transported in a large metal container called a "loadlugger" which provides adequate protection but does not meet ICC regulation. However, we would propose to continue this method with a commercial contractor. Our contractors' present methods of packaging and transporting are deemed safe and adequate, and due to the large cost differential between present burial and commercial burial with current packaging we have not attempted a cost appraisal covering complete ICC requirements.

Following is a summary tabulation for the disposal of the total dry unclassified waste comparing present actual costs with minimum anticipated costs for both commercial burial and combined commercial transportation and burial.

	Packaging	Monitoring	Trans-portation	Burial	Total
AEC Burial	78,000	10,000	24,000	18,000	130,000
Commercial Burial	95,000*	15,000	44,000	140,000	294,000
Commercial Transporta-tion and Burial	95,000*	15,000	**	166,000	276,000

*Includes $9,500 charge for amortization of added capital investment and $85,500 for packaging
**Included in burial cost

We have also considered the possibility of contracting the commercial burial of only that waste currently delivered to 200 Area disposal sites from the 300 Area laboratory operations. This disposal now costs $24,000 for packaging, monitoring and transportation to the burial site plus $8,000 for burial. Burial by commercial contract at $.675 per cu.ft. would cost $17,000 for an annual cost increase of $9,000. A similar comparison is $20,000 for commercial transportation and burial at $.80 per cu.ft. and $17,000 AEC packaging and monitoring cost for an annual cost increase of $5,000. Application of BOB Bulletin 60-2 to these segments does not materially alter these annual increases.

In a conversation with Douglas United Nuclear, Inc. management, they expressed no objection to commercial disposal of our dry unclassified waste. They did comment that this would be a step in the direction of fragmenting their operation which is in conflict with Contract AT(45-1)-1857, Article III (a)(1)(i). This states:

"(1) The services to be performed include, but are not necessarily limited to, the following:

"(i) Performance of work and services associated with Reactor and Fuels Production Operation necessary to produce products conforming to specifications acceptable to the Commission, including delivery of such products to the Commission, or other parties approved by the Commission, and performance of work and services required for standby maintenance and surveillance of deactivated production reactors. Initially, the work shall include the operation of five production reactors and associated Fuels Production Facilities. Further, the operation of the N-Reactor and its associated Fuels Production Facilities shall be assigned to the Contractor under this contract at such time as the N-Reactor's performance as a dual purpose reactor has been demonstrated to the satisfaction of the Commission if, at such time, dual purpose operation is to be continued. Assignment of the operation of the N-Reactor and its associated Fuels Production Facilities hereunder is expected to take place on or before July 1, 1967. Unless the parties otherwise mutually agree, the Commission shall not, prior to the expiration of the period specified in Article XXXVI (a), except in the event of a termination for the default of the Contractor, assign to any other contractor for operation any of the facilities in the 100 - 300 Areas operated by the Contractor pursuant to this contract."

ATTACHMENT "B"

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-107

UNITED STATES GOVERNMENT

Memorandum

TO : C. C. Ohlke, Director
Office of Economic Impact and Conversion

DATE: APR 25 1966

FROM : Ernest B. Tremmel, Director EBT
Division of Industrial Participation

SUBJECT: WASTE DISPOSAL ACTIVITIES

We have received the Richland waste disposal study and would like to offer the following comments for your consideration:

1. In order to more fully understand the cost figures presented in the report we feel that a more detailed breakdown is required. We are specifically concerned with the large cost differential noted between in-house versus commercial burial charges of $.0965 per cubic foot and $.675 per cubic foot respectively. In any case, we would like to have the opportunity of reviewing these costs in greater detail. We understand you have asked RL to provide this information.

2. In addition to more detail regarding cost information we would also appreciate receiving comparative information on any differences in requirements. In order to obtain a realistic, comprehensive understanding of such a comparison, it is essential, we feel, to recognize and weigh all factors which inevitably find their way into the cost column. Only through spelling out the differences in Government versus Commercial operational and procedural requirements in the packaging, monitoring, transportation, and burial phases can we really obtain a clear understanding of their significance in any cost package.

3. We would like to recommend that as an initial step, and as an indication of the Commission's sincere desire to foster the commercial segment of our nuclear economy, we seriously consider releasing for private burial, the 25,000 cu. ft. per year waste generated at the 300 Area laboratory operations. The commercial contract estimate of $20,000 for transportation and burial we feel is reasonable.

Mr. Glenn C. Lee of the Tri-City Nuclear Industrial Council in his letter to you on March 30, 1966 clearly indicated strong support for the continued existence of California Nuclear Company in the Richland area. The Council believes that their operation is a necessary facet of long range diversification on the Hanford Project. DIP concurs in these thoughts and, as you are aware, we have always felt that the development of nuclear services such as laundry, waste, film badge, etc., within our private enterprise system allows the Government and its operating contractors to devote its time and effort on the primary nuclear R&D tasks. In addition, we feel that private nuclear services such as these may provide the added factor in encouraging and attracting other nuclear industry into the area.

I would appreciate having the opportunity of discussing with you the comments presented in this memorandum and of participating in any future staff meetings on this subject.

Attachment "B"

ATTACHMENT "C"

CALIFORNIA NUCLEAR, INC.
2323 South Ninth Street
Lafayette, Indiana 47905

April 12, 1966

Mr. Ernest B. Tremmel, Director
Division of Industrial Participation
U.S. Atomic Energy Commission
Washington, D. C. 20545

Our file: 4126.1

Subject: Richland Low Level Solid Wastes
California Nuclear, Inc.

Dear Ernie:-

Reference is made to previous letters and discussions relative to the Richland low level solid wastes in respect to possible shipment of a portion of the low level solid radioactive wastes to California Nuclear, Inc. Special attention is called to the "Information Presented by Stuart McLain on January 11, 1966 to the Division of Industrial Participation and Others, United States Atomic Energy Commission, Germantown, Maryland."

It was our understanding that the Atomic Energy Commission would make a study of the costs and determine if any of the Richland prime wastes could be shipped to California Nuclear, Inc. To date we have received no official word on this subject. We have, of course, heard a number of rumors.

The situation from our viewpoint still continues unfavorable as we are continuing to lose money on our West Coast operations. We have, however, reduced our personnel to the limit and closed the Richland office. Due to a somewhat increased business with time in our California office, we have reduced our losses to the point that we are able to continue the operations for a few months more. If there is no change in that time, we may find it necessary to discontinue all our West Coast operations.

We would like to point out the fact that we continue to hold the contract prices for waste disposal in California at a low level. In the information we presented on January 11, 1966, we stated that we have "saved the Atomic Energy Commission, Department of Defense, and other tax supported organizations, an estimated $180,000, and industrial organizations a similar amount, or a total of about $350,000." Since then we estimate we have saved the tax supported organizations a total of about $100,000 on new contracts, and industrial organizations a somewhat smaller sum. We suggest that the AEC make inquiries concerning the lowered costs due to our remaining in business on the West Coast.

We would appreciate any assistance that you can give us in respect to the Richland wastes.

Sincerely yours,

CALIFORNIA NUCLEAR, INC.

/s/

Stuart McLain, President

Attachment "C"

5

United States Senate

April 7, 1966

Respectfully referred to

Glenn T. Seaborg, Chairman
Atomic Energy Commission
Washington, D.C.

for such consideration as the communication herewith submitted may warrant, and <u>for a report</u> thereon, <u>in duplicate</u> to accompany <u>return of inclosure.</u>

By direction of

Leverett Saltonstall
U. S. S.

4-7-66

00058 MAR17'66

111 Mount Vernon Street
Newton, Massachusetts 02160
March 14, 1966

Senator Leverett Saltonstall
United States Senate
Washington, D. C.

Dear Senator Saltonstall:

A-C

I have read with alarm of the careless and uncontrolled disposal of atomic waste materials in Colorado and the consequent contamination of the surrounding lands and waterways. I believe that strict and immediate federal supervision is necessary.

In fact, pollution in general seems to be one of the major problems of today, and I urge you to support legislation which will assure citizens of clean waterways and air.

I do not support the administration's Vietnam policies. There seems much in the testimony of George Kennan, Gen. Gavin, etc., that is more wise and just than in our present policy. More should be done to bring this conflict to the conference table.

I have read of U. S. efforts to get food distributed to the starving masses in India and other parts of the world. I certainly do support our effort in this undertaking.

There is a real need for nuclear arms control and disarmament. The loss of the nuclear bomb in Spain is a bad mistake for our country. In fact, I question the policy of having nuclear bombs flown all over the world as a regular and extensive part of our own desfense. I feel that our nation should make every effort to bring nuclear weapons under control and to participate fully in freeing the world of this horror.

Sincerely yours,

Mrs. James L. McDade

Mrs. James L. McDade

Materials -12-

EIGHTY-NINTH CONGRESS

Congress of the United States

House of Representatives

NATURAL RESOURCES AND POWER SUBCOMMITTEE
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS
RAYBURN HOUSE OFFICE BUILDING, ROOM B349-B
WASHINGTON, D.C. 20515

March 9, 1966

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Seaborg:

The Natural Resources and Power Subcommittee of the House Committee on Government Operations is preparing a report on the status of waste disposal practices at several hundred Federal installations, as of December 31, 1965. The report will supplement and up-date information in House Report No. 555, "Disposal of Sewage and Industrial Wastes by Federal Installations (Water Pollution Control and Abatement)," copy enclosed, which surveyed progress in waste disposal practices at 963 Federal installations between December 31, 1960, and December 31, 1964. Installations of the Atomic Energy Commission were not included.

The enclosed Appendixes classify installations under the jurisdiction of your agency, which will be included in the forthcoming report. The classifications are based on information from your agency and the Federal Water Pollution Control Administration.

We would appreciate it if you would please examine the enclosed Appendixes, fill in the columns for which information is incomplete, correct information which is incorrect, and return the Appendixes to us with your comments, as outlined in the accompanying instructions, by March 23, 1966.

Thank you for your assistance.

Sincerely,

Robert E. Jones

ROBERT E. JONES
Chairman
Natural Resources and Power Subcommittee

3-9-66

Materials - 1 5/2

FEB 15 1966

Dear Fred:

We have read with interest the letters you forwarded on January 26 from Drs. Fair, Hubbert, Schaefer and Galley.

As Dr. Wolman points out in his latest transmittal note to you, the major comments relate to the long range aspects of operational practices in the disposal of low and intermediate level waste at certain AEC installations. Since Dr. John Galley, in his letter, indicates that pertinent evaluations will be contained in the report of his Committee (Geologic Aspects of Radioactive Waste Disposal - advisory to our Division of Reactor Development and Technology on its ground disposal research and development program), we have decided to review that report before forwarding a substantive reply to the group of letters. I understand a draft of the report has been completed and that it will be sent to us in the very near future.

I wish to again assure you that the Commission has always considered the satisfactory treatment and safe disposal of all waste materials as a major consideration in all of its operations.

Cordially,

(Signed) Glenn T. Seaborg

Chairman

Dr. Frederick Seitz
President, National Academy of Sciences
2101 Constitution Avenue
Washington, D. C. 20418

cc: Chairman (2)
CI (2)
AGMRD
RDT
OS

RDT
Lieberman OS AGMO AGM EAGM DGM GM

Materials - 12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

1/28/66

January 28, 1966

Dear Mr. Colburn:

Thank you very much for the report on our August 24 meeting with representatives of your company and Tecon Corporation. We have carefully reviewed this document, and the Commission's technical staff has reappraised the concept of transporting high activity wastes through buried pipelines in the manner discussed in your report for disposal into low pressure regions of subsurface geologic formations.

Although the description of the project as included in your report was brief and general, the staff had available the more detailed presentation submitted last year in the joint proposal with Stearns-Roger Corporation and E. A. Polumbus, Jr. and Associates, plus the information you provided in discussion and correspondence.

It is the judgment of the staff that reviewed the previous proposal and recent report, that the transportation and disposal methods you propose offer no advantage in safety over present waste handling methods and would impose a significant economic penalty. The staff analysis providing details leading to the above conclusion is enclosed.

The Commission views its responsibility for protecting the health and safety of the American people as a primary criterion for all of its varied operations. In this connection, we are continually searching for new and better ways of reducing the amount of radioactivity that is discharged to the environment. In view of present program priorities and budget limitations, we do not believe your proposed method holds sufficient promise for advancing these goals to justify further Commission consideration at this time.

1-28-66

Thank you again for the time and effort you have spent in studying these matters related to waste disposal. I regret that we have taken so long to reply to you.

Sincerely yours,

/S/
James T. Ramey
Commissioner

Mr. William A. Colburn
President
Atomic Storage Corporation
1525 Josephine Street
Denver, Colorado 80206

Enclosure:
Staff Analysis

bcc: W. Lennemann, PROD

Distribution:
Commissioner Ramey (2)
GM (2)
AGMR
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RDT: rf (2)
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Form AEC-318 (Rev. 9-53) U. S. GOVERNMENT PRINTING OFFICE 16-62761-8

Staff Analysis of Report of "Summary of Meeting - August 24, 1965, Mr. James T. Ramey with Tecon Corporation and Atomic Storage Corporation"

The Atomic Storage Corporation Report summarizing Commissioner Ramey's meeting with representatives of Tecon Corporation and Atomic Storage Corporation includes no new information. It is generally similar to the joint proposal submitted to the Division of Reactor Development and Technology in January 1964 by Stearns-Roger Manufacturing Company, E. A. Polumbus and Associates, and Atomic Storage Company and includes discussion of theory explaining natural pressure distribution in certain subsurface geologic formations, plus a rough outline of a concept to transport canisters of wastes sorbed on zeolites through a buried pipeline from Hanford to some site having favorable subsurface geologic conditions. It gives no basis for altering the Commission's previous judgment that the transportation of gross quantities of high activity waste from Hanford for deep well disposal elsewhere is unacceptable from the standpoint of both economics and safety. The following paragraphs briefly describe several salient features or points discussed in the report:

1. Storage of High Activity Wastes in Underground Tanks at Hanford: There is every indication that underground tanks can be considered a safe and practical method for storing Hanford's highly radioactive wastes. The waste storage tanks are located on a plateau of dry gravel and sandy soil with the land surface about 250 feet above the level of the underground water table. Annual rainfall averages about 8 inches and the dry desert-like environment permits only shallow penetration of the rainwater before it evaporates. There is no evidence of any extensive downward percolation. The Hanford soil has a blotter effect which is capable of retaining liquids to the extent of 7 to 10 per cent of its volume by capillarity. Any liquid so retained would then evaporate under the arid Hanford conditions.

It has been estimated that 250 gallons of water can be added for each square foot of ground surface without drainage to the present ground water level. This blotter effect in the 180 feet, or so, of dry soil between the bottom of the waste tanks and the water table also acts as a barrier for any waste which might escape from a tank.

In this connection, there is no indication that any of the radionuclides in the Columbia River originate from the tanks where wastes containing high levels of radioactivity are stored. In the instances where a tank leakage has occurred, even with extensive monitoring, it has never been possible to detect any evidence that this leakage did, in fact, reach the ground water beneath the tanks. The radioactivity detectable in the Columbia River (aside from fallout and naturally occurring radionuclides) originates from the effluent cooling water for the Hanford reactors. These releases from the reactors are under the most rigorous controls. Tritium concentrations noted in wells near the river indicate some movement from cribs and seepage pit facilities (into which large quantities of fluid have been placed) toward the river. Trace amounts of tritium and ruthenium-106 have been detected in the ground water at the river's edge and minute quantities undoubtedly have entered the Columbia River. However, the concentrations of these radionuclides in the river are below the limits of detection by the most sensitive methods of analysis and are far less than permissible limits.

2. <u>Hanford Low & Intermediate Level Waste Disposal Practices</u>: With reference to the comments on low-and-intermediate level waste disposal at Hanford, the problems of predicting fluid flow and geochemical effects on radionuclide transport are quite apparent to those responsible for Hanford's waste management, environmental monitoring and geohydrologic research. The extensive hydrologic, geologic and geochemical studies that are being carried out at Hanford are for the express purpose of understanding the environment through which the discharged wastes move and the driving forces that cause them to move. Waste management takes all these things into account and then applies appropriate factors of safety. The monitoring program serves as a check to make sure that disposal practices are adequately conservative.

3. Hanford's Waste Management Program: The foregoing conditions of the Hanford waste tank environment appear extremely favorable for long-term storage of Hanford wastes in underground tanks, particularly as a solid form which would minimize the possibility of any mobility of the waste and its radionuclides. Hanford is initiating a program which involves the evaporation of all highly radioactive liquid wastes to a salt cake in the existing tanks. Some of the longer stored wastes have about reached this stage at the present time. Due to change in chemical processing technology and improved economies in tank utilization, the more recently generated wastes will have to be treated for removal of long-lived fission products in order to reduce the heat generating rate in the evaporation residues to a safe limit. However, over two-thirds of the 146 tanks of waste now at Hanford can be evaporated directly to salt cakes without further treatment.

4. Transportation of Hanford's High Activity Wastes Offsite for Deep-Well Disposal: In this connection, the description of the occurrence of low pressure anomalies in subsurface geologic formations is relatively straightforward, but the question of faulting and its effect on fluid pressure is highly speculative. However, our principal reservations apply to the proposed transportation methods. Although we have on several occasions in the past supplied Mr. Colburn with copies of pertinent reports and lists of references on high level waste management, there is still no indication that the Atomic Storage Corporation has appraised the engineering, economic, or safety problems realistically. Also, while the Atomic Storage Corporation proposes to send the fission products removed from the Hanford wastes to another location for disposal, it overlooks the fact that the removal efficiency is not 100% and the remaining bulk of the wastes still contains enough radioactivity to constitute a potential hazard for a long period of time.

Their intent to return used canisters from the disposal site to Hanford is also open to serious question. The use of a second pipeline for this purpose presumes that two pipelines exist and that petroleum products are normally transferred in opposite directions in each. Although we have not made a detailed study of the distribution of petroleum product pipelines in the vicinity of Hanford, published pipeline maps indicate an 8-inch to 10-inch pipeline leading northeastward from the vicinity of Pasco, across northern Idaho and southeastward into southern Montana. The costs of pipeline construction are high; it hardly seems necessary to point out that if this waste disposal concept depends on construction of a new pipeline from Hanford to a distant deep-well disposal site, the added cost would be prohibitive.

We have also previously pointed out that long-distance pipelines are far more vulnerable to damage by earthquake and floods than are the Hanford waste storage facilities. Pipelines must cross streams and a pipeline from Hanford to - say eastern Montana - would pass through a zone of higher seismic risk than the zone in which the Hanford reservation is included.

While pipelines have not been given detailed study, cost estimates for handling and transporting highly radioactive wastes to another site for disposal have discouraged serious consideration of this approach. For example, an estimate to move the Savannah River wastes to another location about 800 miles away for disposal exceeded $170 million, which included no handling and disposal costs at the destination. Savannah River has considerable less waste in storage than Hanford has. Furthermore, transporting large quantities of radioactive waste over long distances by any method should be avoided if at all possible both from the safety consideration of having to handle the hazardous waste at both ends of the transportation system and the inherent dangers in transporting large quantities of concentrated highly radioactive materials.

In summary, the costs of transporting high level wastes to a geologically and hydrologically suitable site would be prohibitive, and the safety of most schemes for transporting large quantities of liquid wastes over long distances cannot be satisfactorily demonstrated. The use of existing long distance pipelines for transportation of radioactive materials in the solid state, loaded on zeolites or other adsorbents and sealed in canisters, has similar economic disadvantages and serious safety problems. Also, the chemical separations required to load potentially useful fission products on zeolites are not 100 per cent efficient, and therefore the remaining bulk of the wastes still contains enough radioactivity to constitute a potential hazard for a long period of time. Thus the shipment of Hanford wastes to another site would only serve to divide the waste management problem, but not solve it.

5. Disposal of High Activity Wastes in Salt Formations: The discussion of salt mine disposal research indicates a significant lack of technical understanding of the program. Considerable progress has been made in the problem areas referred to, and a field demonstration using reactor fuel elements to simulate the thermal and radiation characteristics of solidified high level wastes, was initiated in the Carey Salt Company Mine in Lyons, Kansas, during November 1965.

Materials. 12

1

NATIONAL ACADEMY OF SCIENCES

OFFICE OF THE PRESIDENT
2101 CONSTITUTION AVENUE
WASHINGTON, D. C. 20418

January 26, 1966

Dr. Glenn T. Seaborg, Chairman
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Glenn:

You will recall your response of November 1, 1965, to the expression of opinions on current policies regarding the disposal of radioactive waste by Dr. Abel Wolman's ad hoc advisory group. We referred your response to Dr. Wolman.

Enclosed you will find a copy of a letter from Dr. Wolman transmitting to me a sequence of letters from four other individuals with whom he has been in communication. Rather than attempt to summarize these letters, I am following Wolman's suggestion that I transmit the entire group to you for consideration by you and your staff.

Sincerely yours,

Fred

Frederick Seitz
President

Enclosures

1-26-66

ABEL WOLMAN
THE JOHNS HOPKINS UNIVERSITY
BALTIMORE, MARYLAND 21218

513 Ames Hall

January 18, 1966

Dr. Frederick Seitz
President, National Academy of Sciences
2101 Constitution Avenue
Washington, D. C.

My dear Dr. Seitz:

I have now received comments on the letter from Dr. Seaborg (under date of November 1, 1965) from Doctors Galley, Fair, Schaefer and Hubbert. Copies of these are enclosed, not to burden you, but because each of them reflects serious doubts about some of the long range thinking now prevailing in A.E.C., particularly with reference to middle and low level wastes.

Any summary of the letters would lose much of the viewpoints individually expressed. It is my recommendation, therefore, if you concur, that the batch of letters be forwarded to Dr. Seaborg. They should be informative and salutary for the A.E.C. staff - and hopefully press them toward an increased soul-searching in relation to their present and projected practices.

Very truly yours,

Abel Wolman

Abel Wolman

M. KING HUBBERT
U. S. GEOLOGICAL SURVEY
WASHINGTON, D. C. 20242

December 29, 1965

Dear Abel:

I have recently received a copy of Glenn Seaborg's letter of November 1, 1965, to Frederick Seitz, with its attachments, in reply to Seitz's transmittal of the recommendations which were made as a result of the conference on July 6, 1965 regarding radioactive waste disposal.

I studied this letter and the attached statement on "Management of Radioactive Wastes from the Nuclear Power Industry" some time ago, and I have just now reviewed them again. Since I attended this conference, and had also served as a member of the Committee on the Geologic Aspects of Radioactive Waste Disposal of the Division of Earth Sciences, for about ten years, and also was a member of the party which reviewed the various A. E. C. sites this spring, permit me to make a few comments on Seaborg's reply.

During our visit to the various A. E. C. sites this spring, I was very favorably impressed with the progress which is being made in the handling of high-level wastes -- particularly the reduction of these wastes to solid form and their safe storage in underground salt mines, or in dry concrete bins. I think the rest of the Committee shared this view.

On the other hand, I was less satisfied with the progress which is being made in the handling of low-level wastes. At Oak Ridge, considerable progress has been made toward forming these into slurries and injecting them periodically into hydraulically fractured shales at depths of around 700 to 1,200 feet. Previously, these same liquid wastes were discharged into bulldozed earth tanks where by leakage they were contaminating a considerable area of countryside and also the local streams.

At most, if not all, of these sites, solid wastes in the form of rags, boxes, and similar trash were being buried in earth trenches with no barrier between the trash and the ground-water table. At Savannah River, as I recall, a bentonite cover was being placed over these refilled trenches to deflect the downward descent of rainwater. In other areas no such protection was afforded. At Oak Ridge, trash trenches were shown which had become filled with water which was flowing from the trenches. At Arco and Hanford, it was argued that surface rainwater did not percolate downward to the water table, but returned to the surface by evapotranspiration. This may possibly be true but, if so, it leaves the question open of how ground-water circulation is maintained in these areas.

At both Arco and Hanford, low-level wastes were being discharged into seepage ponds, and in some cases directly into wells and into the body of ground water in the underlying highly pervious basalts. At Arco, this body of groundwater is flowing southward where it becomes the source of municipal and irrigation water supplies a few tens of miles to the south.

Repeatedly, members of our group protested the local handling of these low-level wastes. Invariably the defense offered was that any other method would be more costly. It was with these and similar practices in mind that, in my report on Energy Resources for the Academy Committee on Natural Resources, I pointed out (page 120) that the Committee on Waste Disposal ".....did not feel that the budget for waste disposal was commensurate with the magnitude of the problem," and recommended "that a much broader view of this problem be adopted, and that a budgetary increase for this purpose, amounting possibly to several fold, be allowed."

This is the context from which I have read Dr. Seaborg's letter and its attachment. Recommendation 2 of your letter, which Dr. Seitz transmitted to Seaborg, emphasized the need for a long-range plan that should "reflect an awareness that expedient small-scale practices may be hazardous, particularly with respect to long-lived nuclides, if the practices were continued to be carried on for a long period of time or on the enlarged scale expected to be reached in 1975."

The reply to this recommendation in Seaborg's letter impresses me as being both vague and evasive. In the attached document to Seaborg's letter, the magnitude (billions of gallons) of these low-level wastes is frankly admitted. This, however, is counteracted by what seems to me to be a persistent tendency to minimize their potential danger, and to over-emphasize their "harmlessness."

On page 1 it is stated "Billions of gallons of low level wastes are produced each year .....," which are discharged to the environment.

On page 8, "Where suitable hydrogeologic conditions exist, ground disposal of low and intermediate level wastes with or without treatment is utilized."

On page 9, in referring to the Oak Ridge experiments on disposal by hydraulic fracturing, the statement is made, "This demonstration establishes the technical and economic feasibility of the hydrofracturing disposal process."

This is much too sweeping a statement since it implies that the Oak Ridge experiment may be duplicated elsewhere. Actually, in the shallow depths at Oak Ridge (with very tight, hard shales) bedding-plane fractures have been achieved. In the preponderance of the thousands of fracturing cases in the oil industry, the evidence indicates that the fractures are vertical. Hence, were the Oak Ridge results to be taken as universally applicable, some serious consequences could occur, should the fractures turn out to be vertical.

On page 10, reference is made to "Atlantic and Pacific Coast sea disposal areas." Again, at this stage, possibly no ill effects will occur from the initially small contaminations. But once such practices are begun, how bad does the situation have to become before they can be stopped?

From its inception, the Committee on the Geologic Aspects of Radioactive Waste Disposal has emphasized that,

1. Safe disposal of radioactive wastes should involve their isolation from the biological system during their period of potential danger.

2. Practices of waste management and disposal instituted during the early stages of the evolution of the nuclear industry should be of such a nature as still to be valid when the industry has grown to much larger sizes.

As a result of my own recent review of the A. E. C. sites and practices, I am satisfied with the progress that is being made with respect to the handling and safe disposal of high-level wastes. The handling of low-level wastes, however, is not yet satisfactory. At most sites, practices which may be barely permissible in the initial stages but could become serious if continued on a large scale are a part of the daily operation. These were repeatedly defended on the short-term basis of cost economy, yet it is stated on page 11 of the attachment to Seaborg's letter that the waste disposal operations should account for less than 1 per cent of the cost of nuclear power in a 6 mill/Kwh economy. It appears, therefore, that a considerable latitude in cost for further improvement of waste management practices exists without significantly increasing the cost of power.

Yours sincerely,

M. King Hubbert

M. King Hubbert

Dr. Abel Wolman
Chairman, Ad Hoc National Academy of Sciences Group
on Radioactive Waste Management
Department of Sanitary Engineering
Johns Hopkins University
Baltimore, Maryland

NATIONAL ACADEMY OF SCIENCES

NATIONAL RESEARCH COUNCIL

DIVISION OF EARTH SCIENCES

2101 CONSTITUTION AVENUE, WASHINGTON, D. C. 20418

P. O. Box 237
Midland, Texas
79701

11 December 1965

Dr. Abel Wolman
Division of Earth Sciences
National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D. C. 20418

Dear Dr. Wolman:

I have reviewed a copy of the Honorable Glenn T. Seaborg's letter to Dr. Frederick Seitz dated 1 November 1965 and of the memorandum report which accompanied it, both having been sent to me by Earl Cook on 26 November with the suggestion that I give you my comments on the adequacy of AEC's response to your recommendations.

I note that Hon. Seaborg's letter mentions anticipation of the report which is now being prepared by my Committee on the Geologic Aspects of Radioactive Waste Disposal. I regret that our report is so long delayed. We are working on it currently, as we have been through the summer and fall. A draft of it was reviewed early in July with Walt Belter and Joe Lieberman, just before the meeting of your _ad hoc_ committee. They objected to certain sections of the report draft in which we had commented adversely on some of the current disposal practices at AEC plant sites. Their objection was based on the fact that these operations are conducted by the Division of Production of AEC, whereas the work of the Committee on Geologic Aspects is supported by the Division of Reactor Development and Technology, to whom solely it is advisory.

We can appreciate the situation in which one Division of AEC does not want to appear to be critical of another Division. These restrictions affected my oral presentation at the meeting of the _ad hoc_ committee in July, especially in regard to practices at NRTS and HAPO, and we are trying in our report to cooperate by avoiding any statements which would place the Division of RD&T in an awkward intra-organizational position.

At the same time, the Committee is composed of sincere civic-minded scientists who feel that they should not remain silent when they are aware of routine practices that are contrary to their concepts of long-term safety in the disposal of radioactive wastes. I mention this problem to you with the thought that you might find an opportunity to explore possible improvements in the Committee's relations to the AEC organization. A situation in which the Committee would be advisory to a larger segment of AEC would remove the restrictions.

Walt and Joe also asked that we strengthen our criticisms and recommendations by adding more detailed analyses of data with which we had been furnished. Inasmuch as each of us has a large file of reports and statistical compilations that were generously provided by the various plant staffs, a thorough review of all of it is beyond the ability of the Committee to handle without devoting weeks of full-time study, which none of the members is in a position to give. Nevertheless, we do want to provide sound and penetrating evaluations of all of the waste-management programs, and especially of those which we feel are not properly conceived or conducted. Inasmuch as some of them are truly debatable, even within this Committee, it takes some time to produce written discussions that all are willing to release. We are making progress, and the final draft should be ready for distribution to members for their approval at or soon after the end of this year.

Turning now to Hon. Seaborg's letter and the accompanying memo-report, I continue to be impressed by the sincerity of AEC's efforts to make sure that no hazardous radioactive contamination of the biosphere will ever result from the uses of nuclear power. However, in some respects the waste-management programs appear to be misdirected for various understandable reasons, among them being the newness of the disposal problems, lack of knowledge concerning subsurface geologic and hydrologic environments, reluctance to recognize inadequacies of disposal requisites at existing plant sites, and over-emphasis on economy when selecting preferred disposal procedures.

My reaction to AEC's reply is that while the letter and memo-report present a careful statement about AEC's aims and principles in waste management, a closer look at details of the research and operations reveals that specific practices do not entirely conform to the stated principles. Our report will discuss these inadequacies in some detail. Meanwhile I offer preliminary observations which are based on early drafts of our work. In making these comments, a basic concern is the need to peer into the future for a clear view of the status of present disposal sites in centuries to come, assuming continuance of present disposal practices, and recognizing the inevitable expansion of nuclear industries and increasing volumes of wastes that will be produced.

The Committee on Geologic Aspects is concerned about the continuing practice of disposing of low and intermediate-level waste liquids into the soil at several AEC sites, notably at NRTS and HAPO which are in arid-land locations. Such disposals are made in trenches, pits, seepage basins, and injection wells. AEC's statement that "concentrations of radioactivity in our environment due to waste disposal activities are only a small fraction of the radiation protection guides ..." is true at the moment. Likewise the quoted conclusion of the Joint Committee on Atomic Energy to the effect that "radioactive waste management practices have not resulted in any harmful effects on the public, its environment, or its resources" seems to be true today as it was when it was written six years ago. The Committee, however, feels that cumulative build-up of long-lived radionuclides by sorption in the soil, and the possibility of future changes in the geohydrology at the sites as man's water-use habits develops and change, taken together create a risk of serious contamination of the ground water at some future time if the practice is continued indefinitely. We feel that failure to acknowledge the risk is the result of several factors, including:

(1) Overconfidence in the prevailing but unsupported belief that meteoric water never reaches the water table at the disposal sites at NRTS and HAPO.

(2) Failure to allow for leaching and remigration of accumulated long-lived nuclides as hydrologic regimens change in future centuries.

(3) A need to dispose of wastes economically at sites which are poorly suited for ground disposals.

The Committee is likewise concerned regarding storage of high-level wastes, both liquid and solid, in tanks or bins above the water table. There seems to be a growing sentiment at the sites in arid lands that favors permanent storage of calcined high-level wastes in surface or near-surface bins, in the belief that any escaped radionuclides will never reach the water table. We even heard the speculation that it is possible to simply dump the calcined solids on the ground without endangering the fresh-water aquifers. The Committee can not concur in casual acceptance of belief in the integrity of the so-called "dry soil" zone, and thinks that research is needed in order to demonstrate its validity.

The Committee supports whole-heartedly the research toward development of technology for solidification of high-level liquid wastes, particularly for those processes which will yield "a more stable ceramic end product" and for "a continuous phosphate glass process".

We also favor the entire program of research in techniques for storage in salt.

The Committee's forthcoming report will have much to say about the proposed bedrock-storage project at Savannah River. In brief, while we had favored extensive research to determine the feasibility of this proposal, and had counted on it as being a more acceptable method than storage in surface tanks, now that much data have been assembled we find that there is little likelihood that the bedrock storage chambers will permanently contain the wastes, and we do not agree with SRP's conclusions that even if radionuclides should escape from the chambers they will never contaminate the biosphere. My personal feeling is that the bedrock-storage proposal is a case of trying to rescue something useful from a very poor disposal location.

With further regard to the Research and Development program, Item 2 of AEC's memo-report considers the treatment and disposal of low and intermediate-level wastes, in which several research projects are under way. Again we would point out that the statement "Where suitable geohydrologic conditions exist, ground disposal of low and intermediate-level wastes with or without treatment is utilized" (page 8 of the memo) is a generalization with which we are not wholly in accord, especially at the arid-land sites, as we are not convinced that suitable geohydrologic conditions do exist there.

The research programs in ion-exchange and grout injections appear to be well-conceived and carefully executed; we have no quarrel with them.

As far as deep-well disposals into permeable formations are concerned, there is some feeling in the Committee that (1) AEC is overly cautious about developing the concept to its fullest possibilities, and (2) some of the research programs that have been conducted and others that are planned are unnecessary. Specifically, for one, in view of the very nature of the proposed technique as implied in its title, "deep-well disposal", and also in view of the precept that no such disposals should be conducted in formations where the hydrologic system would allow the injected liquids to reach the biosphere, we see no reason for research in the rate of migration of radionuclides relative to the velocity of water movement. Such programs have been conducted at Oak Ridge and at the University of California and are proposed for less shallow strata at a site yet to be chosen. Our report will present data supporting our position in this respect.

I have outlined briefly above the principal instances in which we feel that AEC's waste-management practices and proposals do not conform, in our opinion, to its stated aims which in themselves are excellent. It is unfortunate indeed that three of AEC's largest plant sites, SRP, NRTS, and HAPO, where the greatest volumes of waste are produced, are located over some of the largest fresh-water aquifers in the United States. Considering the growing problems of water supply for America's mushrooming population and industry, the foreseeable need to draw heavily on these underground reserves in the next century means that no segment of any aquifer can safely be set apart for use as storage space for long-lived (600 to 1000 years) radionuclides. This is a maxim which, in my own observation, is commonly overlooked in the development of waste-disposal practices.

Finally, I refer to numbered paragraphs 2 and 3 of the five points that were submitted on 30 August for consideration by Hon. Seaborg. I feel that his reply does not answer the very important and realistic observation that "there has been a tendency to solve storage and disposal problems on an ad hoc basis". The Committee on Geologic

Hillsboro Club — 7 December, 1965

POMPANO BEACH • FLORIDA

Dear Dr. Cook,

Your letter of 26 November and its enclosure have followed me here where I am for a brief holiday. It seems to me that Dr. Glenn Seaborg has responded well to the questions raised by Dr. Wolman's ad hoc Academy Group. Pointed up to me, however, is the fact that the studies and progress of AEC in the disposal of radioactive waste substances are no longer being reported as fully to the interested professions as they might be. It would be my suggestion that suitable means of communication be established to remedy the present situation. Possibilities are quarterly or semiannual reviews of published information circulated to interested journals ASCE, FWPCF, Chem. Eng. etc. or even to interested individuals; also a more frequent participation of AEC personnel in meetings of interested groups.

Very sincerely

Gordon M. Fair

Aspects has reiterated this complaint over and over since its first meeting. Also, I see little evidence that AEC's "long-range, comprehensive plan" takes into account "the possible effects of unusual natural events and disasters, as well as foreseeable man-related environmental changes"; or that it reflects an awareness "that expedient small-scale practices may be hazardous, particularly with respect to long-lived nuclides, if the practices were continued to be carried on for a long period of time or on the enlarged scale expected to be reached in 1975".

The suggested AEC "guidelines" report, setting forth "the reasoning behind the guidelines" is still a much-needed item. I doubt that the memorandum-report that was transmitted with Hon. Seaborg's letter is the desired report or was intended to be.

I trust that the preceding comments will be of some use to you.

Very truly yours,

John E. Galley

John E. Galley, Chairman

Committee on Geologic Aspects of Radioactive Waste Disposal

cc: Dr. J. Hoover Mackin
Dr. Earl F. Cook

UNIVERSITY OF CALIFORNIA, SAN DIEGO

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INSTITUTE OF MARINE RESOURCES

P. O. BOX 109
LA JOLLA, CALIFORNIA 92038

December 6, 1965

NOTED
DEC 14 '65
E. F. COOK

Dr. E. F. Cook
Division of Earth Sciences
National Academy of Sciences
2101 Constitution Avenue
Washington, D. C. 20418

Dear Earl:

I thank you very much for your letter of 26 November transmitting a copy of Dr. Seaborg's letter to Dr. Seitz in response to the comments and recommendations of the ad hoc Academy group of Dr. Able Wolman respecting radioactive wastes.

I believe that we should regard Dr. Seaborg's response as being adequate, at least for the time being. I believe, however, that we need to wait and see just what is contained in the "long-range comprehensive waste management plan" to which Dr. Seaborg refers in paragraph three of page two of his letter. He states that the concepts and approaches which are being considered in this planning are discussed in the report enclosed with his letter. The report enclosed with Dr. Seaborg's letter, as is to be expected, is not a very critical review of the management of radioactive wastes from the nuclear power industry, and tends to indicate what a good job has been done so far. While one must agree that radioactive waste management practices to date have not resulted in harmful effects, we cannot necessarily assume that all problems have been solved, and that certain problems require no further investigation. I am particularly bothered by the discussions on page 8 and 9 respecting treatment and disposal of low and intermediate level wastes, and the discussion on page 10 of environmental studies in support of waste disposal. These discussions seem to indicate that the problems of disposing of these classes of wastes, and also the problems of possible effects of accidents (such as accidents in nuclear powered ships) can be solved on the basis of presently existing information, perhaps supplemented by some modest additional studies. In point of fact, I believe there are a good many things that need to be known about various environments that have not yet been investigated, and in which radionucleides may be introduced by design or accident, that require further study before we will have the basis of dealing with all of the problems which may arise. I may, however, be unduly suspicious, and would prefer, therefore, to await the preparation of the report which we recommended as Item 3 of our recommendations before commenting further on these matters.

I believe that it is obvious that the various committees of the Academy concerned with radioactive waste management and disposal should continue their interest in the activities of the Atomic Energy Commission and other agencies.

Sincerely yours,

Benny

M. B. Schaefer
Director

MBS:lr

Materials 12

NATIONAL ACADEMY OF SCIENCES

OFFICE OF THE PRESIDENT
2101 CONSTITUTION AVENUE
WASHINGTON, D. C. 20418

November 29, 1965

The Honorable Glenn T. Seaborg
Chairman
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Glenn:

Your letter and enclosure of November 1 in response to the comments of Abel Wolman's ad hoc group has been most helpful. Copies of your response have been made available to the Wolman group and to all of the other NRC divisions that are concerned with radioactive waste management and related problems.

We greatly appreciate the Commission's effort to keep us informed as to its plans and progress on the disposal problems, and we look forward to a continuing cooperation toward their effective solution.

Sincerely yours,

Fred

Frederick Seitz
President

11-29-65

DATE:

INDEX: Materials 12

TO:

FROM:

SUMMARY: AEC 460/81 - SYMPOSIUM ON THE SOLIDIFICATION AND LONG-TERM STORAGE OF HIGHLY RADIOACTIVE WASTES

FILED: O&M 6 Mtgs.

INDEXER: date of paper: 11-23-65

REMARKS:

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

11-23-65

Maltin... - 2

Sec 8

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

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Dear Fred:

Reference is made to your letter of August 30 with the comments and conclusions of Dr. Wolman's ad hoc group on radioactive waste management activities. The five points presented in your letter have now been given detailed staff consideration and we wish to submit the following information on these points:

1. I am pleased to learn that Dr. Wolman's group believes that the Atomic Energy Commission has made great progress in its waste management practices and research since the Academy's 1960 BEAR Committee Summary Report. Waste management operations at the various AEC installations have continued to reduce the quantities of radioactivity being released to our environment. Also, extensive monitoring programs have shown that concentrations of radioactivity in our environment due to waste disposal activities are only a small fraction of the radiation protection guides which have been established by the Federal Radiation Council and other national and international groups. Also, because of advances in process technology during the past five years, there has been a substantial decrease in the unit volumes of radioactive waste being produced. Therefore, we believe the magnitude of the future waste disposal problem has been significantly reduced, as described in the enclosed report.

2&3. Although the AEC is an operating agency, it also has, as you know, a basic statutory responsibility for protection of the health and safety of the public in connection with nuclear energy activities. Accordingly it was recognized from the beginning of AEC operations, because of the very nature and characteristics of radioactive material and its potential dangers as an environmental pollutant, that the proper management of wastes was essential to the growth of the atomic energy

11-1-65

program. Therefore, the Commission in its past and present operations, and in the planning and conduct of its waste management research and development program for the nuclear power industry, has always considered the satisfactory treatment and permanent disposal of all waste materials as a prime requisite for all program activities.

As indicated above, improved technology is substantially reducing the quantities of radioactive material being discharged to our environment. A prime requirement of AEC operations is a continual re-evaluation of the waste management systems in the light of newly developed technology. You are aware that the effluent control record of the AEC waste management program has also been the subject of extensive hearings by the Joint Committee on Atomic Energy. The adequacy and achievements of this program are accurately reflected in the conclusions of these hearings which we believe continue to be valid, and which state that "radioactive waste management practices have not resulted in any harmful effects on the public, its environment, or its resources".

Concerning the need for a long-range comprehensive waste management plan, I am pleased to report that the Commission and its contractors have given considerable attention to this subject during the past two years. The concepts and approaches which are being considered in this planning are discussed in the enclosed report. Some of the projects and concepts which are being studied were discussed with Dr. Wolman's group. We will continue to provide information on these programs to the Academy as results from research and development studies and field testing programs become available.

4. The AEC and its contractors have been pleased from time to time to provide information on radioactive waste management activities to various Academy committees, including the Committee on Pollution; the Committee on Sanitary Engineering and Environment in the Division of Medical Sciences; the Committee on Oceanography and the Committee on Geologic Aspects of Radioactive Disposal in the Division of Earth Sciences. As you know, the latter group has just recently completed a fairly extensive visit to the major AEC sites in connection with reviewing the ground disposal research and development program of our Division of Reactor Development and Technology. It is our understanding that a report of this review will be available in the near future.

5. You may be interested to know that a number of years ago the Commission established a committee to advise it on all aspects of the Plowshare Program. This committee is composed of eminent men from scientific and engineering professions including, of course, the biologic and earth sciences. I am enclosing a list of the present membership of this committee. Two former members of the Commission's Plowshare Advisory Committee, Drs. Wolman and Abelson, were members of your Ad Hoc Committee. We believe that we are receiving adequate advice from this committee on possible radioactive contamination problems related to the Plowshare Program. However, we would be glad to cooperate with existing Academy committees reviewing problems of radioactive contamination by providing them with information on the Plowshare Program as they may desire.

In connection with space programs, which have used nuclear auxiliary power, the safety of each proposed flight has been thoroughly reviewed by experts within the AEC, NASA and DOD. In addition, specialized advice has also been obtained from other agencies such as the U. S. Weather Bureau and independent scientific and academic institutions, including the NAS. In terms of future planning in this area, we have presented information to the Academy and have also received available guidance. We would be pleased to continue this useful relationship.

The opportunity to provide the Academy with information on this important phase of our activities is appreciated.

Cordially,

(Signed) Glenn T. Seaborg

Chairman

Dr. Frederick Seitz
President
National Academy of Sciences

Enclosures:
1. Rpt., Management of Radioactive wastes from Nuclear Power Industry
2. List, Members Plowshare Advisory Comm.

Distribution
Chairman (2)
GM (2)
AGMR

SUBJ	PROD
NSS	DOS
NS	PNE
RDT: rf (2)	SNPO
RDT:D	AGMO - Erlewine

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MANAGEMENT OF RADIOACTIVE WASTES FROM THE NUCLEAR POWER INDUSTRY

Introduction

The management or disposal of radioactive waste from the nuclear energy industry has been a recognized and important part of all AEC activities. As in most other industries, waste disposal is not a single problem with a single solution. However, because of the very nature and characteristics of radioactive material - their non-detectability by human senses, their ability to cause damage to human tissues, and their potential danger as an environmental pollutant - it was readily apparent from the beginning that the safe handling and ultimate disposal of waste from this industry were paramount and perhaps more essential than any previous industrial operation developed to date. Because of this fact, the subject of industrial radioactive waste disposal was thoroughly and extensively discussed in the Hearings conducted by the Joint Congressional Committee on Atomic Energy in 1959.

Among the salient conclusions reached as a result of the exhaustive JCAE Hearings on this subject were: 1) radioactive waste management practices have not resulted in any harmful effects on the public, its environment or its resources; and 2) the general problem of radioactive waste need not retard the future development of the nuclear energy industry with full protection of the public health and safety. We believe these conclusions are still valid.

Nature of Radioactive Wastes

Radioactive wastes continue to be considered by most people as an uncategorized entity. The word "radioactive" has been so strongly impressed that it has become an all-inclusive term, to the point where waste from nuclear reactors from laboratory research, from medical use, from chemical reprocessing of irradiated fuel elements, etc., are all considered as one and the same thing. Important characteristics such as the quantity and concentration of radioactive material involved and its detailed chemical and physical nature are not considered, and most often completely ignored. However, these are paramount to a meaningful understanding and essential to any discussion of radioactive waste operations.

It is important to understand at the outset that radioactive wastes which are generated in routine nuclear reactor operations, in laboratory and medical research, and in other industrial applications of isotopes -- all are generally considered as low level, or low hazard potential wastes. In terms of radioactivity concentration these wastes are normally in the thousandths or millionths of a curie per gallon range. Billions of gallons of low level wastes are produced each year as a result of these operations. Certain of these wastes in which the concentration of radioactivity is only a few times greater than drinking water standards may be disposed of in streams, where dilution will drop the concentration far below the maximum permitted or, under suitable conditions, may be discharged into soils where the hazardous radionuclides are retained. Other low level wastes are treated by processes which have been proven over several years of operation, and which reduce the

level of radioactivity in the wastes to a point where they may be safely discharged to the environment. Present treatment and dispersal methods in use in the United States have been demonstrated to result in concentrations in the environment well below established permissible limits, and these operations are carefully controlled so as to assure that the safe capacity of the environment is not exceeded.

As indicated above, essentially all the radioactive wastes generated at a nuclear power reactor installation fall into the low level or low activity category. For example, a total of only eight millicuries was contained in the 870,000 gallons of waste discharged by the Yankee reactor in 1962. Spent fuel elements removed from the reactor, which are designed to possess high integrity and which, therefore, retain the great majority of the fission products produced in the reactor, are shipped intact to a fuel reprocessing plant for recovery of the unburned uranium and plutonium. It is in this part of the fuel cycle, i.e., the processing of the spent fuel to recover unburned uranium, that all of the high and intermediate level wastes are produced. These high activity wastes, which are generated at present at AEC production sites as a result of the chemical reprocessing of irradiated reactor fuel, and which will be produced in the future at commercial fuel reprocessing plants such as the NFS facility located in New York State, have concentrations of radioactivity in the range of hundreds up to tens of thousands of curies per gallon. Thus, these wastes have radioactivity levels tens or hundreds of millions of times higher than that contained in low activity wastes. However, it is important to note that the total number of gallons which evolve from low and high level waste operations are vastly different. As opposed to the billions of gallons of low level wastes which are produced annually, the volume of high level wastes which have been generated since the beginning of the atomic energy program has amounted to only about 65 million gallons, all of which is stored in underground tanks and intensively monitored.

Objectives Waste Management Operations

The major objective of waste management in atomic energy operations is control over the radiation hazard that might be produced by these wastes, either in storage or in nature. This requires control not only during operations and discharge, but also over movement and distribution of the waste products in the environment. Two basic disposal concepts are applied:

Concentrate and contain. The radioactive materials may be confined or isolated within permanently maintained reservations, away from people and useful resources. Highly active liquid wastes originating from the chemical processing of irradiated fuels from reactors must be reduced to a suitable concentrated form and contained indefinitely in this way.

Dilute and disperse. In this other basic concept of waste management, the radioactivity may be reduced to tolerable levels by dilution in nature - in air or water. However, the fact that some wastes can be dispersed directly to the environment makes it essential to control these operations carefully so as to assure that the safe capacity of the environment is not exceeded. A third concept of delay and decay is also practicable in certain situations.

For high activity waste from fuel reprocessing, tank storage, while not an ultimate solution in itself, probably will be an operating part of any final disposal system. However, the inherent restrictions of tank storage, such as potential leakage and the necessity of liquid waste transfer for periods of hundreds of years, have resulted in an extensive research and development program directed at engineering a practical system for conversion of high activity liquid waste to a solid form. Final storage, or disposal of high activity solids would be accomplished in a suitable geologic formation, such as salt.

Magnitude of Future High Activity Waste Management Problem

During the hearings before the Joint Committee on Atomic Energy on the subject of industrial radioactive waste disposal held in 1959, it was estimated that using the then current processing technology the volume of high and intermediate level waste accumulated by 1980 would reach 36 million gallons.

The intervening years have brought improvements in fuels technology and in fuel reprocessing methods which have served to markedly reduce the volume of wastes generated per unit of nuclear power produced. Thus, while estimates of installed nuclear power in 1980 have risen by almost a factor of 3 from 25,000 MW_e at the time of the hearings to the present 70,000 MW_e forecast, predicted accumulated waste volume in storage by 1980 has dropped by a factor of 10 to 50 (750,000 to 3,000,000 gallons), depending on the postulated operating procedures of the reprocessing plant. Estimates of waste quantities through the year 2000, based on the most recent predictions concerning growth of the nuclear industry are summarized in Table 1.

TABLE I

Estimate of Wastes Arising From
A Nuclear Power Complex

	YEAR		
	1970	1980	2000
Installed Nuclear Power, MW_e	5,000	70,000 (25,000)**	734,000 (175,000)**
Fuel irradiation level MWD/T	18,000	25,000	25,000
Volume of high activity waste*			
Annual Volume (gal/year)	40,000	235,000	2,800,000
Accumulated Volume (gal)	180,000	1,500,000 (36,000,000)**	22,000,000 (330,000,000)**
Total Sr^{90} (megacuries)	40	500	6,700
Total Fission Products (megacuries)	3,000	30,000	530,000

*Based on 200 gallons high activity waste/Ton U processed. Realistic estimates range from 100 gal/ton, in which case the volumes would be 1/2 of those shown, to 400 gal/ton (NFS flowsheet), in which case volumes would be twice those shown. Assumes three-year lag between installation of power plant and first reprocessing of fuel.

**1959 estimates included in parenthesis.

The above waste volumes are predicated on the assumption that confinement of the wastes will be accomplished by means of long term tank storage of liquids. Should a conversion-to-solids waste management concept (discussed in the next section) be adopted by, say, 1970, the waste storage picture would approximate that shown in Table II.

TABLE II

Waste Volumes in Storage Under
Conversion-to-Solids Waste Management Concept

	YEAR 1970	1980	2000
Annual Volume of Waste generated (gal/year)*	40,000	235,000	2,800,000
Accumulated liquid held for 5 year interim storage (gal)	165,000	900,000	11,000,000
Accumulated solids in ultimate storage (cu. ft.)**	70	3,000	52,000
Sr^{90} in liquid (megacuries)	37	300	3,350
Sr^{90} in solid (megacuries)	3	200	3,350

*Based on 200 gal waste/ton U processed.
**Based on 1 cubic foot solidified waste/ton U processed.

Economic evaluation studies of the conversion-to-solids waste management concept have indicated that to achieve minimum costs, a period of interim storage is required to permit decay of short-lived fission products and attendant reduction of decay heat generation. The five year figure used in the above table was found to be optimum from the economic point of view. However, recent studies indicate that substitution of interim solid storage under forced cooling conditions for part or all of the interim liquid storage period may be economically attractive. Shorter interim liquid storage periods would, of course, result in storage of a greater fraction of the wastes in solid rather than liquid form.

Research and Development Program

1. Treatment and Disposal of High Activity Fuel Reprocessing Wastes

More than 15 years experience with storage of liquid high activity wastes in tanks has shown it to be a safe, practical means of interim handling. The long term usefulness of this mothod is limited, however, dueto the long effective life of the wastes (hundreds of years) and the comparatively short life of storage tanks, estimated at several tens of years. Accordingly,

the Commission has pursued a vigorous research and development program aimed at developing and demonstrating, on an engineering scale, systems for the conversion of high level liquid wastes to stable solids.

The largest development effort in this area has been the installation of a 60-gallon per hour Waste Calcination Facility at the Idaho Chemical Processing Plant, NRTS, for the fluidized bed calcining of acid aluminum nitrate wastes from MTR-type fuels. Cold engineering development work and successful Na^{24} tracer runs were completed in 1962 and early 1963, and hot operation with wastes stored at the ICPP commenced in December of 1963. The plant was operated continuously until October 15, 1964, at which time the existing solids storage bins were filled. During this period, 510,000 gallons of waste were converted to solid forms. Additional solids storage capacity is now being installed in preparation for continued operation of the calcination facility.

The power reactor waste solidification program has now reached the stage where an intensive effort culminating in full level demonstration is being carried out for a small number of processes which have continued to show real promise during the course of their development. To this end, a Waste Solidification Engineering Prototype Plant is now in the construction phase at Hanford Laboratories. This plant, which will be installed in the Fuels Recycle Pilot Plant Facility, will have a processing capacity of ten gallons per hour and will go into operation with high level wastes during FY 1966. Present plans call for demonstration of the pot calcination and radiant spray calcination processes and/or modifications of these techniques which will result in a more stable ceramic end product, as well as a continuous phosphate glass process. The flexibility of the plant which permits multiple process demonstration is due in large measure to the use by all processes of common feed preparation and off-gas treatment equipment, and to a unique design concept which groups associated pieces of equipment on remotely removable "plug-in" racks, thereby facilitating modification and maintenance.

As a prelude to this demonstration, hot pilot plant studies have been carried out at Hanford during the last one and one half years on the radiant spray and pot concepts, using full level wastes, and have been highly successful. Cold engineering development work on the pot, radiant spray, and continuous glass processes has been carried out by ORNL, Hanford, and BNL, respectively. Thus, the prototype demonstration work will be a national, cooperative effort involving participation of all three sites.

Long term storage or ultimate disposal

After high level liquid wastes are converted to solids, there still exists the requirement for storage or ultimate disposal of these solid wastes. This has led to the investigation of selected geologic formations for this purpose. [illegible] is [illegible] s the [illegible] disposal media because of its unique [illegible] dry, impervious to water, and [illegible] sources. Because of its plasticity, fractures in salt seal or close rapidly. Deposits of rock salt underlie some 400,000 square miles of the United States and may represent some of the few naturally occurring dry environments in the Eastern part of the country. Extensive laboratory investigations at ORNL and field studies in the Carey Salt Mine, Hutchinson, Kansas, have shown strong promise. A field experiment has been designed using short-cooled ETR fuel elements, to simulate the thermal and radiation characteristics of full-scale power reactor waste such as would exist in a pot containing calcined solids. This field demonstration is planned for early 1965, in the Carey Salt Mine in Lyons, Kansas.

Economic Implications

Long range engineering and economic studies are being conducted to give some indication of the magnitude of waste management costs in a future nuclear power economy. In studies completed to date on the high level waste management concept involving reduction to solids followed by storage in salt, the total cost of interim liquid storage, solidification, interim solid storage, shipment of solids over a 2,000-mile round trip to an ultimate disposal site, and storage in a salt formation, have an estimated total cost range of 0.026-0.030 mills per kilowatt hour electrical. This constitutes approximately one half of one percent of the cost of 6 mill power.

Impact of utilization of fission products

It has been suggested that the costs of waste management might be markedly reduced by the expedient of removing some of the fission products from the waste and thereby simplifying their subsequent management. Using optimistic expectations of waste compositions from future fission product separation processes, it has not been possible to show any substantial economic advantages to waste management. (It should be noted that reference here is made to future power reactor wastes. The Hanford Waste Management Program, discussed below, is a notable exception to the above statement, in that fission product removal makes it possible to utilize existing tanks for long term storage of wastes in salt-cake form.) In a study conducted at ORNL, the cases of 90 and 99% fission product removal have been compared with that for the untreated waste. The cost of managing wastes that are 90 to 99% depleted in fission products is about 70% as much as the cost of managing wastes with no fission products removed. The difference, about $400 per metric ton of uranium processed, is not enough to pay for the separation and handling of fission product concentrates unless there are mitigating circumstances, such as at Hanford. Fission product removal must be justified and paid for by the market for fission product radiation or heat sources, with only a marginal credit from reduced costs of waste management. From an environmental or over-all waste management standpoint, f.p. recovery cannot be equated to f.p. removal.

Other long term waste management methods for the some 65 million gallons of waste in storage at AEC production sites are now in the study or implementation stage. The Waste Calcination Facility at the ICPP has been discussed above. As a possible alternative to high level liquid waste tank storage, the AEC is investigating at its Savannah River Plant the feasibility of storing aged fuel reprocessing waste in deep impermeable (basement rock) formations, approximately 2,000 feet beneath the plant. Several widely spaced exploratory holes have been drilled into the underlying bedrock. Field permeability tests of the basement rock have been made and continuous core samples have been obtained for determination of tensile and compressive strength, thermal conductivity, and chemical compatibility of the rock with Savannah River Plant waste. Technical studies have been conducted with respect to waste characteristics, including heat generation rates, age of waste to be stored, and the physical form of waste considered most desirable. A preliminary safety analysis has been completed, and studies are now underway on methods for removing wastes, including caked sludges, from the storage tanks.

The proposed Hanford Waste Management program is specially designed for existing and future Hanford production wastes. It makes optimum use of the existing facilities and the favorable geology and climate of the area. It involves extraction of most of the strontium-90, cesium-137, promethium-147, and cerium-144. The residual waste with low heating rates is then discharged to existing underground tankage and later solidified to a salt cake by <u>in-situ</u> evaporation. The extracted long-lived fission products are packaged in small, high-integrity containers and placed in storage. Accordingly, large quantities of strontium and cesium will be available on demand for utilization.

Based on past laboratory and engineering scale cold unit operations data and on an expected successful field demonstration and testing program with actual high level wastes, it is firmly believed that waste management operations should not constitute a major obstacle to the development of safe and economical nuclear power.

2. <u>Treatment and Disposal of Low and Intermediate Level Wastes</u>

Radioactive low and intermediate waste management is presently accomplished by single or multiple stage treatment systems involving filtration, chemical precipitation, ion-exchange, evaporation, concrete solidification, vermiculite adsorption and tank storage. Where suitable geohydrologic conditions exist, ground disposal of low and intermediate level wastes with or without treatment is utilized. Wastes are processed by the method which provides the required decontamination at the lowest cost, in accordance with acceptable health and safety standards.

Flocculation and chemical treatment processes have been developed for the decontamination of large volume low activity waste at several AEC installations. Treatment efficiencies up to 90% have been achieved for strontium and cesium and up to 99% for alpha activity using single stage treatment. Multi-stage treatment is capable of achieving over-all decontamination factors as high as 1,000 (treatment efficiencies of 99.9%), but complexity and cost also increase considerably.

Improved decontamination processes using special ion-exchange materials have been developed and are now in use in laboratory waste and power reactor station treatment systems. Extensive R&D work in this area has been conducted at Argonne, Los Alamos, and Oak Ridge. Decontamination factors for cation exchange resins have ranged from 20 to 50 for mixed fission product waste to as high as 10^5 for mixed-bed units.

Recent studies at Oak Ridge have indicated that a phenolic resin ion-exchange process can provide higher decontamination factors and volume reduction than other current processes for strontium and cesium removal from low level wastes. Results of pilot plant work show that approximately 99.9% of the strontium and cesium, the greatest health hazards, have been removed from 1500-2000 volumes of alkaline wastes with an over-all volume reduction of approximately 2000.

A prime example of ground disposal research and development involves the potential disposal of intermediate level wastes by hydraulic fracturing of shale or other suitable geologic formations. This technique which was obtained from the petroleum industry has been under extensive development by the Oak Ridge National Laboratory for waste disposal application during the past three years. The method consists of injecting a waste-cement-clay mixture under high pressure into an impermeable formation by fracturing. A full-scale engineering test of this concept, involving five injections of actual ORNL intermediate waste, was successfully conducted in 1964. This demonstration established the technical and economic feasibility of the hydrofracturing disposal process.

A committee of the American Petroleum Institute has studied the feasibility of injecting liquid waste into deep (several thousand feet) permeable formations. Laboratory investigations and theoretical studies on ion sorption, chemical compatibility, corrosion, etc., have been carried out by the Oak Ridge National Laboratory, the Bureau of Mines, and the University of California. Small-scale field tracer tests have been carried out at the University of California. A subcommittee of the American Association of Petroleum Geologists is compiling and evaluating available hydrodynamic data which exist on several deep sedimentary basins in the United States to determine which areas may be suitable for a deep well field scale experiment. With a continual lowering of acceptable limits of radioactivity in our environment, it is envisioned that deep well injection could provide a future method for the disposal of certain types of large volume, low and intermediate activity wastes.

Environmental Studies in Support of the Waste Disposal Program

For safe disposal of low activity waste to the environment after processing and/or monitoring, a wide variety of environmental studies (stream and river, estuary and oceanographic, soil and earth) have been conducted to provide specific information on the fate and behavior of low level effluents dispersed in specific environments. In this manner a more accurate and specific assessment of the environmental effects of waste disposal practices can be made.

An example of the environmental studies being carried out in the waste disposal program is the comprehensive stream investigation which is being conducted on the Clinch and Tennessee Rivers below ORNL. This study involves various federal agencies and scientific disciplines, and has been extremely successful because of the close cooperation and active participation of each group. While normal monitoring practices at ORNL have determined that the concentration of radioactivity in the Clinch and Tennessee Rivers below Oak Ridge is well within internationally accepted standards, it was believed important to obtain further fundamental and applied information on the physical, chemical, and biological dynamics of a flowing freshwater system which is receiving volumes of low level radioactive waste. The ultimate fate and distribution of radionuclides of specific interest at Oak Ridge - strontium-90, cesium-137, ruthenium-106, and cobalt-60 - are being determined. The over-all capacity of the Clinch River for radioactive waste disposal purposes is being evaluated to determine future treatment and management criteria. These studies will also establish more effective long-term monitoring procedures for waste effluent control.

Field studies of physical dispersion of radioactive effluents in estuarine and coastal waters have been conducted for the AEC by the Chesapeake Bay Institute of the Johns Hopkins University. A comprehensive study of New York Harbor, involving field measurements of currents, temperature, and salinity by the U. S. Coast & Geodetic Survey and data analyses by CBI has provided a means for evaluating the safety of nuclear ship operations within the Harbor.

Extensive environmental studies have been carried out in the Atlantic and Pacific Coast sea disposal areas to determine if the discharge of solid packaged low activity waste was causing any adverse effect on the oceanic environment. Seasonal surveys have included the collection of plankton, bottom sediments, fish and seawater samples to the thousand fathom depth. Based on the results of alpha, beta, and gamma low level counting analyses, it was determined that no radioactivity existed in bottom sediment, benthic organisms, and bottom fish that could be distinguished from natural background.

Conclusions

Waste management operational experience at U. S. atomic energy installations, (AEC production and laboratory facilities and nuclear power reactor stations) has been more satisfactory than essentially any other facet of the nuclear fuel cycle. The research and development program has reached the pilot plant and field demonstration phase for several major projects, and it is expected that results of these programs will be available when industrial reprocessing of spent reactor fuels becomes a reality. Present engineering cost studies indicate that waste disposal operations should account for less than one percent of the cost of nuclear power in a 6 mill/Kwh economy. Based on an expected successful field demonstration and testing program with high activity waste, it is firmly believed that waste management operations will not consitute a major obstable in development of the nuclear energy industry - from either a safety or economic standpoint.

PLOWSHARE ADVISORY COMMITTEE MEMBERS

Dr. Spofford G. English, Chairman
Assistant General Manager for
Research and Development
U. S. Atomic Energy Commission
Washington, D.C. 20545

Mr. Willard Bascom
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Ocean Science and Engineering, Inc.
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Dr. Philip C. Rutledge
Partner
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& Johnston
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New York 17, New York

Dr. Paul B. Sears
Professor Emeritus and Former
Chairman, Conservation Program
Yale University
New Haven, Connecticut

Mr. John S. Kelly, Secretary
Director, Division of Peaceful
Nuclear Explosives
U. S. Atomic Energy Commission
Washington, D.C. 20545

Material - 12

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

[redacted]FFICIAL USE ONLY[redacted]erence & Reproduction Branch

UNITED STATES GOVERNMENT

Memorandum

Germantown

TO : File

DATE: OCT 26 1965

FROM : W. B. McCool, Secretary

SUBJECT: AEC 1083/54 - SYMPOSIUM ON DISPOSAL OF RADIOACTIVE WASTES

SECY:JCH

1. At Information Meeting 525 on October 22, 1965, the Commissioners approved the General Manager's recommendation for AEC participation in the IAEA Symposium on the Disposal of Radioactive Wastes into Seas, Oceans and Surface Waters in Vienna, Austria, May 16-20, 1966. The number of AEC supported attendees is not to exceed twenty persons as proposed in AEC 1083/54.

2. It is our understanding the Division of Technical Information will take the required action.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for IA
Asst. Gen. Mgr. for Admin.
Asst. Gen. Mgr. for Operations
Asst. Gen. Mgr. for Plans & Prod.
Asst. Gen. Mgr. for Reactors
Asst. Gen. Mgr. for R&D
General Counsel
Director, Biology & Medicine
Director, International Affairs
Director, Operational Safety
Director, Production
Director, Reactor Dev. & Tech.
Director, Technical Information

10-26-65

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Materials - 12

AEC
UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Tel. 973-3335 or
973-3446

October 12, 1965

NOTE TO EDITORS AND CORRESPONDENTS: Following for your information is the text of a public announcement issued by the Atomic Energy Commission's Oak Ridge (Tennessee) Operations Office for use today.

RADIOACTIVE FUEL ASSEMBLIES TO BE STORED IN KANSAS MINE DURING TWO-YEAR EXPERIMENT

A demonstration of the disposal of highly radioactive solid wastes in underground salt formations will begin next month in an abandoned salt mine near Lyons, Kansas. Irradiated reactor fuel assemblies will be used to simulate the wastes.

The two-year experimental program, called "Project Salt Vault," is part of a research and development program sponsored by the Atomic Energy Commission aimed at providing alternative methods of economical and safe disposal of high-level radioactive wastes. These methods involve the conversion of liquid wastes to a solid stable form, followed by permanent storage in geologic formations such as salt.

The test disposal program is the latest in a series of experiments performed by Oak Ridge National Laboratory using abandoned mines of the Carey Salt Company at Lyons and at nearby Hutchinson, Kansas. Oak Ridge National Laboratory is operated for the AEC by Union Carbide Corporation.

Project Salt Vault is the first test in which actual radioactive material will be placed in an underground salt mine. Simulated non-radioactive wastes and electric heaters have been used in earlier tests dating back to an initial mine test at Hutchinson in 1959.

10-12-65

(more)

Materials - 12

OCT 7 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: PUBLIC ANNOUNCEMENT ON WASTE DISPOSAL TEST IN SALT MINE

Attached for your information is a public announcement on the demonstration of the feasibility of disposing highly radioactive wastes in a salt mine near Lyons, Kansas. Irradiated reactor fuel assemblies will be used next month to simulate the wastes.

A demonstration with a Cobalt 60 source will be held Tuesday, October 12, for newsmen and Kansas officials. A news briefing will be held by the Oak Ridge National Laboratory and AEC officials at 9 a.m. that same day for local Kansas newsmen.

The attached announcement is scheduled for issuance by Oak Ridge Friday, October 8, for use on Tuesday. We do not plan to issue a national announcement but will distribute the Oak Ridge announcement for the information of newsmen on our mailing list.

The announcement has the approval of the Office of the General Manager.

Duncan Clark

Duncan C. Clark, Director
Division of Public Information

Attachment

cc: R. E. Hollingsworth, General Manager
J. J. Burke, Dir., OCR
H. C. Brown, AGMA
W. G. Belter, RDT
H. I. Mueller, RA
W. B. McCool, Secretary

10-7-65

OFFICE ▶	PI	PI	PI			
SURNAME ▶	RWNewlin/ad					
DATE ▶	10/7/65					

Materials -

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

SEP 9 1965

MEMORANDUM FOR COMMISSIONER RAMEY

THROUGH GENERAL MANAGER (Signed) John V. Vinciguerra for

SUBJECT: REQUEST FOR INFORMATION ON MR. W. A. COLBURN, ATOMIC STORAGE COMPANY

Reference is made to a telephone request from Mr. Klug of your office to Dr. Lieberman for information on any contacts between Mr. W. A. Colburn and this Division. The major forms of AEC contact with Mr. W. A. Colburn (and his associations with the Petroleum Research Corporation (PRC) and later the Atomic Storage Company) since January, 1960, centers about the possible disposal of radioactive wastes into certain geologic formations by deep well injection. The following paragraphs summarize the history and status of this approach to waste disposal within the Commission and provide background information for the series of contacts which have been made with Colburn, et al in the past 5½ years. It is our understanding that PRC is no longer in business and that some of Mr. Colburn's associates in that organization are not associated with the Atomic Storage Company.

The possibility of disposing of radioactive wastes into deep subsurface formations has been considered attractive for many years. In September, 1955, a committee of the National Academy of Sciences-National Research Council met to discuss the geologic aspects of radioactive waste disposal and in essence recommended the implacement of wastes into the bottom of structural basins. The complete report of the committee is NAS-NRC Publication 519, "The Disposal of Radioactive Waste on Land", April, 1957.

Initially, the research and development program that grew out of the committee suggestions explored the feasibility of injecting high-radioactivity, high-ionic content wastes. Included were laboratory studies of the chemical compatibility of wastes with

9-9-65

typical geologic formations that might be used as disposal reservoirs, literature and field studies of the distribution and characteristics of structural basins in which disposal reservoirs might be located, and studies of the effects of radiogenic heat on the chemical and hydraulic stability of wastes.

It was recognized at the outset that optimum methods of waste disposal are environment dependent. What may be the best method for Savannah River may not be best for Hanford. Study of various sedimentary basins was predicated on future growth of the nuclear industry and the possibility that location of future chemical processing plants might be influenced by waste disposal methods. Early in the research it was recognized that fluid pressure distribution would be important in any deep-well disposal scheme, and the 1960 discussions and correspondence with PRC were related for the most part to this point. As the research program on the conversion of high level wastes to solids began to show encouraging results, the idea of injection disposal of high level wastes was generally set aside, and emphasis was placed on work related to injection of low activity liquids. With this shift in emphasis, the importance of fluid pressure distribution decreases, because injected wastes do not need to be so completely confined, and porosity and permeability factors become more important because of the larger volumes of low level waste. This evolution in thinking came about gradually, but had been fully adopted by 1962. PRC, and Colburn in particular, have apparently held the view that fluid pressure distribution is virtually the only factor to consider in deep well disposal. They have certainly not realistically evaluated the economic or safety aspects of waste management.

Attached is a resume of AEC contacts with the Petroleum Research Corporation and Atomic Storage Company, along with a copy of a proposal submitted jointly by Stearns Roger Manufacturing Company, E. A. Polumbus and Associates, and the Atomic Storage Company and copies of correspondence sent to Mr. Colburn following discussion, technical review, and evaluation of the proposal.

We would be pleased to discuss the above in greater detail if you desire.

Original Signed
Milton Shaw

Milton Shaw, Director
Division of Reactor Development
and Technology

Distribution:
SUBJ
NSS
NS
RDT: rf (2)
RDT:D
GM (2)
AGMR
Secretariat (2)

RDT:NS
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OFFICE	Attachments: As stated above.	RDT:NSS	RDT:D	AGMR	AGM/DGM	GM
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NATIONAL ACADEMY OF SCIENCES

OFFICE OF THE PRESIDENT
2101 CONSTITUTION AVENUE
WASHINGTON, D. C. 20418

August 30, 1965

The Honorable Glenn T. Seaborg
Chairman
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Glenn:

Following a suggestion of Dr. Abel Wolman, the Academy convened an ad hoc group to review the current status of radioactive waste disposal methods, especially as these relate to anticipated needs and their effects on the biologic environment.

The group which met on July 6, 1965, consisted of Dr. Philip Abelson, Dr. Gordon M. Fair, Mr. John E. Galley, Dr. M. King Hubbert, Dr. Milner B. Schaefer, and Dr. Abel Wolman (chairman), and the following twelve persons from government and industry:

Mr. Walter Belter, U. S. Atomic Energy Commission
Dr. Gordon Dunning, U. S. Atomic Energy Commission
Mr. William Lennemann, U. S. Atomic Energy Commission
Dr. Joseph Lieberman, U. S. Atomic Energy Commission
Mr. Alex Perge, U. S. Atomic Energy Commission
Dr. Forrest Western, U. S. Atomic Energy Commission
Mr. Paul Dragoumis, American Electric Power Company
Mr. Abraham Gerber, American Electric Power Company
Mr. John Bernsee, Yankee Atomic Power Company
Dr. Ronald G. Menzel, U. S. Department of Agriculture
Mr. James G. Terrill, U. S. Public Health Service
Dr. Paul Tompkins, Federal Radiation Council

9-30-65

After presentations and discussion, the group, in executive session agreed on five points that are here submitted for your consideration:

1. The Atomic Energy Commission has made great progress in waste management practices and research since the 1960 Summary Report of the Committees on the Biological Effects of Atomic Radiation.

2. Because the AEC is an operating agency, there has been a tendency to solve storage and disposal problems on an _ad hoc_ basis. There is a need for a long-range, comprehensive plan that will elucidate the principles and practices needed to solve not only present problems but those of the future; the plan should take into account the possible effects of unusual natural events and disasters, as well as foreseeable man-related environmental changes; and it should reflect an awareness that expedient small-scale practices may be hazardous, particularly with respect to long-lived nuclides, if the practices were continued to be carried on for a long period of time or on the enlarged scale expected to be reached in 1975.

3. The group suggested that the Commission prepare a report that will contain guidelines for management and disposal of radioactive wastes, including those generated by the burgeoning nuclear power industry, over the next 20-30 years. The reasoning behind the guidelines should be set forth.

4. The group recommends that the Academy continue its committees concerned with varied aspects of radioactive waste management and disposal. No new committee is needed at this time. The existing committees should schedule periodic reviews of the matters within the scopes of their assignments.

5. These existing Academy committees should attempt to take into account not only the waste problems of the AEC and nuclear-power industry, but radioactive-contamination problems related to projects of Plowshare and the National Aeronautics and Space Administration, as well as those that may emerge from other programs.

I believe a guideline report on disposal methods and management along the lines suggested by the group could be enormously useful in focusing constructive attention on these increasingly important problems, and providing guidance to those who are seeking better solutions. I am sure that each of the members of the ad hoc group would be willing to respond on these comments and conclusions, should the Commission wish them to do so.

Sincerely yours,

Fred

Frederick Seitz
President

cc: Dr. Abel Wolman

Materials-12

AUG 5 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: ANNOUNCEMENT OF PROPOSED LICENSE FOR COMMERCIAL WASTE DISPOSAL AT HANFORD SITE

Attached for your information is a public announcement of proposed issuance of a license to California Nuclear, Inc., Lafayette, Indiana, for disposal of radioactive waste at the Government's Hanford site. The announcement has the approval of the Director of Regulation. We plan to distribute the announcement within the next few days when notice is filed with the Federal Register.

(signed) Philippe G. Jacques
Philippe G. Jacques
Acting Director
Division of Public Information

Attachment

cc: R. E. Hollingsworth, General Manager
H. C. Brown, AGMA
J. J. Burke, OCR
J. A. McBride, ML, (Attn: Lyall Johnson)
Nathan Bassin, ML
W. B. McCool, SECY

copy filed: MH&S 3-3 Contam & Decontam

copy of release (8-10-65) filed: I&O 14-6 Reg

8-5-65

AEC PLANS TO LICENSE COMMERCIAL RADIOACTIVE WASTE BURIAL ON LAND AT HANFORD

The Atomic Energy Commission is proposing to license California Nuclear, Inc., Lafayette, Indiana, to bury radioactive waste at the Government's Hanford site near Richland, Washington.

The site is located in Benton County, Washington, approximately one mile from the southwest corner of the area designated as the 200 East Area of AEC's Hanford Works. California Nuclear, Inc., is presently licensed by the Commission to receive, process, repackage and store radioactive waste materials at this site.

The company would bury only solid wastes in packages as received from customers or in packages prepared by the company. The waste would be put into open trenches which would be backfilled and then marked in such a manner as to identify the contents and size of the trenches.

Commission regulations require that radioactive wastes be buried on land owned by a state government or the Federal Government because of the necessity for long-term control over the land. The proposed land burial site is located on land owned by the Federal Government and leased to the State of Washington. California Nuclear, Inc., will operate the burial ground under a sublease from the State of Washington.

The Commission has found that the company's proposed equipment, facilities and procedures are adequate and that it is technically qualified to carry out the disposal operations in a safe manner.

Notice of proposed issuance of the license amendment will be published in the Federal Register on ________________. Unless a request for a hearing is received by the Commission within 15 days after that date, the license amendment will be issued. Such requests should be addressed to the Secretary, Atomic Energy Commission, Washington, D. C., 20545.

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Materials-12

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

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UNITED STATES GOVERNMENT

Memorandum

TO : File DATE: August 3, 1965

Original signed by
F. T. Hobbs for

FROM : W. B. McCool, Secretary

SUBJECT: JULY 22 LETTER FROM THE NATIONAL ASSOCIATION OF SANITARIANS RE HANFORD EFFLUENTS

SECY:ICB

1. At Information Meeting 502 on July 29, 1965, Mr. Bloch noted a reply to the July 22 letter from the National Association of Sanitarians re Hanford Effluents was in preparation for the Chairman's signature.

2. We understand the Division of Operational Safety is taking the required action.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for Operations
Asst. Gen. Mgr. for P&P
General Counsel
Director, Operational Safety
Director, Congressional Relations

8-3-65

signed copy filed: MH&S-3-3 Contam & Decontamination

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ROBERT E. JONES, ALA., CHAIRMAN
JOHN E. MONAGAN, CONN.
J. EDWARD ROUSH, IND.
DAVID S. KING, UTAH
HENRY HELSTOSKI, N.J.
JOHN E. MOSS, CALIF.

FRANK J. HORTON, N.Y.
HOWARD H. CALLAWAY, GA.
JOHN N. [illegible], ILL.

CAPITOL [illegible]

EIGHTY-NINTH CONGRESS

Congress of the United States

House of Representatives

NATURAL RESOURCES AND POWER SUBCOMMITTEE
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS

RAYBURN HOUSE OFFICE BUILDING, ROOM [illegible]
WASHINGTON, D.C. [illegible]

June 29, 1965

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Seaborg:

Enclosed are three copies of a report entitled, "Disposal of Sewage and Industrial Wastes by Federal Installations (Water Pollution Control and Abatement)," which was unanimously adopted by the House Committee on Government Operations. I call your attention to the Principal Recommendations on pages 4 and 5 of the report.

The report is one of a series stemming from hearings held during the 88th Congress by the Committee's Natural Resources and Power Subcommittee. It summarizes the Subcommittee's survey of 963 Federal installations previously listed as discharging untreated waterborne sewage or industrial wastes of 3,000 gallons per day or more, or nonwaterborne wastes of 200 persons or more per day, directly into surface waters or into the ground.

Although 34 installations of the Atomic Energy Commission were included in the Subcommittee's survey, they are not discussed in this report because the Public Health Service has not yet completed its inspections, reports and review procedures concerning these AEC installations.

I shall welcome your comments on this report.

Sincerely,

Robert E. Jones

ROBERT E. JONES
Chairman
Natural Resources and Power Subcommittee

Encs.

Materials - 12 - Waste Disp. C

MAY 26 1965

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: REVISED ANNOUNCEMENT OF VISIT OF USSR SPECIALISTS

Attached for your information is a revised announcement concerning a visit by a group of 10 Soviet radioactive waste disposal specialists who are scheduled to begin a tour of U.S. installations next Monday. The tour had been scheduled for late March but was postponed.

This announcement, approved by the Office of the General Manager on March 17 and sent to you for information on March 22, has been revised slightly. In notifying the AEC that their waste disposal experts would come to the U.S. this weekend, the Soviets substituted three names, one that of a woman specialist.

We will distribute this announcement to the public media on Monday if the USSR group arrives over the weekend as scheduled.

(Signed) Philippe G. Jacques
for

Duncan C. Clark, Director
Division of Public Information

Attachment

cc: R. E. Hollingsworth, General Manager
J. J. Burke, Dir., OCR
D. C. Brown, AGMA
J. Hall, AGM/IA
M. Kratzer, Dir., DIA (Attn: M. Abrahams)
M. Shaw, Dir., DRDT (Attn: M. Mueller)
W. B. McCool, Secretary

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5-26-65

USSR ATOMIC WASTE DISPOSAL SPECIALISTS
ARRIVE TO TOUR U.S. INSTALLATIONS

Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission, today announced that 10 specialists of the Soviet Union having an interest in radioactive waste disposal have arrived in the United States. The USSR group arrived in New York City on Saturday.

The visitors are scheduled to begin a tour of unclassified waste disposal facilities in Massachusetts today. They also will discuss with experts in this country various methods of waste disposal and the problems encountered in this important field.

For the first time since the United States and Soviet Russia inaugurated their nuclear exchange program, a woman is a member of a visiting scientific group. She is Miss Neonila Ye. Brezhneva of the USSR Academy of Sciences in Moscow.

This visit completes the fourth in a series of technical exchanges of groups of nuclear specialists between the United States and the Soviet Union. Ten Soviet reactor specialists visited U.S. installations in April. The exchanges are provided for under the Memorandum signed in Moscow in May, 1963, by Dr. Seaborg and Mr. Andronik M. Petrosyants, Chairman of the USSR State Committee on the Utilization of Atomic Energy. The Memorandum is part of the program of exchanges established under the over-all U.S.-U.S.S.R. Scientific, Technical, Educational and Cultural Agreement.

The Soviet scientists who will tour the U.S. are:

Mr. Viktor I. Spitsyn, Director, Institute of Physical Chemistry, USSR Academy of Sciences, Moscow;

(more)

Miss Neonila Ye. Brazhneva, Member, Institute of Physical Chemistry, Academy of Sciences, USSR, Moscow;

Mr. Lev.I. Gedeonov, Senior Scientific Worker, Khlopin Radium Institute, Leningrad;

Mr. Boris S. Kolychev, Head of Section, USSR State Committee on Utilization of Atomic Energy;

Mr. Alfred A. Levich, Head of Section, Beloyarsk Atomic Power Station;

Mr. Vladimir F. Menshikov, Reviewer, USSR State Committee on Utilization of Atomic Energy;

Mr. Mikhail L. Portny, Senior Engineer, Novovoronezh Atomic Power Station;

Mr. Stanislav P. Potapov, Head of Section, USSR State Committee on Utilization of Atomic Energy;

Mr. Vyacheslav M. Sedov, Engineer-Chemist, Leningrad Planning Institute, and

Mr. Pavel V. Zimakov, Engineer, USSR State Committee for Chemistry.

The Soviet delegation is scheduled to visit waste disposal facilities and related activities of the Yankee Atomic Power Plant, Rowe, Mass.; the Harvard University Air Cleaning Laboratory, Cambridge, Mass.; the Brookhaven National Laboratory, Upton, L.I., N.Y.; Argonne National Laboratory, Argonne, Ill.; Dresden Nuclear Power Station, near Morris, Ill.; PHS Taft Sanitary Engineering Center, Cincinnati, Ohio, and the Oak Ridge National Laboratory, Oak Ridge, Tenn. The visitors then will return to Washington, D.C. to confer with AEC Headquarters representatives.

At the time of the signing of the Memorandum in Moscow in 1963, Dr. Seaborg and a group of U.S. scientists were touring Soviet instal-

(more)

lations on the invitation of Mr. Petrosyants. Mr. Petrosyants headed a group which toured United States establishments in November, 1963, as guests of Dr. Seaborg.

During 1964, the U.S. and the Soviet Union exchanged visits of scientists in the fields of controlled thermonuclear reactions and solid state physics and two groups from the United States visited reactor and radioactive waste disposal installations in the USSR.

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Materials - 12 - Waste Recovery

AEROJET-GENERAL CORPORATION

AZUSA, CALIFORNIA 91703 • ED 4-6211

VON KARMAN CENTER

16 April 1965

Dr. G. T. Seaborg, Chairman
Atomic Energy Commission
Washington, D. C.

Dear Dr. Seaborg:

Aerojet-General Corporation has been retained by the State of California to conduct a statewide waste management study. The purposes of this study are to examine current wastes, waste handling techniques, and waste generators, to evaluate population trends and waste absorptive capabilities of various resources, and to determine how wastes can best be assimilated, while keeping natural resources reasonably uncontaminated.

This study is expected to yield a plan that is capable of being implemented by the State of California to control and prevent the pollution of land, water, and air environments of the State. Prominent features of this plan will be:

a. A description of the principal problems and the technical means of solving them.

b. Design of an administrative organization to monitor and implement development of detailed plans connected with specific problems.

c. Recommendations that relate to the techniques, including legal implications, of evolving from present methods of handling wastes to those that will be required in the future.

Aerojet has been very concerned about the best means by which the State of California can manage the radioactive waste materials produced within its boundaries for the next two to three decades. The mushrooming use of nuclear energy will undoubtedly impose greater responsibility on the State with respect to disposing of nuclear waste. Nuclear wastes and storage of contaminated materials may become a major problem for the State of California if adequate measures are not taken now for their proper management and safe disposal. The State must ensure the safe disposal of all waste generated in various nuclear power plants, nuclear research reactors, industry, research institutions, hospitals, and medicines. Consequently, we are striving in our study to present an intelligent, unbiased view on the best nuclear waste management plan for maximum utilization of nuclear energy in endeavors that are unhampered by political, technical, or sociological bottlenecks.

Aerojet is asking your office to provide general guides for such a plan and to discuss these guides with Aerojet representatives so they can obtain maximum benefit of the technical, policy-making, and managerial experiences that your

4-19-65

organization has acquired. We would like to define the role played by the AEC in nuclear wastes and the possible impact of the AEC on present and future nuclear planning for the State of California. Moreover, we should work together to establish plans for proper disposal of radioactive wastes and contaminated materials resulting from ever-increasing activities in this field. Information on AEC plans and recommendations on waste management for the State in general is greatly needed. The State has no dumping ground for radioactive materials; California has been totally dependent upon Nevada to dispose of radioactive wastes.

We would greatly appreciate the opportunity of talking with you, or with whomsoever you may designate, about the nuclear aspects of the waste management study.

I recall with great pleasure the Berkeley days and look forward to meeting you again.

Very truly yours,

AEROJET-GENERAL CORPORATION

J. H. Irani

J. H. Irani
Waste Management Study

JHI:bb

Materials - 12

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ROBERT E. JONES, ALA., CHAIRMAN
JOHN S. MONAGAN, CONN.
J. EDWARD ROUSH, IND.
DAVID S. KING, UTAH
HENRY HELSTOSKI, N.J.
JOHN E. MOSS, CALIF.

FRANK J. HORTON, N.Y.
HOWARD H. CALLAWAY, GA.
JOHN N. ERLENBORN, ILL.

CAPITOL [illegible]

EIGHTY-NINTH CONGRESS

Congress of the United States
House of Representatives

NATURAL RESOURCES AND POWER SUBCOMMITTEE
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS
RAYBURN HOUSE OFFICE BUILDING, ROOM [illegible]
WASHINGTON, D.C. 20515

April 7, 1965

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington, D. C.

Dear Dr. Seaborg:

In May 1963, I asked your agency and the Department of Health, Education, and Welfare to inspect the waste water discharge practices at several of your installations, and advise me with respect to the extent of water pollution and plans for its abatement. The installations represented 34 discharge points and are part of the 1,003 installations mentioned in House Report 1636, 88th Congress (copy herewith). Your agency sent us several reports concerning the waste discharges at individual installations, for which I thank you.

We are now completing a study of these 1,003 installations, classifying each installation according to the status of progress in water pollution abatement since December 31, 1960. Enclosed herewith is a set of Appendixes 1-15 to show the classification system.

To date we have received from the Public Health Service reports and Appendixes on all installations of every agency, except the Atomic Energy Commission as to which we have received reports on only 10 of the 34 discharge points. We understand that the Public Health Service has not yet inspected many of your installations.

It will be appreciated if you would do everything possible to help the Public Health Service expedite these inspections. I am asking the Secretary of Health, Education, and Welfare, to prepare a schedule for the inspections, in cooperation with you, and to let us have a copy of the schedule. Enclosed is a copy of my letter to him. I am also sending him a copy of this letter.

Your assistance in this matter of common interest will be appreciated.

Sincerely,

Robt E. Jones

ROBERT E. JONES
Chairman
Natural Resources and Power Subcommittee

4-7-65

Encs.

ROBERT E. JONES, ALA., CHAIRMAN
JOHN S. MONAGAN, CONN.
J. EDWARD ROUSH, IND.
DAVID S. KING, UTAH
HENRY HELSTOSKI, N.J.
JOHN E. MOSS, CALIF.

FRANK J. HORTON, N.Y.
HOWARD H. CALLAWAY, GA.
JOHN N. ERLENBORN, ILL.

CAPITOL 5-6427

EIGHTY-NINTH CONGRESS

Congress of the United States

House of Representatives

NATURAL RESOURCES AND POWER SUBCOMMITTEE
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS
RAYBURN HOUSE OFFICE BUILDING, ROOM B349-B
WASHINGTON, D.C. 20515

April 7, 1965

Honorable Anthony J. Celebrezze
Secretary of Health, Education, and Welfare
Department of Health, Education, and Welfare
Washington, D. C.

Dear Mr. Secretary:

In May 1963, I asked you in cooperation with the heads of a number of agencies to arrange to have the Public Health Service inspect and send me reports on 1,003 Federal installations that existing information indicated might be contributing to pollution of the Nation's waters. We have received reports on all the installations of every agency except those of the Atomic Energy Commission, as to which we have received reports only with respect to the Hanford Operations Office, Richland, Washington, (letter November 2, 1964) referring to 10 of the 34 Atomic Energy Commission discharge points mentioned in our letter of May 1963.

It will be appreciated if you would arrange for the Public Health Service to expedite the inspections of the Atomic Energy installations. Would you please prepare a schedule for such inspections, in cooperation with the Atomic Energy Commission, and send us a copy of the schedule. I am sending a copy of this letter to Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission, and enclose a copy of my letter to him.

With respect to the discharge points already inspected, we will appreciate your classifying them to the Appendixes 1-15 that have been developed to show the status of progress in water pollution abatement since December 31, 1960. Would you please send us the classifications by April 14, if possible.

Your assistance in this matter of common interest will be appreciated.

Sincerely,

ROBERT E. JONES
Chairman
Natural Resources and Power Subcommittee

Enclosure

Materials - 13

MAR 8 1965

Dear Mr. Holifield:

During the 1966 authorization hearings on February 5, 1965, I referred to a statement prepared by the AEC staff on the Management of Radioactive Wastes from the Nuclear Power Industry. We have made a few revisions in this statement to reflect the current projections as to the probable installed nuclear power capacity and I am attaching a copy for your information.

Sincerely yours,

/s/

James T. Ramey
Commissioner

Honorable Chet Holifield
Chairman, Joint Committee
on Atomic Energy
Congress of the United States

Enclosure:
Statement

cc: Ramey (2)
GM
Cong. Liaison (2)
Secretariat (2)
Controller
DDRT
AGMR
Starr
Caron
Green
File

3-8-65

Cjw 11/mjw 3/6/65	ACGa/ Contr.	DDRT/AGMR	ADR	DRM	GM	Congressional

FEB 17 19

MANAGEMENT OF RADIOACTIVE WASTES FROM THE NUCLEAR POWER INDUSTRY

Introduction

The management or disposal of radioactive waste from the nuclear energy industry has been a recognized and important part of all AEC activities. As in many other industries, waste disposal is not a single problem with a single solution. However, because of the very nature and characteristics of radioactive material - their non-detectability by human senses, their ability to cause damage to human tissues, and their potential danger as an environmental pollutant - it was readily apparent from the beginning that the safe handling and ultimate disposal of waste from this industry were paramount and perhaps more essential than any previous industrial operation developed to date. Because of this fact, the subject of industrial radioactive waste disposal was thoroughly and extensively discussed in the Hearings conducted by the Joint Congressional Committee on Atomic Energy in 1959.

Among the salient conclusions reached as a result of the exhaustive JCAE Hearings on this subject were: 1) radioactive waste management practices have not resulted in any harmful effects on the public, its environment or its resources; and 2) the general problem of radioactive waste need not retard the future development of the nuclear energy industry with full protection of the public health and safety. We believe these conclusions are still valid.

Nature of Radioactive Wastes

Radioactive wastes continue to be considered by most people as an uncategorized entity. The word "radioactive" has been so strongly impressed that it has become an all-inclusive term, to the point where waste from nuclear reactors, from laboratory research, from medical use, from chemical reprocessing of irradiated fuel elements, etc., are all considered as one and the same thing. Important characteristics such as the quantity and concentration of radioactive material involved and its detailed chemical and physical nature are not considered, and most often completely ignored. However, these are paramount to a meaningful understanding and essential to any discussion of radioactive waste operations.

It is important to understand at the outset that radioactive wastes which are generated in routine nuclear reactor operations, in laboratory and medical research, and in other industrial applications of isotopes -- all are generally considered as low level, or low hazard potential wastes. In terms of radioactivity concentration these wastes are normally in the thousandths or millionths of a curie per gallon range. Billions of gallons of low level wastes are produced each year as a result of these operations. Certain of these wastes in which the concentration of radioactivity is only a few times greater than drinking water standards may be disposed of in streams, where dilution will drop the concentration far below the maximum permitted or, under suitable conditions, may be discharged into soils where the hazardous radionuclides are retained. Other low level wastes are treated by processes which have been proven over several years of operation, and which reduce the

level of radioactivity in the wastes to a point where they may be safely discharged to the environment. Present treatment and dispersal methods in use in the United States have been demonstrated to result in concentrations in the environment well below established permissible limits, and these operations are carefully controlled so as to assure that the safe capacity of the environment is not exceeded.

As indicated above, essentially all the radioactive wastes generated at a nuclear power reactor installation fall into the low level or low activity category. For example, a total of only eight millicuries was contained in the 4?,000 gallons of waste discharged by the Yankee reactor in 1962. Spent fuel elements removed from the reactor, which are designed to possess high integrity and which, therefore, retain the great majority of the fission products produced in the reactor, are shipped intact to a fuel reprocessing plant for recovery of the unburned uranium and plutonium. It is in this part of the fuel cycle, i.e., the processing of the spent fuel to recover unburned uranium, that all of the high and intermediate level wastes are produced. These high activity wastes, which are generated at present at AEC production sites as a result of the chemical reprocessing of irradiated reactor fuel, and which will be produced in the future at commercial fuel reprocessing plants such as the NFS facility located in New York State, have concentrations of radioactivity in the range of hundreds up to tens of thousands of curies per gallon. Thus, these wastes have radioactivity levels tens or hundreds of millions of times higher than that contained in low activity wastes. However, it is important to note that the total number of gallons which evolve from low and high level waste operations are vastly different. As opposed to the billions of gallons of low level wastes which are produced annually, the volume of high level wastes which have been generated since the beginning of the atomic energy program has amounted to only about 65 million gallons, all of which is stored in underground tanks and intensively monitored.

Objectives of Waste Management Operations

The major objective of waste management in atomic energy operations is control over the radiation hazard that might be produced by these wastes, either in storage or in nature. This requires control not only during operations and discharge, but also over movement and distribution of the waste products in the environment. Two basic disposal concepts are applied:

> Concentrate and contain. The radioactive materials may be confined or isolated within permanently maintained reservations, away from people and useful resources. Highly active liquid wastes originating from the chemical processing of irradiated fuels from reactors must be reduced to a suitable concentrated form and contained indefinitely in this way.

Dilute and disperse. In this other basic concept of waste management, the radioactivity may be reduced to tolerable levels by dilution in nature - in air or water. However, the fact that some wastes can be dispersed directly to the environment makes it essential to control these operations carefully so as to assure that the safe capacity of the environment is not exceeded. A third concept of delay and decay is also practicable in certain situations.

For high activity waste from fuel reprocessing, tank storage, while not an ultimate solution in itself, probably will be an operating part of any final disposal system. However, the inherent restrictions of tank storage, such as potential leakage and the necessity of liquid waste transfer for periods of hundreds of years, have resulted in an extensive research and development program directed at engineering a practical system for conversion of high activity liquid waste to a solid form. Final storage, or disposal of high activity solids would be accomplished in a suitable geologic formation, such as salt.

Magnitude of Future High Activity Waste Management Problem

During the hearings before the Joint Committee on Atomic Energy on the subject of industrial radioactive waste disposal held in 1959, it was estimated that using the then current processing technology the volume of high and intermediate level waste accumulated by 1980 would reach 36 million gallons.

The intervening years have brought improvements in fuels technology and in fuel reprocessing methods which have served to markedly reduce the volume of wastes generated per unit of nuclear power produced. Thus, while estimates of installed nuclear power in 1980 have risen by almost a factor of 3 from 25,000 MW_e at the time of the hearings to the present 70,000 MW_e forecast, predicted accumulated waste volume in storage by 1980 has dropped by a factor of 10 to 50 (750,000 to 3,000,000 gallons), depending on the postulated operating procedures of the reprocessing plant. Estimates of waste quantities through the year 2000, based on the most recent predictions concerning growth of the nuclear industry are summarized in Table 1.

TABLE I

Estimate of Wastes Arising From
A Nuclear Power Complex

	YEAR		
	1970	1980	2000
Installed Nuclear Power, MW_e	5,000	70,000 (25,000)**	734,000 (175,000)**
Fuel irradiation level MWD/T	18,000	25,000	25,000
Volume of high activity waste*			
Annual Volume (gal/year)	40,000	235,000	2,800,000
Accumulated Volume (gal)	180,000	1,500,000 (36,000,000)**	22,000,000 (330,000,000)**
Total Sr^{90} (megacuries)	40	500	6,700
Total Fission Products (megacuries)	3,000	30,000	530,000

*Based on 200 gallons high activity waste/Ton U processed. Realistic estimates range from 100 gal/ton, in which case the volumes would be 1/2 of those shown, to 400 gal/ton (NFS flowsheet), in which case volumes would be twice those shown. Assumes three-year lag between installation of power plant and first reprocessing of fuel.

**1959 estimates included in parenthesis.

The above waste volumes are predicated on the assumption that confinement of the wastes will be accomplished by means of long term tank storage of liquids. Should a conversion-to-solids waste management concept (discussed in the next section) be adopted by, say, 1970, the waste storage picture would approximate that shown in Table II.

TABLE II

Waste Volumes in Storage Under
Conversion-to-Solids Waste Management Concept

	YEAR		
	1970	1980	2000
Annual Volume of Waste generated (gal/year)*	40,000	235,000	2,800,000
Accumulated liquid held for 5 year interim storage (gal)	165,000	900,000	11,000,000
Accumulated solids in ultimate storage (cu. ft.)**	70	3,000	52,000
Sr^{90} in liquid (megacuries)	37	300	3,350
Sr^{90} in solid (megacuries)	3	200	3,350

*Based on 200 gal waste/ton U processed.
**Based on 1 cubic foot solidified waste/ton U processed.

Economic evaluation studies of the conversion-to-solids waste management concept have indicated that to achieve minimum costs, a period of interim storage is required to permit decay of short-lived fission products and attendant reduction of decay heat generation. The five year figure used in the above table was found to be optimum from the economic point of view. However, recent studies indicate that substitution of interim solid storage under forced cooling conditions for part or all of the interim liquid storage period may be economically attractive. Shorter interim liquid storage periods would, of course, result in storage of a greater fraction of the wastes in solid rather than liquid form.

Research and Development Program

1. Treatment and Disposal of High Activity Fuel Reprocessing Wastes

More than 15 years experience with storage of liquid high activity wastes in tanks has shown it to be a safe, practical means of interim handling. The long term usefulness of this method is limited, however, dueto the long effective life of the wastes (hundreds of years) and the comparatively short life of storage tanks, estimated at several tens of years. Accordingly

the Commission has pursued a vigorous research and development program aimed at developing and demonstrating, on an engineering scale, systems for the conversion of high level liquid wastes to stable solids.

The largest development effort in this area has been the installation of a 60-gallon per hour Waste Calcination Facility at the Idaho Chemical Processing Plant, NRTS, for the fluidized calcining of acid aluminum nitrate wastes from MTR-type fuels. Cold engineering development work and successful Na^{24} tracer runs were completed in 1962 and early 1963, and hot operation with wastes stored at the ICPP commenced in December of 1963. The plant was operated continuously until October 15, 1964, at which time the existing solids storage bins were filled. During this period, 510,000 gallons of waste were converted to solid forms. Additional solids storage capacity is now being installed in preparation for continued operation of the calcination facility.

The power reactor waste solidification program has now reached the stage where an intensive effort culminating in full level demonstration is being carried out for a small number of processes which have continued to show real promise during the course of their development. To this end, a Waste Solidification Engineering Prototype Plant is now in the construction phase at Hanford Laboratories. This plant, which will be installed in the Fuels Recycle Pilot Plant Facility, will have a processing capacity of ten gallons per hour and will go into operation with high level wastes during FY 1966. Present plans call for demonstration of the pot calcination and radiant spray calcination processes and/or modifications of these techniques which will result in a more stable ceramic end product, as well as a continuous phosphate glass process. The flexibility of the plant which permits multiple process demonstration is due in large measure to the use by all processes of common feed preparation and off-gas treatment equipment, and to a unique design concept which groups associated pieces of equipment on remotely removable "plug-in" racks, thereby facilitating modification and maintenance.

As a prelude to this demonstration, hot pilot plant studies have been carried out at Hanford during the last one and one half years on the radiant spray and pot concepts, using full level wastes, and have been highly successful. Cold engineering development work on the pot, radiant spray, and continuous glass processes has been carried out by ORNL, Hanford, and BNL, respectively. Thus, the prototype demonstration work will be a national, cooperative effort involving participation of all three sites.

Long term storage or utlimate disposal

After high level liquid wastes are converted to solids, there still exists the requirement for storage or ultimate disposal of these solid wastes. This has led to the investigation of selected geologic formations for this purpose. Salt has been chosen as the most optimum disposal media because of its unique geologic characteristics. Salt formations are dry, impervious to water, and not associated with usable groundwater sources. Because of its plasticity, fractures in salt seal or close rapidly. Deposits of rock salt underlie some 400,000 square miles of the United States and may represent some of the few naturally occurring dry environments in the Eastern part of the country. Extensive laboratory investigations at ORNL and field studies in the Carey Salt Mine, Hutchinson, Kansas, have shown strong promise. A field experiment has been designed using short-cooled ETR fuel elements, to simulate the thermal and radiation characteristics of full-scale power reactor waste such as would exist in a pot containing calcined solids. This field demonstration is planned for early 1965, in the Carey Salt Mine in Lyons, Kansas.

Economic Implications

Long range engineering and economic studies are being conducted to give some indication of the magnitude of waste management costs in a future nuclear power economy. In studies completed to date on the high level waste management concept involving reduction to solids followed by storage in salt, the total cost of interim liquid storage, solidification, interim solid storage, shipment of solids over a 2,000-mile round trip to an ultimate disposal site, and storage in a salt formation, have an estimated total cost range of 0.026-0.030 mills per kilowatt hour electrical. This constitutes approximately one half of one percent of the cost of 6 mill power.

Impact of utilization of fission products

It has been suggested that the costs of waste management might be markedly reduced by the expedient of removing some of the fission products from the waste and thereby simplifying their subsequent management. Using optimistic expectations of waste compositions from future fission product separation processes, it has not been possible to show any substantial economic advantages to waste management. (It should be noted that reference here is made to future power reactor wastes. The Hanford Waste Management Program, discussed below, is a notable exception to the above statement, in that fission product removal makes it possible to utilize existing tanks for long term storage of wastes in salt-cake form.) In a study conducted at ORNL, the cases of 90 and 99% fission product removal have been compared with that for the untreated waste. The cost of managing wastes that are 90 to 99% depleted in fission products is about 70% as much as the cost of managing wastes with no fission products removed. The difference, about $400 per metric ton of uranium processed, is not enough to pay for the separation and handling of fission product concentrates unless there are mitigating circumstances, such as at Hanford. Fission product removal must be justified and paid for by the market for fission product radiation or heat sources, with only a marginal credit from reduced costs of waste management. From an environmental or over-all waste management standpoint, f.p. recovery cannot be equated to f.p. removal.

Other long term waste management methods for the some 65 million gallons of waste in storage at AEC production sites are now in the study or implementation stage. The Waste Calcination Facility at the ICPP has been discussed above. As a possible alternative to high level liquid waste tank storage, the AEC is investigating at its Savannah River Plant the feasibility of storing aged fuel reprocessing waste in deep impermeable (basement rock) formations, approximately 2,000 feet beneath the plant. Several widely spaced exploratory holes have been drilled into the underlying bedrock. Field permeability tests of the basement rock have been made and continuous core samples have been obtained for determination of tensile and compressive strength, thermal conductivity, and chemical compatibility of the rock with Savannah River Plant waste. Technical studies have been conducted with respect to waste characteristics, including heat generation rates, age of waste to be stored, and the physical form of waste considered most desirable. A preliminary safety analysis has been completed, and studies are now underway on methods for removing wastes, including caked sludges, from the storage tanks.

The proposed Hanford Waste Management program is specially designed for existing and future Hanford production wastes. It makes optimum use of the existing facilities and the favorable geology and climate of the area. It involves extraction of most of the strontium-90, cesium-137, promethium-147, and cerium-144. The residual waste with low heating rates is then discharged to existing underground tankage and later solidified to a salt cake by <u>in-situ</u> evaporation. The extracted long-lived fission products are packaged in small, high-integrity containers and placed in storage. Accordingly, large quantities of strontium and cesium will be available on demand for utilization.

Based on past laboratory and engineering scale cold unit operations data and on an expected successful field demonstration and testing program with actual high level wastes, it is firmly believed that waste management operations should not constitute a major obstacle to the development of safe and economical nuclear power.

2. <u>Treatment and Disposal of Low and Intermediate Level Wastes</u>

Radioactive low and intermediate waste management is presently accomplished by single or multiple stage treatment systems involving filtration, chemical precipitation, ion-exchange, evaporation, concrete solidification, vermiculite adsorption and tank storage. Where suitable geohydrologic conditions exist, ground disposal of low and intermediate level wastes with or without treatment is utilized. Wastes are processed by the method which provides the required decontamination at the lowest cost, in accordance with acceptable health and safety standards.

Flocculation and chemical treatment processes have been developed for the decontamination of large volume low activity waste at several AEC installations. Treatment efficiencies up to 90% have been achieved for strontium and cesium and up to 99% for alpha activity using single stage treatment. Multi-stage treatment is capable of achieving over-all decontamination factors as high as 1,000 (treatment efficiencies of 99.9%), but complexity and cost also increase considerably.

Improved decontamination processes using special ion-exchange materials have been developed and are now in use in laboratory waste and power reactor station treatment systems. Extensive R&D work in this area has been conducted at Argonne, Los Alamos, and Oak Ridge. Decontamination factors for cation exchange resins have ranged from 20 to 50 for mixed fission product waste to as high as 10^5 for mixed-bed units.

Recent studies at Oak Ridge have indicated that a phenolic resin ion-exchange process can provide higher decontamination factors and volume reduction than other current processes for strontium and cesium removal from low level wastes. Results of pilot plant work show that approximately 99.9% of the strontium and cesium, the greatest health hazards, have been removed from 1500-2000 volumes of alkaline wastes with an over-all volume reduction of approximately 2000.

A prime example of ground disposal research and development involves the potential disposal of intermediate level wastes by hydraulic fracturing of shale or other suitable geologic formations. This technique which was obtained from the petroleum industry has been under extensive development by the Oak Ridge National Laboratory for waste disposal application during the past three years. The method consists of injecting a waste-cement-clay mixture under high pressure into an impermeable formation by fracturing. A full-scale engineering test of this concept, involving five injections of actual ORNL intermediate waste, was successfully conducted in 1964. This demonstration established the technical and economic feasibility of the hydrofracturing disposal process.

A committee of the American Petroleum Institute has studied the feasibility of injecting liquid waste into deep (several thousand feet) permeable formations. Laboratory investigations and theoretical studies on ion sorption, chemical compatibility, corrosion, etc., have been carried out by the Oak Ridge National Laboratory, the Bureau of Mines, and the University of California. Small-scale field tracer tests have been carried out at the University of California. A subcommittee of the American Association of Petroleum Geologists is compiling and evaluating available hydrodynamic data which exists on several deep sedimentary basins in the United States to determine which areas may be suitable for a deep well field scale experiment. With a continual lowering of acceptable limits of radioactivity in our environment, it is envisioned that deep well injection could provide a future method for the disposal of certain types of large volume, low and intermediate activity wastes.

Environmental Studies in Support of the Waste Disposal Program

For safe disposal of low activity waste to the environment after processing and/or monitoring, a wide variety of environmental studies (stream and river, estuarine and oceanographic, soil and earth) have been conducted to provide specific information on the fate and behavior of low level effluents dispersed in specific environments. In this manner a more accurate and specific assessment of the environmental effects of waste disposal practices can be made.

An example of the environmental studies being carried out in the waste disposal program is the comprehensive stream investigation which is being conducted on the Clinch and Tennessee Rivers below ORNL. This study involves various Federal agencies and scientific disciplines, and has been extremely successful because of the close cooperation and active participation of each group. While normal monitoring practices at ORNL have determined that the concentration of radioactivity in the Clinch and Tennessee Rivers below Oak Ridge is well within internationally accepted standards, it was believed important to obtain further fundamental and applied information on the physical, chemical, and biological dynamics of a flowing freshwater system which is receiving volumes of low level radioactive waste. The ultimate fate and distribution of radionuclides of specific interest at Oak Ridge - strontium-90, cesium-137, ruthenium-106, and cobalt-60 - are being determined. The over-all capacity of the Clinch River for radioactive waste disposal purposes is being evaluated to determine future treatment and management criteria. These studies will also establish more effective long-term monitoring procedures for waste effluent control.

Field studies of physical dispersion of radioactive effluents in estuarine and coastal waters have been conducted for the AEC by the Chesapeake Bay Institute of the Johns Hopkins University. A comprehensive study of New York Harbor, involving field measurements of currents, temperature, and salinity by the U. S. Coast & Geodetic Survey and data analyses by CBI has provided a means for evaluating the safety of nuclear ship operations within the Harbor.

Extensive environmental studies have been carried out in the Atlantic and Pacific Coast sea disposal areas to determine if the discharge of solid packaged low activity waste was causing any adverse effect on the oceanic environment. Seasonal surveys have included the collection of plankton, bottom sediments, fish and seawater samples to the thousand fathom depth. Based on the results of alpha, beta, and gamma low level counting analyses, it was determined that no radioactivity existed in bottom sediment, benthic organisms, and bottom fish that could be distinguished from natural background.

Conclusions

Waste management operational experience at U. S. atomic energy installations (AEC production and laboratory facilities and nuclear power reactor stations) has been more satisfactory than essentially any other facet of the nuclear fuel cycle. The research and development program has reached the pilot plant and field demonstration phase for several major projects, and it is expected that results of these programs will be available when industrial reprocessing of spent reactor fuels becomes a reality. Present engineering cost studies indicate that waste disposal operations should account for less than one percent of the cost of nuclear power in a 6 mill/Kwh economy. Based on an expected successful field demonstration and testing program with high activity waste, it is firmly believed that waste management operations will not constitute a major obstacle in development of the nuclear energy industry - from either a safety or economic standpoint.

Materials 12 -

Hos. & Status Br. - GTH

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

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UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: February 19, 1965

FROM : W. B. McCool, Secretary

Original signed
W. B. McCool

SUBJECT: WATER POLLUTION BILL - S. 560

SECY:JCH

1. At Information Meeting 451 on February 12, 1965, the Commissioners accepted Mr. Ink's recommendation that in response to the BOB on S. 560, the Commission should state the view that it does not favor a Bill which would authorize one agency to fund for actions for which another agency is responsible.

2. The Office of the General Counsel subsequently prepared a response to the BOB which was signed by the Chairman and dispatched on February 16, 1965.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Exec. Asst. to Gen. Mgr.
Asst. Gen. Mgr. for Reactors
General Counsel

2-19-65

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Materials - 12

Res. & Status Br. - GTN

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

~~OFFICIAL USE ONLY~~

UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: February 17, 1965

FROM : W. B. McCool, Secretary

Original signed W. B. McCool

SUBJECT: PROPOSED U. S. ITINERARIES FOR SOVIET REACTOR AND WASTE DISPOSAL DELEGATIONS

SECY:JCH

1. At Information Meeting 453 on February 15, 1965, the Commissioners approved the U. S. Itineraries for the Soviet Reactor and Waste Disposal Delegations as proposed in Mr. Kratzer's February 12 memorandum. The Commissioners requested relaxation of the restriction on access to reactor fuel technology to the extent of perhaps opening up more information on one facility. The Commission also suggested development of additional information for the Soviets on the SNAP 10A program.

2. It is our understanding the Division of International Affairs is taking the required action.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Asst. Gen. Mgr. for IA
Asst. Gen. Mgr. for Reactors
Exec. Asst. to Gen. Mgr.
General Counsel
Director, International Affairs
Director, RD&T

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2/26/65

~~Legal 4 - Law~~ ; Material 12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

0/9

FEB 16 1965

Dear Mr. Gordon:

This is in response to your request for the Commission's comments on S. 560, a bill to amend the Federal Water Pollution Control Act, as amended, and the Clean Air Act, as amended.

The Commission recognizes the national concern with water and air pollution and the need for comprehensive control thereof and fully supports the objective of controlling pollution which may endanger the health or welfare of persons.

The Commission therefore fully supports the objectives of S. 560. However, the bill as drafted is not clear in some respects and would, we believe, create some serious problems. These matters could be remedied and to accomplish this it is recommended that the bill be revised as follows:

1. Sections 101 (c), and the similar provisions in Section 202 (c), would authorize appropriations for the installation, maintenance and operation of waste disposal systems for any building, installation or other property, under the jurisdiction of a Federal Department or agency, for which the Secretary of the Department of Health, Education and Welfare has approved the plans and specifications. It further provides that such appropriations shall be appropriated to the Department of Health, Education and Welfare and made available to the Federal agency concerned in accordance with a plan approved by the Secretary.

We believe that such provisions are basically unsound. The agency responsible for carrying out a program should be solely responsible for budgeting for all aspects of the program. When certain aspects of an agency's program, particularly operation of a waste disposal system, are placed under the discretionary

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control of another agency the resulting division of responsibility would only lead to inefficiencies and a less rapid improvement toward the desired objectives. For example, in the Commission's reactor plant complexes radioactive waste handling considerations are not separable from the primary function of the facility. Provision for waste handling must be integrated in the design, construction, maintenance and operation of the facility and separate funding for installation, maintenance and operation of waste disposal facilities by another agency having no responsibility for the primary function of the facility is not realistic.

Moreover, the meaning of the term "waste disposal systems" is not defined. In its broad sense it would seem to include any system concerned with disposal of any type waste including systems integrated with another program. In a narrower sense it could apply only to systems supplemental to another function, such as a sewage disposal plant serving a military base.

We, therefore, recommend that Sections 101 (c) and 202 (c) be deleted.

2. Section 101 (b) provides that any Federal department or agency having jurisdiction over any building, installation or other property shall discharge wastes therefrom only in compliance with standards for such discharges which the Secretary may establish.

We believe it is apparent from the context in which it is used that the jurisdiction mentioned in this and other sections of the bill is not intended to include Federal regulatory or licensing jurisdiction over buildings, installations or other property.

Under this provision the Secretary could establish standards applicable to the discharge of radioactive waste from Federal buildings, installations or other property. However, this is a function which is now being performed by the Federal Radiation Council. The Federal

Radiation Council is required by statute to advise the President with respect to radiation matters and to provide guidance to all Federal agencies in the formulation of radiation standards. In addition the Atomic Energy Commission in connection with its functions is authorized to and has established standards in the area of control of radioactivity. The duplicative authority which S. 560 would provide is therefore not necessary. In order to avoid the undesirable situation of duplicative control by Federal agencies it is recommended that Sections 101 (b) and 201 be amended to exclude radiation standards from those which the Secretary would be authorized to establish.

Finally, under Section 101 (b) Federal agencies would be required to discharge wastes only in compliance with standards which the Secretary may establish. The effect of violation of this provision by a Federal agency is not clear. However, this provision might provide a private person adversely affected by unauthorized discharges with a legal basis for terminating or interrupting the offending Federal activity even though that activity might be important to the national defense. We believe this consequence is not intended and it could be avoided by amending the section to show that the only consequence of non-compliance would be the requirement that the agency report the situation to the Secretary under Section 101 (e) who in turn would report the matter to the President and the Congress.

Throughout its history of operation, AEC has endeavored to cooperate with State, local and regional health or pollution control authorities, as well as with the U.S. Public Health Service, so that waste discharges from our plant operations (whether radioactive or chemical) not only comply with applicable standards but are kept as far below the maximum permissible levels as it is practicable to do so. We fully intend to continue following this policy. In addition, we would be pleased to participate in the development of standards by the Secretary. However, we do not believe it is feasible to advance the common objective through division of responsibility for complicated and integrated plant operations or through duplicative and perhaps varying procedures for establishing standards.

The Commission believes S. 560 with the changes recommended above would provide desirable authority to advance the program of controlling or preventing water and air pollution from Federal installations.

Sincerely,

(Signed) [illegible]

Chairman

Honorable Kermit Gordon
Director
Bureau of the Budget

Materials 12

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November 17, 1964

CORRECTION NOTICE

COPY NO. 74

ATOMIC ENERGY COMMISSION

CORRECTION NOTICE TO AEC 180/24 - RELEASE OF LOW-LEVEL AQUEOUS WASTES

Done

Note by the Secretary

The phrase "to the environment" has been added to the second line of the Secretary's note on the cover sheet. Please substitute the attached revised page in your copy of the paper.

W. B. McCool

Secretary

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November 12, 1964

AEC 180/24

COPY NO. 74

AEC 180/24

ATOMIC ENERGY COMMISSION

RELEASE OF LOW-LEVEL AQUEOUS WASTES

Note by the Secretary

The attached report by the Director of Production summarizing the practices and experience in the release to the environment of low-level radioactive wastes from production facilities at Hanford, Savannah River and Idaho is circulated for the information of the Commission at the request of the Assistant General Manager for Plans and Production.

W. B. McCool

Secretary

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ATOMIC ENERGY COMMISSION

DISCHARGE OR RELEASES OF LOW-LEVEL AQUEOUS WASTES

Report by the Director of Production

I. SUMMARY

At the Hanford Operations, so-called "intermediate-level" wastes (5×10^{-5} to 100 uc/cc), such as condensate from the evaporation of high-level aqueous wastes, other process condensates, and decontamination washings, are released to the ground by seepage from cribs and trenches. Because of the favorable geological and hydrological conditions of the Hanford site and the capacity of the over 200 feet of underlying sediments to both adsorb radionuclides and retain liquids, the radioactive components of these wastes essentially are "stored" in the ground. Low-level wastes ($< 5 \times 10^{-5}$ uc/cc), mostly process cooling water, are released to the ground via surface ponds (swamps).

Operations at the Savannah River Plant (SRP) release extremely low concentrations of radioactivity into surface streams draining the SRP site. Open seepage basins are used for the release of low-level wastes, such as process condensates and fuel disassembly basin water, when they are considered too radioactive for release to the surface streams. While geologic and hydrologic conditions of the SRP site are not particularly favorable for retention of the radionuclides within the site perimeter, a limited amount of retention does occur at the seepage basins. Releases of radioactivity to the site environs at the SRP are controlled by radioactive release standards. The average release levels are kept as far below the waste release standards as possible.

At the National Reactor Testing Station (NRTS), low-level aqueous wastes (considered to be less than 10^{-3} uc/ml) are released, (1) via injection wells which penetrate the lithosphere to varying depths above and below the water table and (2) into ponds excavated on surface. Discharge limits are such that concentrations of radionuclides at points of use will not exceed one-tenth of the recommended guides for drinking water.

The following Table I-1 presents a summary of the reported radioactive releases, criteria and responsibilities for Hanford, Savannah River and NRTS.

Appendix "A" attached to this paper discusses the various committees for radiation hazards, their promulgations on guides and standards for radiation exposure, and correlates their respective recommendations for limiting radiation exposures.

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TABLE I-1 - SUMMARY OF REPORTED LOW-LEVEL LIQUID RELEASES
(Cumulative Through End of CY 1963)

AEC Operation	Basic Criterion for Radioactive Releases	Criteria and Control Responsibility	Source	Reported Total Radioactive Releases: Millions of Gals.	Alpha Curies	Beta Curies	Tritium Curies	Iodine Curies	Misc.	Released To:
Hanford	1/10 MPC for 168-hr. week NBS Handbook 69 (limits for people in the vicinity of a controlled area)	Criteria: Hanford Laboratories Control: Hanford Operating Departments	Chemical Separations	59,200		8,289			Gms. Pu 912	Swamps and Ponds
				5,255		2.6×10^6			69,170	Cribs and Trenches
			Reactors	(no data) (Reactor cooling water is separate subject)						Ponds and Trenches
										Columbia River
Savannah River	NCRP levels for off-site population (1/30 of MPC for 168-hr. week - NBS Handbook 69)	Criteria: SRP Health Physics Section Control: SRP Production Department	Chemical Separations	NA 3/	0.20	17.31 1/	9,200			Surface Streams
				356 4/	8.2	1615 1/	113,833	1722		Seepage Basins
			Reactor Areas	NA		8023 1/	318,532	227		Surface Streams
				8.3 4/		3251 1/	24,765			Seepage Basins
			300/700 Area	NA	3.503				Lbs. U_3O_8 11,509	Surface Streams
				10.8 4/	0.34	2.92 1/				Seepage Basins
National Reactor Testing Station	Concentration at point of exposure (use) will not exceed 1/10 of MPC for 168-hr week - NBS Handbook 69	ID Health and Safety Division	ICPP	49.9		131 2/	253			Seepage Pit
				3199		1198 2/	1167			Injection Well

1/ Nonvolatile beta - does not include iodine or tritium
2/ Beta-gamma curies and does not include tritium reported separately after 1960
3/ Not Available
4/ Includes estimate for NA (Not Available) years

II. HANFORD

The Hanford site is bounded on the north and the east by the Columbia River. The climate is arid, averaging 7.5 inches of moisture annually which is lost by surface evaporation. There are no surface streams. Over 200 feet of dry, sandy, gravelly soil (glacio-fluviatile sediments) exists between the surface and the underground water table. In areas where aqueous waste, other than that from the reactors, is discharged, the underground water flow moves in northerly and easterly directions to the Columbia River.

Two major operations at Hanford release large quantities of low-level aqueous wastes to the site environment. These are the Reactor Areas which are situated adjacent to the Columbia River and the Chemical Separations Areas which are somewhat centrally located away from the River on the Hanford reservation. The Reactor Areas utilize the large volume of the Columbia River flow for dilution of the radioactivity in the reactor effluents. The Chemical Separations Areas utilize the favorable hydrologic and geological conditions of the Hanford site for retaining the vast majority of the radionuclides in the approximately 200 foot layer of sediments between the ground surface and the local water table. Such liquids as released to the ground by the Chemical Separations Areas percolate down to the water table and have to travel seven to ten miles to reach the Columbia River. Under present conditions, this time takes several years.

The large amount of reactor cooling water that is discharged directly to the Columbia River is considered as a subject in itself and will not be discussed or summarized in this paper.

The Hanford Operations release large volumes of water containing very low concentrations of radioactivity to seepage ponds, or swamps. Smaller volumes of aqueous wastes containing radioactivity higher than the limit for seepage basin disposal are discharged to trenches and cribs (covered trenches). Under the disposal sites, the fine sand and clay fraction of the glacio-fluviatile sediments has good ion exchange properties and adsorbs radionuclides, retaining them in the vicinity of their discharge. Some discharges rely solely on the ability of the dry sediments to retain the liquid. Since the rainfall is low, there is only minimum leaching, or transfer by other mechanisms, and the radioactive materials essentially are "stored" in the sediments above the water table. Decay time and additional ion exchange capability are gained during the slow movement of the ground water to the Columbia River where copious dilution would be available.

Seepage Ponds (Swamps)

Very low-level aqueous wastes, primarily cooling water from the chemical separations areas, have such a low potential for contaminating the environment that they are discharged to natural surface depressions and form seepage ponds. Water is lost by both evaporation in the arid climate and seepage down through the sedimentary soils to the water table.

The enormous volumes of water released to the swamps over the past 20 years have created water mounds as high as seventy feet above the normal water table.

A limit of 5×10^{-5} uc/cc of beta emission has been established for releases to the swamps. This low concentration limit minimizes the potential for contamination of wildfowl and spread of radioactivity by wind.

Cribs and Trenches

Cribs or underground trenches are used to minimize radiation levels and contamination at the ground surface. They are used for releases of so-called "intermediate-level" wastes, in the range of 5×10^{-5} to 100 uc/cc of beta emission. The classical crib design is a box-like timbered structure. More recent cribs have trapezoidal cross-sections and may vary in length from 30 to 1600 feet. They are filled with washed and sized gravel to promote even distribution of the waste solutions which percolate through the soils to the water table.

Trenches are shallow ground disposal facilities which receive isolated batches of the "intermediate-level" aqueous wastes, particularly those that would cause complications because of high solids, organic solvents, etc., at routine disposal sites, such as cribs. Generally, the trenches are backfilled after receiving a discharge to prevent any spread of surface contamination.

Sources of Releases

The Reactor Areas discharge small volumes of abnormally contaminated effluent wastes into trenches and ponds along the bank of the Columbia River. These facilities essentially act only as filtering devices, and provide some time for radioactive decay prior to a release reaching the river, in addition to utilizing the ion exchange capacity of the soil.

In the Fuel Preparation Area, cooling water, pickling rinses and dilute caustic liquid wastes from the fuel canning process, together with depleted uranium solutions from cold pilot plant studies of separations processes are discharged to either of two surface ponds near the Columbia River bank. Uranium in the pond water has averaged about 5×10^{-7} uc/cc which is less than one percent of the maximum permissible concentration for occupational exposure. The pond water percolates to ground water and finally is diluted as it drains into the river.

At the Hanford Laboratories, liquid wastes such as cooling water, sink drainage, etc., which are expected to be uncontaminated, and those contaminated with only unirradiated uranium are held up in retention basins for sampling and analysis before disposal to trenches along the Columbia River bank. The "intermediate-level" (5×10^{-5} to 100 uc/cc) wastes are collected and hauled periodically by tank trailer to one of the Chemical Separations Areas for disposal into a crib.

In the Chemical Separations Areas, the large quantity of process cooling water used and discharged generally contains less than 5×10^{-5} uc/cc of beta emission. This process cooling water from vessel jackets and condensors is the principal release to the swamps. Process steam condensate, which has a higher probability of being contaminated because of failure of heat transfer surfaces, and condensates from boiling radioactive solutions are sent to cribs. In addition, aqueous raffinates and effluents from plutonium button production and plutonium scrap processing are discharged to cribs. Plutonium is very tightly held by the soil and migrates only a few feet at the most.

Responsibilities

The radioactive waste disposal operating standards and practices for the Hanford Operations are established and modified as appropriate by the Radiation Protection Operation of the Hanford Laboratories. This group also audits the actual disposal performance and conditions both against the disposal standards and for determining the inventory and location of the released radionuclides. Each major type of aqueous waste is evaluated in the laboratory for its behavior in the soil before it is released into the ground.

The responsibility for the conduct of the Hanford Operations to conform with the radioactive waste disposal standards and reporting the releases of the low-level aqueous wastes rests with the respective managers of the Hanford operating departments. The originating operation's responsibility for radioactive waste ends when the material has been released to the environment in the approved fashion. The point of release is defined to be the end of the discharge pipe or spillway into the river or the bottom of the ground disposal facility.

The Radiation Protection Operation of the Hanford Laboratories has an Environmental Studies and Evaluation Staff which periodically publishes their studies on the effects of the radioactive releases into the Hanford environment. These reports are given public distribution. In addition, various Federal and State agencies are kept advised and contribute to the study and evaluation of Hanford's radioactive waste disposal practices.

Criteria

Hanford employs a so-called "point-of-exposure" criterion which involves controlling the release of radioactive material from all sources so that no permissible limit is exceeded at any point of exposure, which may be remote in both time and distance from the point of release.

Radioactive waste release operations within the project are limited by the occupational exposure of the project personnel involved. The nationally recommended occupational exposure limits (NBS Handbook 69) are used as the basis for control of Hanford personnel exposure. Exposure of people outside of the project boundary is limited to the national recommendations (NBS Handbook 69) for people in the vicinity of a controlled Area. These limits are one-tenth of the corresponding permissible limits for continuous occupational exposure (168-hour-week). Due to lag times and uncertainties, more conservative standards are used for the disposal of low-level aqueous wastes to the Hanford environs. These standards are:

1. Operating control for radioisotopes in the Columbia River has been set at one-twentieth of the continuous occupational exposure limit (NBS Handbook 69 - 168-hour week).

2. Disposal to the ground at any one disposal site in the Chemical Separations Areas shall cease when the concentration of any radioisotopes (of half-life greater than three years) in ground water samples from that disposal site exceeds one-tenth of the maximum permissible concentration (continuous occupational) in drinking water (NBS Handbook 69 - 168-hour week).

With respect to Standard 2, it is noteworthy that three disposal sites have been abandoned because a ground water sample taken next to the site exceeded the standard, and several more have been abandoned in anticipation of this happening.

Radioactive ruthenium is only slightly retained by adsorption on the soils and concentrations in excess of Standard 2 are tolerated in the ground water because this radionuclide has a short half life (1 year) and will decay to acceptable levels during the several years it takes for the ground water to reach the Columbia River. Tritium (half life of 12 years) in the liquid waste releases is not adsorbed at all and is permitted to enter the ground water at concentrations higher than Standard 2 since, similar to ruthenium, it will be diluted both by ground water and decay during the time it takes for the tritium to migrate to the Columbia River. Any detectable concentrations of ruthenium or tritium that ultimately enter the Columbia River would be diluted by the River to far below biologically significant levels.

Discharges

Actual amounts of radionuclides are unknown in the releases of radioactive liquid wastes by the Reactor Areas to ponds and trenches located on the river bank. For all practical purposes the undecayed radioactivity eventually enters the Columbia River where it is diluted.

The reported releases of low-level radioactive liquid waste to the Hanford site's regolith (the soils and sediments overlying the solid rock) from the Chemical Separations Areas, only, are given in the following Table II-1. The extent of the Hanford site's ground water contamination by beta emitters and tritium are shown in Figures II-1 and II-2, respectively.

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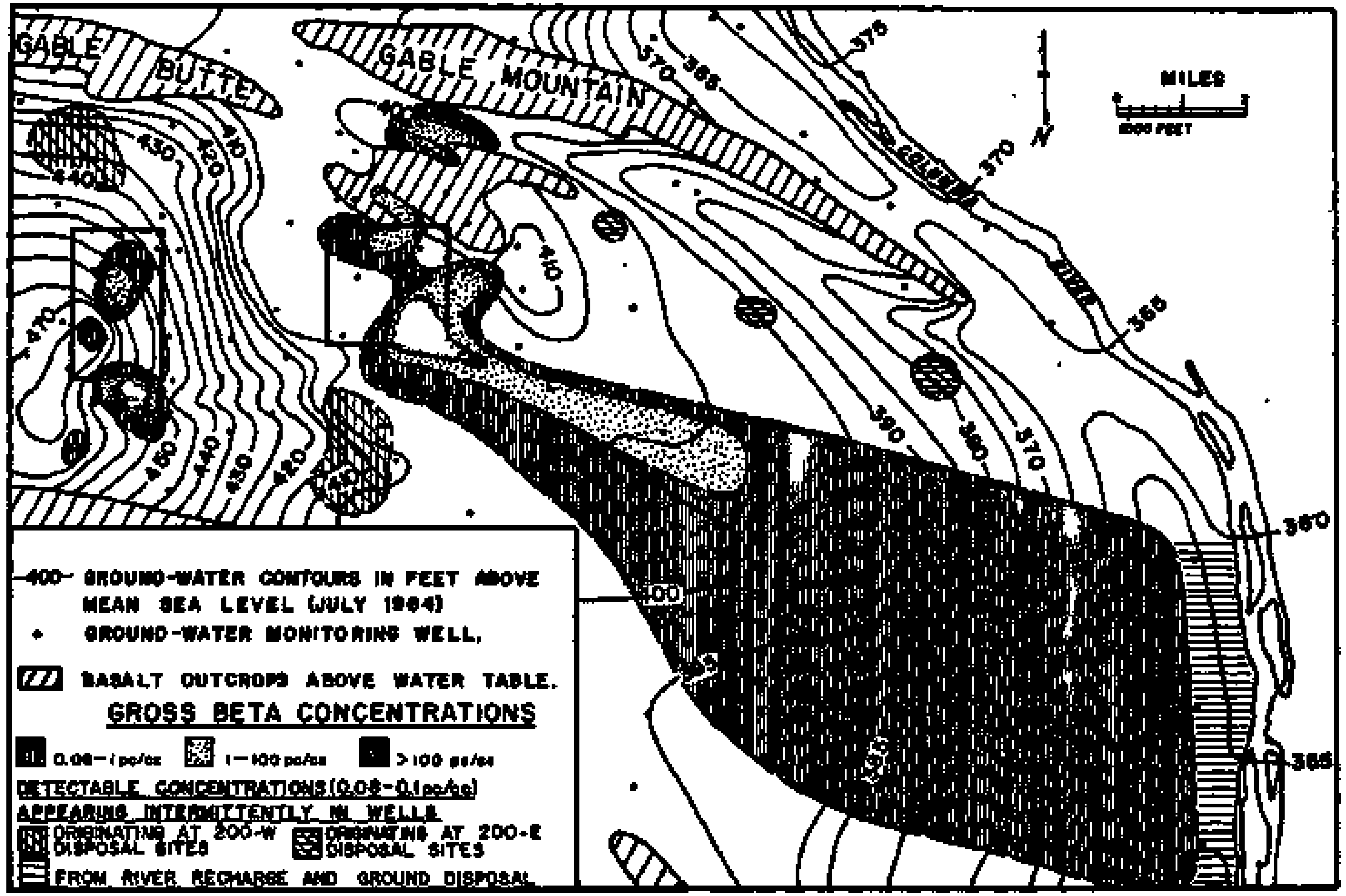
TABLE II - 1 REPORTED RELEASES INTO THE REGOLITH BY HAPO[1/]

Calendar Year	Estimated Releases on Ground Surface (Swamps and Ponds) 4/ — Billions of Gals.	Gross Beta Curies 6/	Gms. of Pu	Estimated Releases in Ground (Cribs, Trenches, and Holes) 5/ — Millions of Gals.	Gross Beta Curies 6/	Curies of Cs-137	Curies of Sr-90	Gms. of Pu
Cumulative to 1953	9.3	1719	225	135	41,000	7,600	240	
1953	3.4	694	6	85	48,400	1,000	560	
1954	2.8	272	7	770	372,200	24,000	9,200	
1955	3.1	420	8	760	826,600	4,600	11,800	
1956	5.6	95	32	900	769,100	7,500	6,100	
1957	5.1	100	157	560	321,400	6,800	4,000	33,380 2/
1958	5.3	600	185	470	127,000	1,500	1,000	7,250
1959	4.5	39	41	400	8,700	1,200	100	5,170
1960	4.5	8	8	320	7,800	700	50	4,110
1961	6.7	1850	80	245	6,366	370	230	9,920
1962	5.2	1774	31	315	61,850	300	190	5,442
1963	5.7	778	132	275	36,400	94	235	3,898
Totals	59.2	8289	912	5,255	2,626,816	55,664	33,705	69,170
Est. Current Inventory 3/		3000	912		260,000	47,000	29,000	69,170

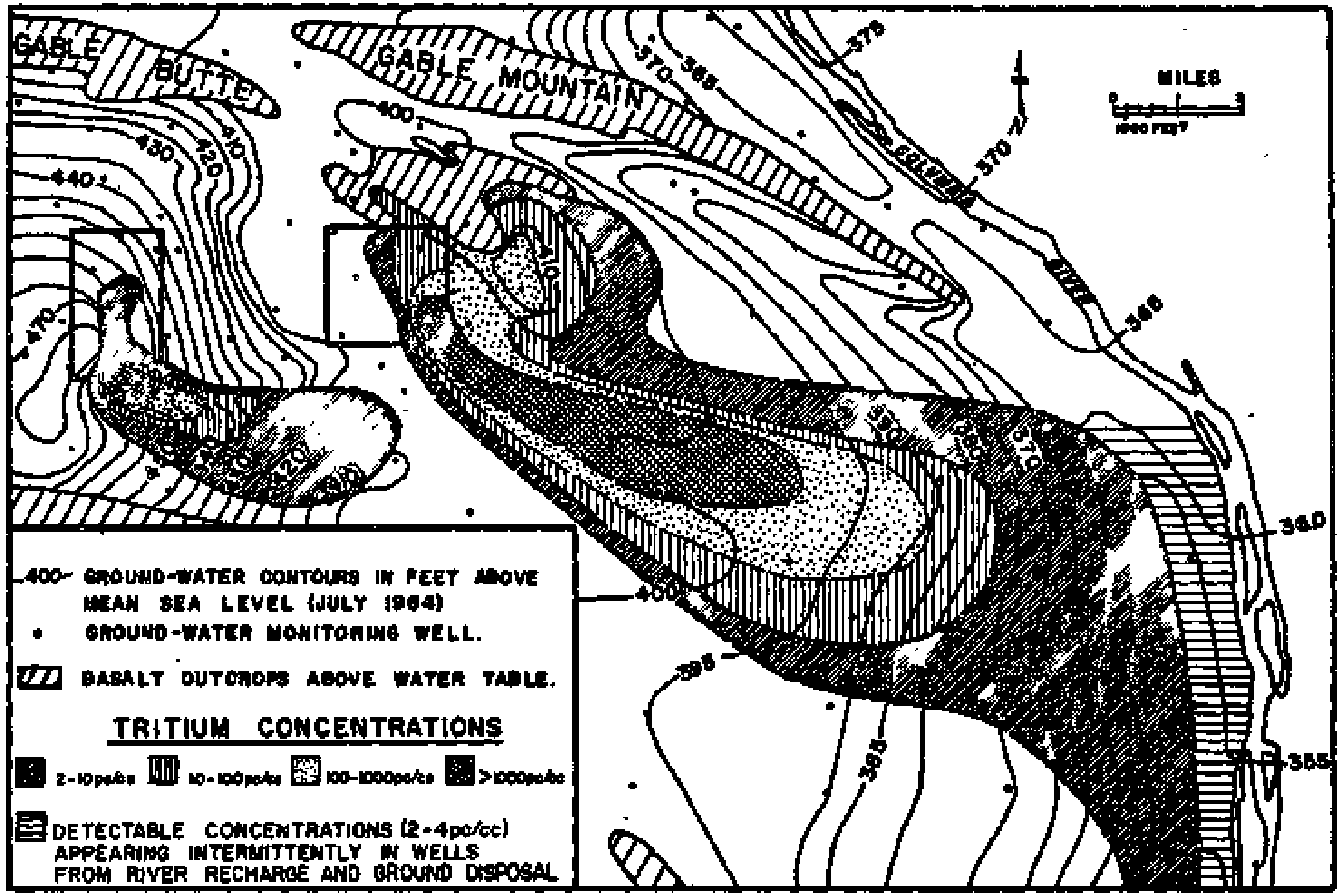
1/ Releases are for Chemical Separations Areas only
2/ Through 1957
3/ Corrected for radioactive decay
4/ Reported for 7 swamps (2 currently not in use)
5/ Reported for 50 crib facilities (4-6 now abandoned), 5 trench facilities and 4 well holes
6/ Includes negligible quantities of tritium. Tritium is a very weak beta emitter and requires special counting techniques.



EXTENT OF GROUND WATER GROSS BETA CONTAMINATION JANUARY-AUGUST 1964

Figure II-1

NOTE: Gross beta contamination includes negligible quantities of tritium. Tritium is a very weak beta emitter and requires special counting techniques for measurement.



EXTENT OF GROUND WATER TRITIUM CONTAMINATION JANUARY-AUGUST 1964

Figure II-2

NOTE: Maximum permissible concentration for tritium in water for continuous occupational exposure for body tissue (NBS Handbook 69 - 168-hr week) is 30,000 pc* per cc or ml.

* picocurie (pc) is a micromicrocurie (uuc) or 10^{-12} curie (c).

III. SAVANNAH RIVER

Rainfall in the Savannah River Plant (SRP) area is about 45-50 inches annually but because of the sandy nature of the soil, there is little run-off except after a heavy rainfall. The normal or unconfined water table is relatively close to the surface (30 to 60 feet) and drains to surface streams within the Plant boundaries.

The SRP operations release extremely low-level aqueous wastes containing very small amounts of radioactivity to the site's surface streams. Low-level aqueous wastes containing radioactivity in concentrations above plant limits for release to surface streams are discharged to open seepage basins for temporary retention. In the seepage basins, the volume is somewhat reduced by surface evaporation and particulates settle. Most of the liquid eventually percolates through the ground and discharges into the SRP surface stream system, with some of the radionuclides being retained by the soil. The effect of a seepage basin is to create a ground water mound on the normal water table.

Surface Streams

Five streams either originate on or flow through the 320 square mile plant site and discharge into the Savannah River within the plant boundaries. Each of these streams is fed by numerous small tributaries; hence no location on the site is far removed from a continuously flowing stream. Upper Three Runs Creek, which flows across the northwest sector of the SRP site, discharges into the Savannah River a short distance upstream from where the secondary cooling water for the reactors and the Heavy Water Plant's feed water are pumped from the Savannah River. Therefore, it is necessary that Upper Three Runs Creek normally be free of radioactive contamination. Four Mile Creek, draining the central site area and flowing from one to two miles parallel to Upper Three Runs Creek, receives water discharged from both separations and reactor plants.

Pen Branch and Steel Creek, which join together as a single effluent in the extensive, primeval swamp adjacent to the river on the south side of the plant site, contain reactor plant effluents. Lower Three Runs Creek, which drains the east portion of the plant and flows through a corridor of government-owned land south of the Plant, receives the overflow from Parr Pond Dam which was constructed in 1958 to provide a reservoir for reactor cooling water.

Seepage Basins

Open seepage basins are used for the release (discharge) of low-level liquid wastes in each of the five Reactor Areas and the two Separations Areas. In addition, the Savannah River Laboratory has a seepage basin. The seepage basins are constructed by excavating and carefully preparing dikes, taking whatever advantage is possible of the natural terrain. The site for a seepage basin is based on stratigraphic and hydrologic data and the selection is recommended by the SRP Health Physics section with the concurrence of the particular operations group, (Separations, Reactors, etc.) that is involved. Besides permitting additional decay time for radionuclides prior to their release, there is some adsorption of the radionuclides as the seepage basin water percolates through the soils. Generally, soil retention of the fission products is less than satisfactory due to channeling of the seeps through sandy strata. Fission product tritium is not adsorbed and, under the acidic conditions usually present in the seepage basins, strontium-90 is poorly adsorbed on the SR soils. Certain other fission product radionuclides, such as cesium-137, are adsorbed and do not migrate to the extent that strontium does.

Sources of Releases

The major source of radioactive liquid waste released (discharged) to the surface streams in the Reactor Areas is disassembly basin water. If such discharges become more than very slightly radioactive, they are sent to a seepage basin. The main sources of contamination are fuel element failures, filter and equipment decontamination, and cleanup of disassembly basin areas. Discharges to the Reactor Areas' seepage basins are not routine.

The major types of radioactive liquid waste routinely discharged directly to the surface streams in the Separations Areas consist of sanitary water, storm sewer water and "segregated" cooling water. Normally, the radioactive content in these streams is negligible. Waste which is routinely discharged to seepage basins from the Separations Areas is mainly condensates from the evaporation of high-level liquid waste resulting from the chemical separations operations and decontamination washings.

Radioactive waste from the 300 (Raw Materials) Area is contaminated mostly with uranium and is released to a surface stream flowing into Upper Three Runs Creek. The Savannah River Laboratory releases its low-level waste, resulting from R and D experiments, to seepage basins.

Responsibilities

All low-level aqueous waste discharge operations at the Savannah River Plant (SRP) are under the direct supervision of the Plant operator's (du Pont) Production Department. All Plant processes, including those concerned with waste disposal, are prescribed in the form of Technical Standards which specify limits for the maximum amount of radioactivity that may be released to the environment. Deviations from these standards require approval of the Directors of the Manufacturing and Technical Divisions in du Pont's Wilmington Office. The waste release standards, and their associated limits, are based on the NCRP recommendations (NBS Handbook 69) and studies of the environmental effects from previous operating experience. The SRP Health Physics Section has the responsibility of initiating and revising these standards. Health Physics also inventories and audits all radioactive waste releases.

An extensive monitoring program is carried out in the vicinity of the Savannah River Plant to determine the concentrations of radioactivity in the Plant environs and streams, especially the Savannah River. The results of this monitoring are reported in detail to the AEC, the Savannah River Advisory Board, United States Public Health Service, public health officials in Georgia and South Carolina, the Philadelphia Academy of Sciences, United States Geological Survey and others. Monitoring information now is issued in semi-annual reports which are available to the public.

Criteria

The Savannah River Plant (SRP) limits the discharge of radioactivity in such a manner that human uptake of the radionuclides from the air, food, and water will not result in body burdens of radionuclides greater than the maximum permissible levels set for off-site populations by the NCRP. This is 1/30 of the maximum permissible burdens for continuous occupational exposure. (NBS Handbook 69 - 168-hour week)

The basic principle guiding the SRP operations is total containment of radioactive waste and the waste release standards are not considered desirable discharge levels; instead, any release of radioactivity is minimized as far as possible. Radioactive waste discharge to the plant environs and its dispersal is not permitted on the basis that there is no health hazard. The goal is that there should be no radioactive contamination of air and water, as measured at the SRP perimeter. If this goal cannot be achieved, the average release levels are kept as far below the waste release standards as possible. The standards for release of low-level aqueous waste are:

1. Releases of radioactive liquid wastes to Upper Three Runs Creek may originate in one or all of the following areas: 700-A, 300-M, 200-F and 700-U. The releases are subject to the following limitations:

   a. The combined nonvolatile beta and alpha activity of the stream water, taken after reasonable mixing has occurred, shall not exceed a monthly average of 3×10^{-13} curies/ml.

   b. Nonvolatile beta and alpha activity contributed by 700-U Area (HWCTR) shall not exceed 4 curies/month or result in stream water contamination greater than 3×10^{-13} curies/ml.

2. Total releases of radioactive liquid wastes from the Reactor Areas to SRP Area effluent streams are subject to the following limitations.

a. I-131 releases not to exceed 15 curies/month.

b. Sr-90 releases not to exceed 3.5 curies/month.

c. S-35 releases not to exceed 200 curies/month.

d. All other nonvolatile beta emitters not to exceed 50 curies/month. (Isotopes positively identified and known to have radioactive half-lives less than 30 days, excluding I-131, may be released at rates not exceeding 1000 curies per month.)

3. The radioactive concentrations of the liquid waste streams entering Four Mile Creek from the Separations Areas must be low enough so that, after reasonable mixing, the creek itself measures no more than 10^{-12} curies per cc, evaluated as a monthly average.

4. The release of radioactive aqueous waste containing oil or chemicals to the disposal pits in the Reactor Areas are subject to the following limitations:

a. Pu not to exceed 4 mc/month/area.

b. Sr-90 not to exceed 35 mc/month/area.

c. Total beta emitters with half-lives greater than 15 days not to exceed 1 curie/month/area.

5. Releases of radioactive liquid waste to seepage basins in the Reactor Areas are subject to the following limitations:

a. Pu not to exceed 0.5 curie/year/area.

b. Sr-90 not to exceed 0.7 curie/month/area minus direct releases to stream water.

c. Beta emitters with half lives greater than 15 days excluding Sr-90 and H-3 not to exceed 40 curies/month/area.

d. pH of the waste in the basins is to be controlled between 6 and 9.

e. The salts content shall be less than 0.1 percent by weight of sample of the liquid waste to be discharged to the basins.

f. Oil content shall be such that no visible oil or organic solvents will be present on a sample of the waste to be discharged to the basins.

6. Releases of radioactivity in liquid wastes to seepage basins in the Separations Areas are subject to the following limitations:

   1. Alpha emitters not to exceed 0.3 curies/month/area.

   2. Sr-90 not to exceed 0.1 curie/month/area.

   3. Total nonvolatile beta not to exceed 20 curies/month/area.

   4. pH of the waste in the basins is to be controlled between 3 and 10.

   5. Salt content of the waste shall be maintained at less than 0.1 percent as measured in the basins.

7. Release of radioactive liquid waste from low-level waste storage tanks to seepage basins in the Savannah River Laboratory area are subject to the following limitations:

   a. Natural uranium not to exceed 40 lb per month, average.

   b. Alpha emitters, other than uranium, not to exceed 0.1 curie per month.

   c. Total nonvolatile beta ≠ alpha not to exceed 4 curies per year.

   d. pH of the waste in the basins is to be controlled between 5 and 10.

<u>Discharges</u>

The following Tables III-1 and III-2 present the reported releases of low-level radioactive liquid wastes to the environs of the Savannah River Plant. Figures III-1, III-2, III-3 and III-4 respectively show the concentrations of gross nonvolatile beta emitters and tritium in the Savannah River Plant site's ground water due to seepage from the Separations Areas' seepage basins.

TABLE III-1 REPORTED RELEASES TO EFFLUENT STREAMS BY SRP

Cal. Year	From Chemical Separations Areas: Gals.	Alpha Curies	Nonvolatile Beta Curies 5/	Curies of Tritium	From Reactor Areas: Gals.	Nonvolatile Beta Curies S. L. 1/		L. L. 2/	Curies of I-131	Curies of Tritium	Curies of S-35	From Raw Materials (300) Area: Gals.	lb U_3O_8	Alpha Curies 3/
1954	Not Available	<0.01	0.01		Not Available		30					Not Available		
1955		0.06	0.13				212							
1956		0.04	1.64				303						236	0.073
1957		0.01	0.31				875		65				1,732	0.537
1958 4/		0.01	0.39	400			537						376	0.117
1959		0.01	0.95	800			1,323			24,042			115	0.036
1960		0.02	8.30	1600						41,152			180	0.037
1961		0.02	3.23	2000		581		255		46,925			330	0.110
1962		0.01	0.95	1700		158	7	173	29	80,794	66		327	0.110
1963		0.02	1.40	2700		373		170	87	46,681	512		1,750	0.530
						2117		275	46	78,938	156		6,523	1.953
TOTALS		0.20	17.31	9200			7,889		227	318,532	734		11,509	3.503

Footnotes:

1/ Short-lived nonvolatile beta -- half lives < 15 days (Mo-99, Np-239, Ba-La-140 and includes I-131 where I-131 is not separately given). After 1961, definition changed to half lives <30 days (this included Cr-51). In 1963, Mo-99 was dropped since it had been an insignificant component of the S. L. group.

2/ Long-lived nonvolatile beta -- half lives >15 days (Ce-141-144, Cr-51, Ru-103-106, Zr-Nb-95, Zn-65, Co-60, Sr-89-90 and Cs-137 included after 1960). After 1961, definition changed to half lives > 30 days (this dropped Cr-51).

3/ Uranium alpha.

4/ Analyses for tritium releases began in 1958.

5/ Radiostrontium, radiocesium, Ce-141-144, Ru-103-106 and Zr-Nb-95.

TABLE III-2 REPORTED RELEASES TO SEEPAGE BASINS BY SRP

Cal. Year	From Chemical Separations Areas: Millions of Gals.	Alpha Curies	Nonvolatile Beta Curies 1/	Curies of I-131	Curies of Tritium	From Reactor Areas: Millions of Gals.	Nonvolatile Beta Curies 1/	Curies of Tritium	From 300/700 Area: Millions of Gals.	Alpha Curies	Nonvolatile Beta Curies 1/
1954					Annual Releases Are Classified				NA 2/	0.01	0.07
1955									NA	0.03	0.18
1956	NA 2/	1.0	50	550					NA	0.08	0.18
1957	NA	0.9	120	870		NA	2162		NA	0.04	0.25
1958	28.8	1.0	78	25		2.0	565		1.3	0.04	0.05
1959	33.1	1.2	230	105		1.0	236		1.5	0.02	0.05
1960	48.6	1.1	466	5		1.0	130	5,043	1.5	0.03	0.05
1961	39.4	0.6	183	157		1.2	79	11,878	0.9	0.03	0.07
1962	93.3	1.3	227	7		0.9	41	4,038	0.8	0.04	1.74
1963	91.7	1.1	261	3		1.2	38	3,806	0.8	0.03	0.28
TOTALS	314.9 41.1 3/	8.2	1615	1722	113,833	7.3 1.0 3/	3251	24,765	6.8 4.0 3/	0.34	2.92
TOTALS	356.0					8.3			10.8		

Footnotes:

1/ [illegible], Ce-141-144, Ru-103-106 and Zr-Nb-95

2/ Not Available

3/ Estimate for NA (Not Available) years.

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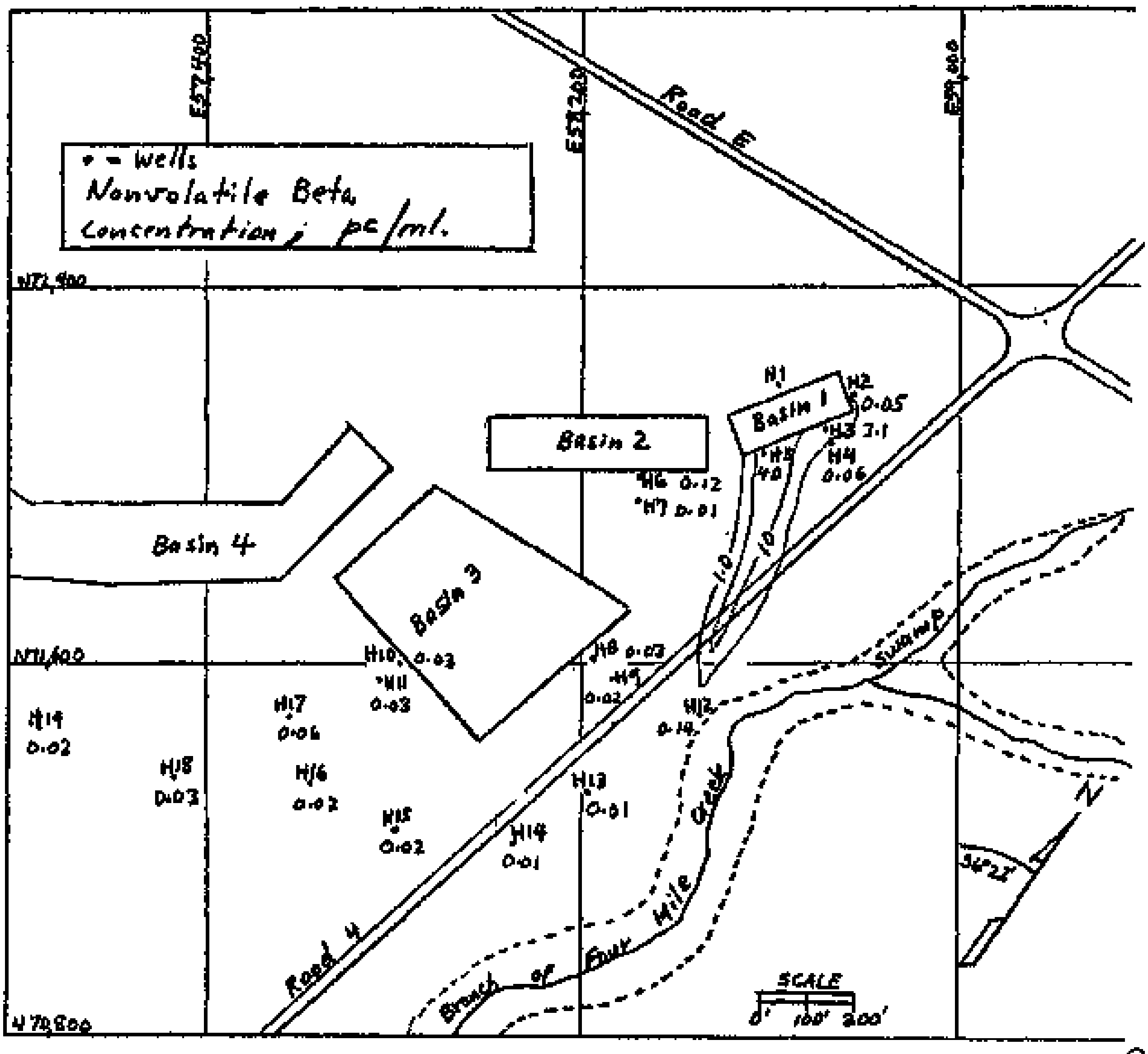

Nonvolatile Beta Emitters in Ground Water at H-Area Seepage Basins
(Sept. 23, 1964) Figure III-1

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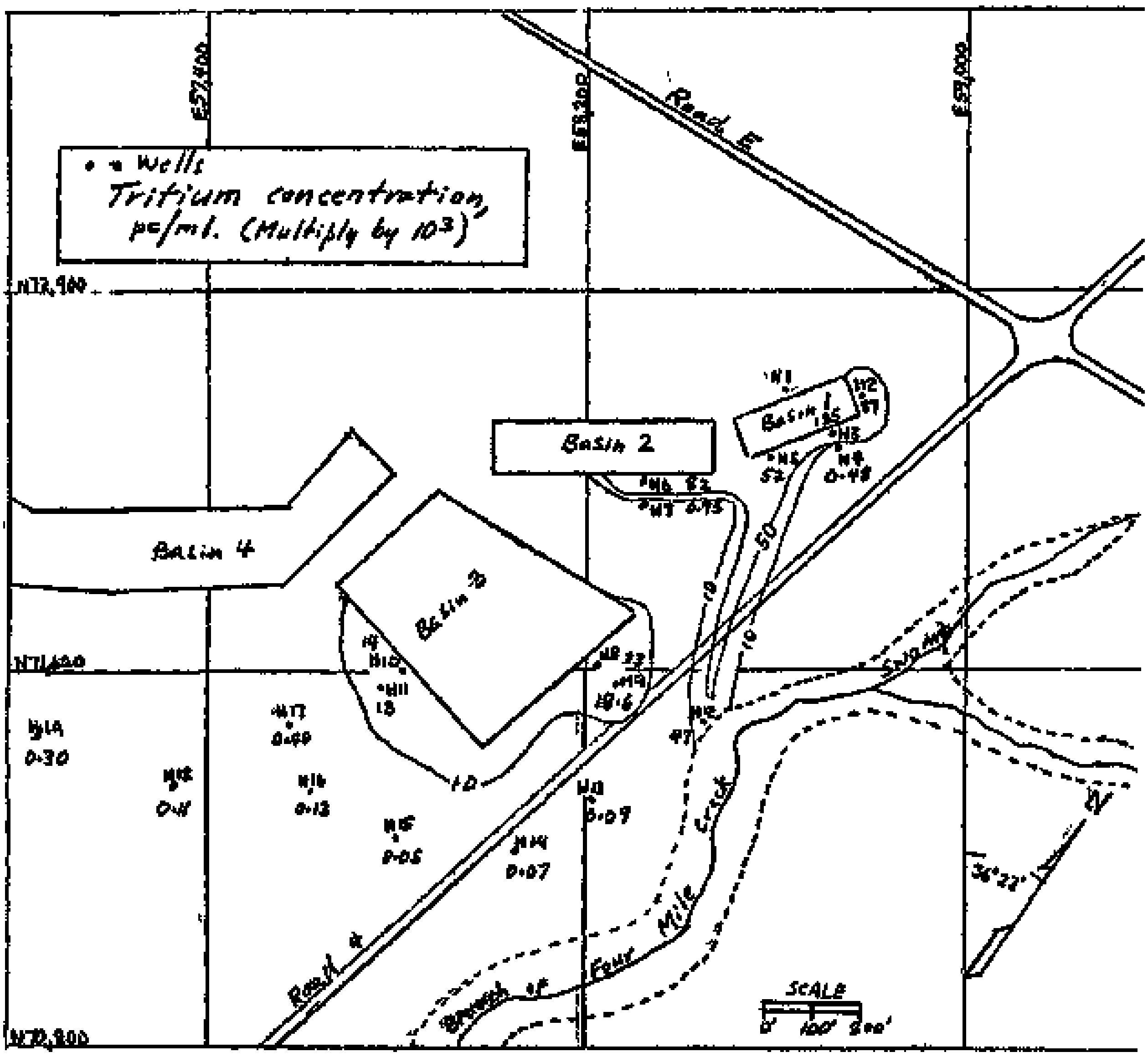

Tritium in Ground Water at H-Area Seepage Basins (Sept. 23, 1964)

Figure III-2

NOTE: Maximum permissible concentration for tritium in water for continuous occupational exposure for body tissue (NBS Handbook 69 - 168-hr week) is 30,000 pc* per cc or ml.

* picocurie (pc) is a micromicrocurie (uuc) or 10^{-12} curie (c).

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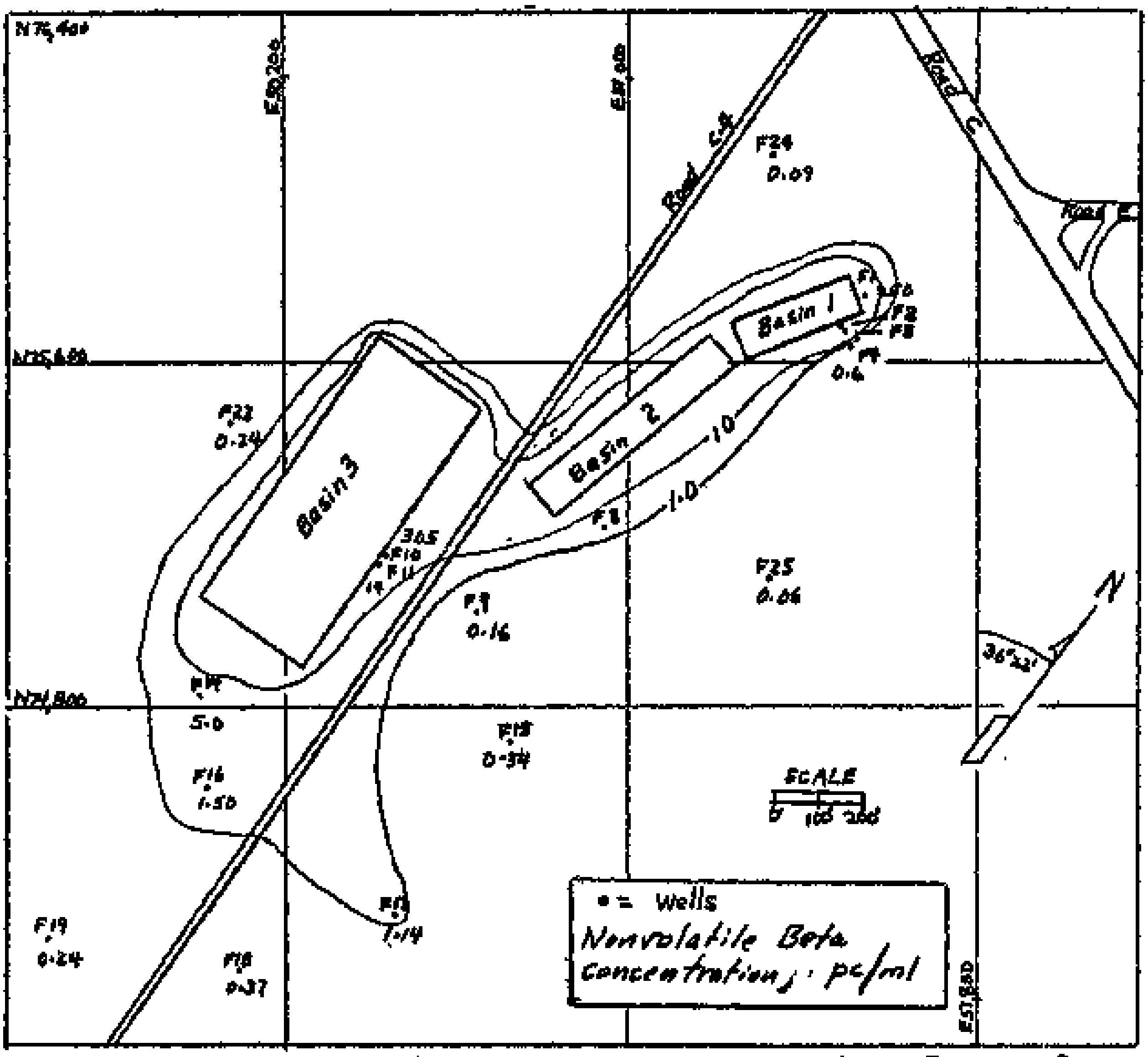
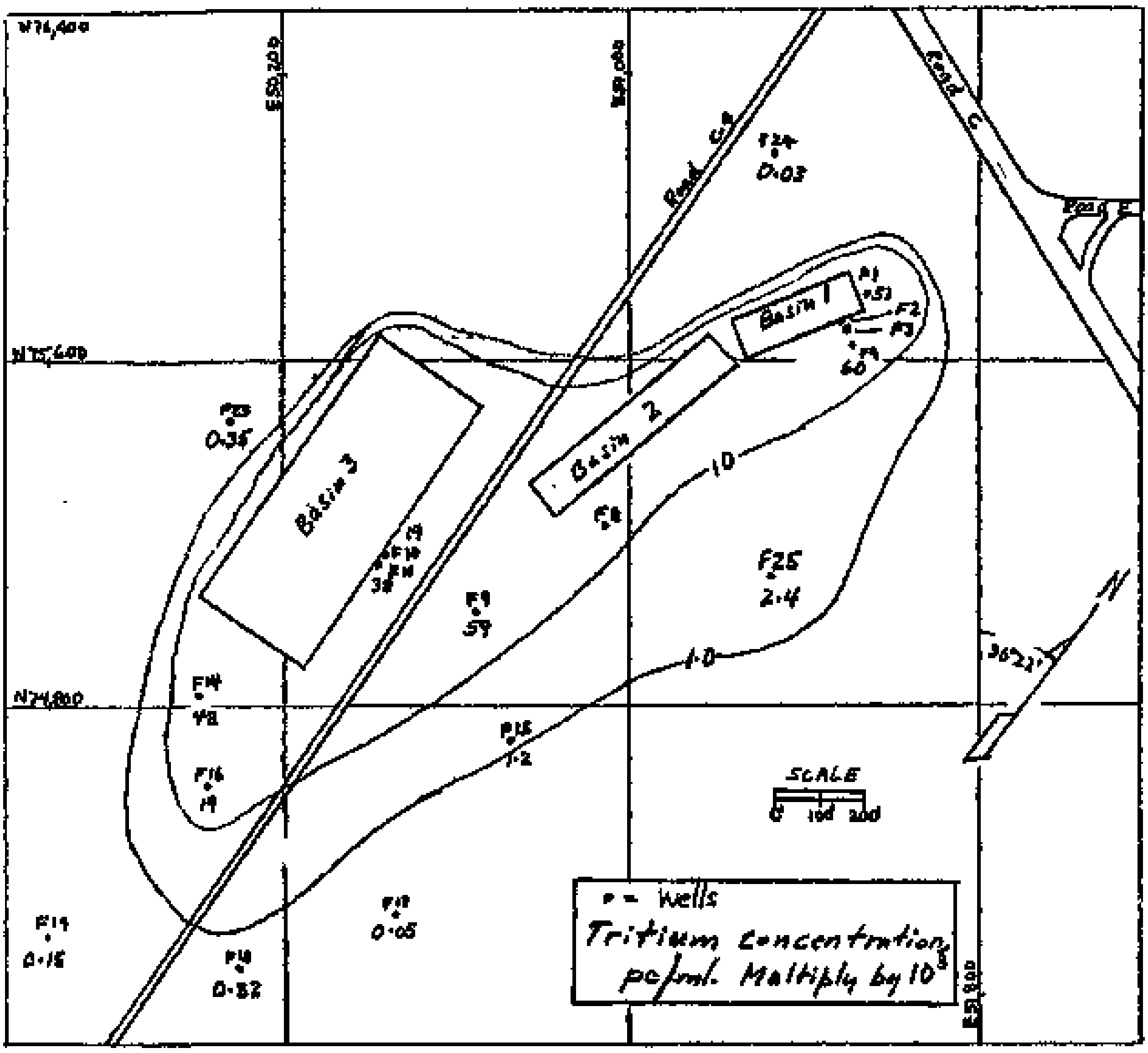


Nonvolatile Beta Emitters in Ground Water at F-Area Seepage Basins (Sept. 28, 1964) Figure III-3

UNCLASSIFIED



Tritium in Ground Water at F-Area Seepage Basins (Sept 23, 1964)

Figure III-4

NOTE: Maximum permissible concentration for tritium in water for continuous occupational exposure for body tissue (NBS Handbook 69 - 168-hr week) is 30,000 pc* per cc or ml.

* picocurie (pc) is a micromicrocurie (uuc) or 10^{-12} curie (c).

IV. NATIONAL REACTOR TESTING STATION

The National Reactor Testing Station (NRTS) is located on an arid plain formed by basalt flows. The ground surface over the basalt is composed of air and water borne sediments, varying in depth from a few inches to over 100 feet, with thickness and distribution influenced by the irregularities of the underlying basalt. Annual rainfall averages around 7.5 inches. This moisture seldom penetrates over six feet beneath the surface. The regional ground water table is about 200 feet below the surface in the northern part and about 700 feet below the surface in the southern part of the NRTS. Ground water is recharged by underground flow from the adjacent mountainous areas to the north, northwest and northeast and moves through interconnected voids at contact zones between basalt flows in a southwesterly direction. Several water courses enter the site from the adjacent mountains and disappear on the surface. The streams flow intermittently with the water sinking either along the channel or into playa areas. No surface flow from these or any other streams leaves the NRTS.

At NRTS, radioactive (low-level) aqueous waste is released mainly via wells, which penetrate the ground to varying depths above and below the water table, and into ponds that are excavated in the regolith (the surface sediments). Other devices used are a sub-irrigation field and a crib (gravel covered pit). Release limits are such that radioactive concentration at points of use will not exceed one-tenth of the recommended guides (NBS Handbook 69) for drinking water. Contamination of the regional ground water has not been found, with the exception of tritium. Tritium contamination has been detected for a distance of six miles down gradient from the ICPP injection well.

The operations and plant facilities at the NRTS which discharge significant volumes of low-level aqueous waste to the ground are listed below in the decreasing order of volumes released.

Facility	Used
MTR-ETR	Seepage Pond
Chemical Processing Plant	Injection Well and Seepage Pit
Naval Reactor Facility	Seepage Ponds and Crib
Aircraft Nuclear Propulsion	Injection Well
Central Facilities Area (Laundry)	Sub-Irrigation Field
Others (SPERT, OMRE, TAN, etc.)	Seepage Ponds

The various NRTS operations and projects fall under the responsibilities of several AEC Headquarters operating divisions. The Division of Reactor Development has overall site responsibility for waste management. The Division of Production has the responsibility for waste management for the Idaho Chemical Processing Plant (ICPP) operations within the limits of this facility. While NRTS's low-level liquid waste releases mechanisms and criteria will be discussed generally, only the low-level aqueous waste releases from the ICPP operations will be summarized in detail in this paper.

Injection Wells

The injection wells generally release (discharge) the low-level aqueous wastes into the water table under the NRTS site. Some wells inject into porous strata above the water table. The injection well used by the Idaho Chemical Processing Plant (ICPP) is 600 feet deep. The bottom is 150 feet below the regional water table. In using the injection wells, the only reduction in radionuclide concentration which is considered reliable is that due to radioactive decay during the time in which the underground water travels to some point of use. Assumptions have to be made for velocities and volumes of underground water flow. Flow rates recently have been determined to be in the magnitude of ten feet per day.

The nearest use point down gradient from the ICPP injection well is the production wells at Central Facilities, a distance of about two and one-half miles.

Seepage Ponds

Seepage ponds at the NRTS are large or small open basins constructed in the alluvial regolith. While water is lost by surface evaporation in the dry climate, observations indicate that, within a relatively short distance from a seepage pond, most of the contaminated water percolates through the porous shallow surface sediments into the underlying basalt formations. There, the water moves horizontally and forms perched water tables in basalt interbed sediments.

Release of low-level aqueous waste either by injection well or by pond is not used as justification for different disposal limits. Pond disposal does increase the travel distances and times to ground water and the amount of sorptive medium. While there will be certain amount of radionuclide retention by the soils, the percolating liquors do not migrate through enough soils for this to be significant.

Sources of Releases - ICPP Operations

All low-level wastes arising from the ICPP operations (with the exception of purge water from the Fuels Storage Basin) is released into the water table by means of one injection well.

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This waste is principally the condensate from the ICPP Process Equipment Waste Evaporator (PEW) which concentrates most intermediate-level wastes from the ICPP and Waste Calcining Facility (WCF). Such intermediate-level wastes result from equipment decontamination, process equipment operation, cell drainage, and condensates from higher level waste evaporators. The PEW condensate is collected in hold tanks where it is mixed with non, or slightly, radioactive ICPP and WCF process wastes, such as cooling water, steam condensates and chemical wastes like water softener brines, before well injection. At times the activity of this released waste is kept below undesirable levels by dilution with process water.

The purge of water from the Fuels Storage Basin at the ICPP is released into a seepage pit. During CYs 1961/1963, the concentration of cesium and strontium radioactivity in the basin water released to the seepage pit exceeded permissible disposal guides as a result of ruptured fuel elements being stored in the basin. To correct this problem, treatment of the basin discharge water was initiated in 1963 by passing this effluent through drums of crushed clinoptilolite (a natural zeolite mineral with a high ion exchange affinity for cesium and strontium). When its ion exchange capacity is exhausted, the barrel of clinoptilolite is buried.

Responsibilities

The Idaho Operations Office (ID) has overall responsibility for establishing policy and guidelines for radioactive waste disposal and waste release practices at the NRTS. In addition, ID has direct responsibility for radioactive monitoring of the NRTS external to plant facilities and of the surrounding areas as well as appraisal of ID contractor practices and procedures. This general responsibility is delegated to the Director, Health and Safety Division. This Division develops detailed plans and procedures, inspects, supervises, monitors and determines that necessary control measures are applied by the contractors.

The ICPP operation is under the Director of Nuclear Technology Division who is responsible for assuring that the regulations and procedures are promulgated for waste disposal involving such operations under his jurisdiction.

A program of research and development is conducted by the ID Health and Safety Division, involving among others the U.S. Geological Survey. The object of this program is to establish prudent realistic limits, assure environmental safety and investigate and develop new techniques for radioactive waste disposal. Hydrologic, geologic, geochemical and geophysical research is conducted to determine environmental characteristics affecting the migration of the radionuclides after discharge.

The ID Health and Safety Division prepares periodic reports for public distribution which give a complete summary of all NRTS wastes discharges and monitoring data for the NRTS site and surrounding area, along with the Division's environmental studies on the effects of the discharges. The data are discussed and interpreted. The ID Health and Safety Division keeps close liaison with Federal and State health agencies.

Criteria

At NRTS, low-level waste is considered to not have more than 10^{-3} uc/ml of radioactive contamination. The development of working limits for discharging (releasing) low-level liquid waste to the NRTS environs is based on the capability of the lithosphere (solid part of the earth) to sorb and attenuate the radioactivity.

The basic guide used by the NRTS for release of low-level aqueous wastes to the ground or ground water is that the concentration of radioactivity in the waste shall be maintained at levels such that a radionuclide concentration in the water at any point of use shall not exceed a concentration which will result in a dose to individuals in excess of one-tenth of the applicable Radiation Concentration Guide (RCG) (NBS Handbook 69). Essentially this means, and it is ID's policy, that liquids can be discharged at any level of radioactivity as long as the result does not exceed the basic guide. However, in order to establish working limits applicable at the point of discharge, ID considers three factors: (1) decay, (2) dilution, and (3) ion exchange and absorption. These are factored into the calculation of a specific guide for a local situation. Factors of uncertainty are applied according to the reliability of measurements and extent of knowledge of pertinent environmental conditions.

The calculated discharge limits are promulgated in the form of a log-log graph and based on the assumption that waste solutions will be analyzed for specific radioisotopes. At the present time, identification of radioisotopes is required according to the following guide:

Gross Concentration, uc/ml	Isotopes to be Identified
10^{-7} or less	H-3
10^{-6}	H-3, Sr-90
10^{-5}	H-3, Sr-90, Ru-Rh-106, I-129-131
10^{-4}	H-3, Sr-89-90, Ru-Rh-106, I-129-131, Cs-137, Ce-144
10^{-3}	H-3, Sr-89-90, Zr-Nb-95, Ru-Rh-106, I-129-131, Cs-137, Ce-144, Cd-115

As an illustration, the graph used for releases into the ICPP injection well is included as Figure IV-1. The maximum allowable discharge for a respective isotope is found from its half life. Dilution, ion exchange and sorption are used to justify allowances of 3 and 10 times the maximum Permissible Concentration (MPC) (NBS Handbook 69-168-hour week) for those radioisotopes with half lives in excess of 1000 days where decay allowances are insignificant.

The approximate half-life of unidentified contaminating isotopes are either estimated, when possible, or considered to be least 1000 days.

Discharges

The reported releases of low-level aqueous waste by the ICPP operations into the water table and on the ground are given in the following Table IV-1.

Figure IV-2 presents the latest map of tritium contamination of the NRTS ground water. Gross beta contamination (other than tritium) in the regional ground water is, for all practical purposes, below detection limits at the present time.

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TABLE IV-1 REPORTED RELEASES INTO THE GROUND BY ICPP

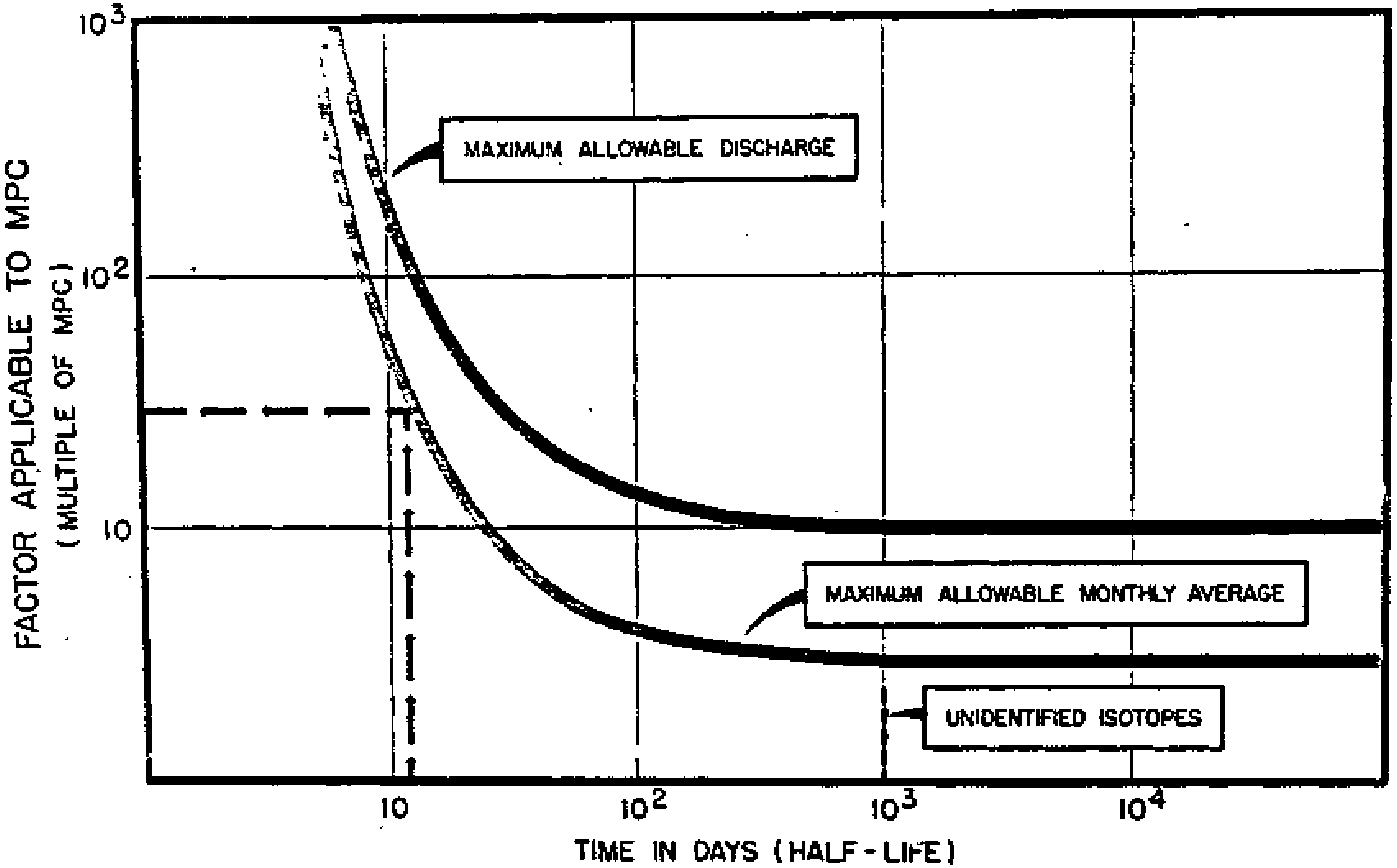
Calendar Year	Estimated Releases By Injection Well: Millions of Gallons	Estimated Releases By Injection Well: Beta-Gamma Curies 3/	Estimated Releases to Seepage Pit: Thousands of Gallons	Estimated Releases to Seepage Pit: Beta-Gamma Curies 3/
1953	396	15	Incomplete Record	
1954	229	8	5,128	2.1
1955	396	15	5,357	4.9
1956	351	16	5,671	5.4
1957	231	285	5,428	3.8
1958	373	339	6,847	4.7
1959	328	47	7,628	12.6
1960	190	32	2,203	4.2
1961	186	607 1/	2,081	17.7
1962	262	176 1/	4,811	243.0 2/
1963	257	1,025 1/	4,800	86.0 1/
TOTALS	3,199	2,565	49,954	384.4

Footnotes:

1/ Includes tritium

2/ Tritium - 194 c, Sr-89 - 1.5 c, Sr-90 - 22.6 c, Cs-137 - 20.5 c

3/ Includes negligible quantities of tritium unless otherwise indicated by footnote 1/.



MAXIMUM ALLOWABLE CONCENTRATION OF RADIOISOTOPES

Figure IV-1
MPC is Maximum Permissible Concentration, currently termed
Radiation Concentration Guide (RCG)

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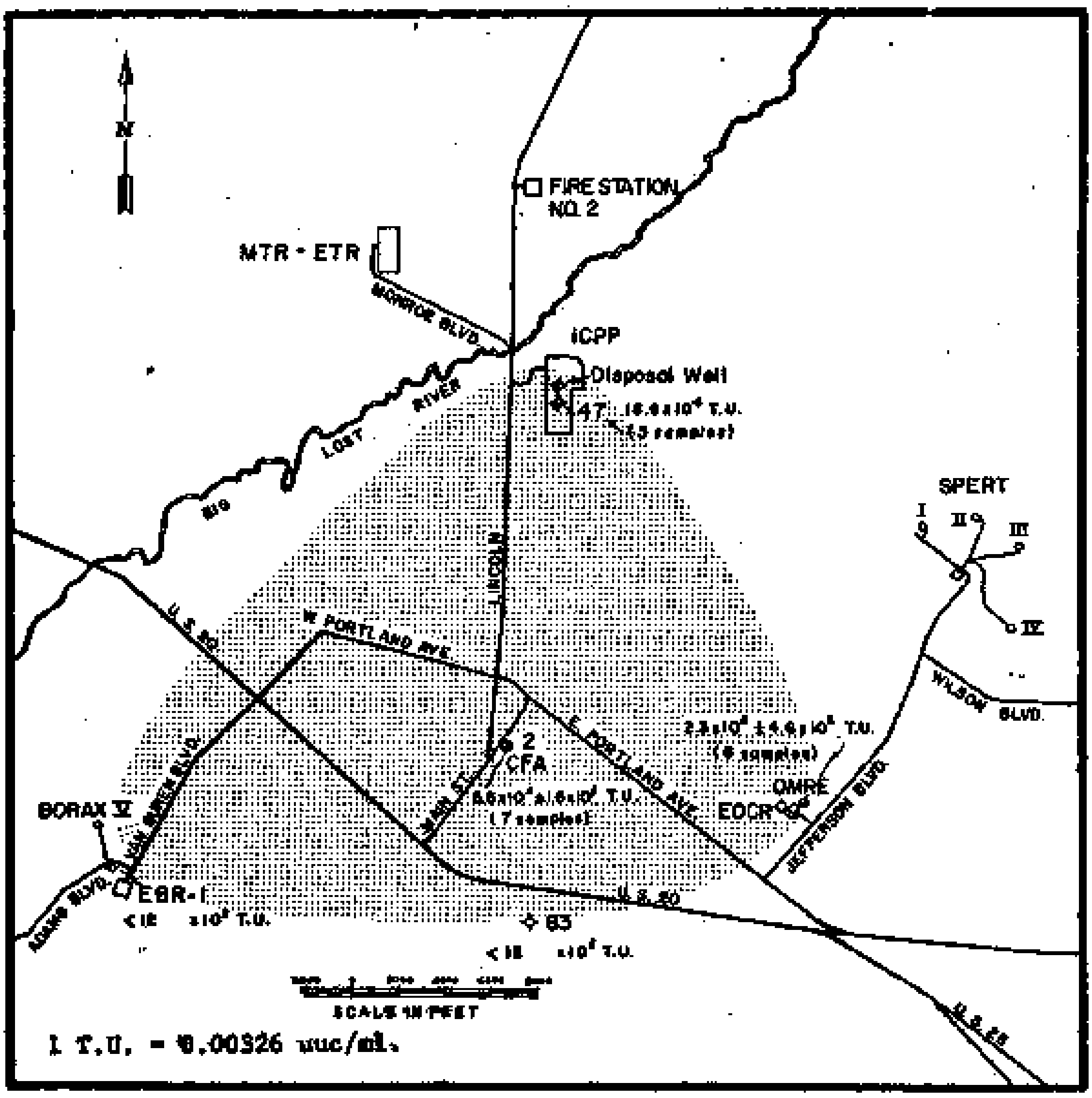

Figure IV-2.--Map of ICPP-CFA area showing the distribution of tritium in regional ground water, January through July, 1963. (Tritium travel time 6-8 feet per day).

NOTE: Maximum permissible concentration for tritium in water for continuous occupational exposure for body tissue (NBS Handbook 69 - 168-hr week) is 30,000 pc* per cc or ml.

* picocurie (pc) is a micromicrocurie (uuc) or 10^{-12} curie (c).

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APPENDIX "A"

RADIATION PROTECTION GUIDES

The International Commission on Radiological Protection (ICRP) was formed in 1928 under the auspices of the International Congress of Radiology. It is now a commission of the International Society of Radiology. This commission has published recommendations about every three years except for the period 1938-49.

The U. S. National Committee on Radiation Protection and Measurements (NCRP) was organized initially as the "Advisory Committee on X-ray and Radium Protection". The initial membership included representatives from the medical societies, x-ray equipment manufacturers, and the National Bureau of Standards (NBS). In 1946 this advisory committee was reorganized, took its present name, and included representatives from other organizations having scientific interest in the field of radiation protection and measurements. The recommendations of this group generally have been published as NBS handbooks. The latest of interest is NBS Handbook 69. In July, 1964, the National Council on Radiation Protection and Measurements (NCRP) was created by Public Law 88-376. The Council will take over and continue the work previously carried out by the National Committee on Radiation Protection and Measurements.

In 1956, the National Academy of Sciences - National Research Council (NAS-NRC) published reports of its Committees on the Biological Effects of Atomic Radiation. These committees published a revised report in 1960.

The Federal Radiation Council (FRC) was formed in 1959 (Public Law 86-373) to provide a Federal policy on human radiation exposure. A major function of the Council is to "... advise the President with respect to radiation matters, directly or indirectly affecting health, including guidance for all Federal agencies in the formulation of radiation standards and in the establishment and execution of programs of cooperation with States..."

The first report (May 13, 1960) of the FRC provided a general philosophy of the radiation protection to be used by Federal agencies in the conduct of their specific programs and responsibilities. It introduced and defined the terms "Radiation Protection Guide" (RPG) and "Radioactivity Concentration Guide" (RCG) to replace the terms "Maximum Permissible Dose" (MPD) and "Maximum Permissible Concentration" (MPC) used by the NCRP. It provided numerical values for RPGs for the whole body and certain organs of radiation workers and for the whole body of individuals in the general population, as well as an average population gonadal dose.

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The recommendations in the first FRC report were to a large extent consistent with corresponding standards of radiation protection which had been developed over a period of thirty years by the NCRP and the ICRP. The recommendations of the NCRP and ICRP specify that whole body or genetic exposure of individual members of the general population in the vicinity of controlled areas shall not exceed 0.5 rem per year. However, the ICRP limited the exposure of the population at large to one-third of this value. The FRC used the same level of 0.5 rem per year in its RPG's for individuals in population groups but stated that the exposure for a suitable sample of an exposed population group should be not over one-third dose (o.17 rem).

The second report (September 1961) of the FRC provided guidance in limiting the exposure of members of population groups to radiation from radioactive materials deposited in the body as a result of the occurrence of these materials in the environment. Similarly, the whole body RPG for the general population of 0.5 rem per year applies to individual members of the general population and 0.17 rem per year for the average of suitable samples of exposed population groups.

Formerly, AEC Manual Chapter 0524, "Standards for Radiation Protection" used the NCRP recommendations. The revised Chapter 0524, August 12, 1963, superseded the NCRP recommendations with the FRC recommendations which are consistent with the NCRP recommendations (NBS Handbook 69).

References:

* (1) Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure, Recommendations of the National Committee on Radiation Protection, National Bureau of Standards Handbook 69, issued June 5, 1959.

* (2) Background Material for the Development of Radiation Protection Standards, Report No. 1, May 13, 1960, Staff Report of the Federal Radiation Council.

* (3) Background Material for the Development of Radiation Protection Standards, Report No. 2, September, 1961, Staff Report of the Federal Radiation Council.

** (4) Recommendations of the International Commission on Radiological Protection, (Adopted September 9, 1958), Published for the International Commission of Radiological Protection by Pergamon Press.

Footnotes:

* on file in Division of Production.

** on file in Division of Operational Safety

~~Security~~ Materials - 12

No. G-259
Tel. 973-3335 or
973-3446

FOR IMMEDIATE RELEASE
(Friday, November 13, 1964)

U.S. WASTE DISPOSAL GROUP LEAVES TODAY FOR MOSCOW;
SOVIET NUCLEAR EXPERTS TO COME HERE IN DECEMBER

Dr. Glenn T. Seaborg, Chairman of the U. S. Atomic Energy Commission, today announced that a group of eight U.S. nuclear waste disposal specialists will depart for Moscow late today (Friday, November 13) for a tour of Soviet installations. USSR waste disposal experts are expected to visit U.S. installations in December.

The U.S. scientists who will make the trip:

Walter G. Belter, Chief, Environmental and Sanitary Engineering Branch, Division of Reactor Development, USAEC, Germantown, Md.;

Raymond E. Blanco, Chemical Technology Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.;

L. P. Hatch, Leader, Chemical Technology Group No. 2, Nuclear Engineering Dept., Brookhaven National Laboratory, Upton, L.I., N.Y.;

Joseph Lewin, Engineer, Reactor Operation and Mechanical Design, Oak Ridge National Laboratory;

Joseph A. Lieberman, Assistant Director for Nuclear Safety, Division of Reactor Development, USAEC, Germantown, Md.;

Frank L. Parker, Waste Disposal Research Section, Health Physics Division, Oak Ridge National Laboratory;

11-13-64

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(more)

Alex F. Perge, Chief, Materials, Processing Safety Branch, Division of Operational Safety, USAEC, Germantown, Md.;

Allison M. Platt, Manager, Chemical Development, Hanford Atomic Power Laboratories, Richland, Wash.

The U.S. delegation is scheduled to visit the Institute of Physical Chemistry, Academy of Sciences of the USSR, Moscow; Moscow Station for Purification of Radioactive Waste, and the Physical-Technical Institute, Obninsk. The U.S. group also will visit an operating power reactor at Beloyarsk or Novovoronezh. In December the Soviet delegation will visit the Yankee Power Station at Rowe, Mass.; Argonne National Laboratory, Argonne, Ill.; Brookhaven National Laboratory, Brookhaven, L.I., N.Y.; and the Air Purification Laboratory, Harvard University, Cambridge, Mass.

The visit of the U.S. group to the Soviet Union is the first phase of the third exchange of scientists between the two countries this year. Ten U.S. scientists having particular interest in plasma physics and controlled thermonuclear reactions departed on February 7 for Moscow while seven Soviet solid state physics experts arrived in New York on February 10 in the first exchange. The second exchange took place in June, with seven solid state physicists going to Moscow on June 6 while eight USSR plasma physics and controlled thermonuclear reactions scientists arrived in New York for a tour on June 20.

These exchanges, all unclassified, are provided for under the provisions of the Memorandum which Dr. Seaborg and Mr. A. Petrosyants, Chairman of the USSR State Committee on the Utilization of Atomic Energy, signed in May, 1963. The memorandum was signed while the AEC Chairman and a group of U.S. nuclear scientists were visiting USSR installations as guests of the Soviet nuclear chief. On the invitation of Dr. Seaborg, Dr. Petrosyants and a group of Soviet scientists toured U.S. installations last November.

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11/13/64

Materials - 12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

SEP 25 1964

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: AMERICAN NUCLEAR CORPORATION - USE OF ORNL BURIAL GROUND

Attached is a memorandum to me from Ed Bloch, with a proposed memorandum to Sam Sapirie, approving an exception to AEC's policy denying use of its radioactive waste burial grounds to licensees.

I would like to bring this matter up with the Commission at an early Information Meeting.

Signed:
John V. Vinciguerra

General Manager

Enclosure:
Memo, Bloch to GM, dtd 9/23/64
w/attachment

cc: GM (2)
Secretariat (2)
OGC
E. J. Bloch

9-25-64

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

UNITED STATES GOVERNMENT

Memorandum

TO : R. E. Hollingsworth
General Manager

DATE: September 23, 1964

FROM : E. J. Bloch
Assistant General Manager for Operations

SUBJECT: AMERICAN NUCLEAR CORPORATION - USE OF ORNL BURIAL GROUND.

Attached is a memo from you to Sapirie authorizing him to approve the request from the American Nuclear Corporation to utilize the ORNL burial grounds. You will note that this exception to AEC's policy denying use of its burial grounds to licensees is not predicated upon a finding that commercial burial services are not conveniently available to the region which would be within the policy announced in the Slaton Report.

The exception is made as an expression of good will in recognition of the fact that ANC is presently established in the Oak Ridge area; that their decision to locate in that area, which was made prior to the adoption of AEC's policy on use of the burial grounds, was influenced in large part by their expectation that they would be permitted to use the burial grounds; and that denial of such use would impose a hardship upon ANC.

An exception on this basis is not recognized by the Commission action on AEC 180/23 (May 17, 1963). That action indicated the Commission would reconsider its decision in the event there were any appreciable increases in NECO's price structure and no other commercial firms were available offering similar services at or below NECO's prices.

The General Manager approved on July 17, 1963 one previous exception for Abbott Laboratories. This approval was granted on the same basis as is now proposed for ANC and we believe was discussed informally with the Commission.

The Division of Industrial Participation concurs in and recommends the course of action outlined in the attached memo to Sapirie.

Attachment

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-107

UNITED STATES GOVERNMENT

Memorandum

TO : S. R. Sapirie, Manager
Oak Ridge Operations Office

DATE:

FROM : R. E. Hollingsworth
General Manager

SUBJECT: BURIAL AT ORNL OF AMERICAN NUCLEAR CORPORATION WASTE.

This is in reference to your teletype to me of August 4, 1964, on the above subject, and to a subsequent memorandum of September 10, 1964 from you to the Director, Division of Industrial Participation regarding American Nuclear Corporation's request to be permitted to dispose of their radioactive wastes in the burial ground at ORNL.

We understand that ANC's request is the second case arising from the Commission's offer in the Slaton Report to consider requests, on a case-by-case basis, for the provision of specific services which are compatible with AEC operations and program requirements, until they are commercially available to the region on a convenient basis. We further understand that ANC is located within three miles of the Oak Ridge City limit; that one of their basic assumptions, which played a major role in their decision in April 1961 to locate their plant in the Oak Ridge area, was that they would be able to dispose of their contaminated wastes at ORNL; and that the nearest available commercial burial ground is operated by the Nuclear Engineering Company, Inc., at Fleming, Kentucky, approximately 250 miles from Oak Ridge.

The advantage to be obtained by ANC, should their request be approved, would be the convenience of shipping wastes in their own vehicles as they accumulate in shorter intervals rather than having to allocate a larger storage space for temporary storage prior to shipment to more distant-burial grounds. They estimate an annual savings in transportation costs alone of $2,000.

In view of the foregoing, you are hereby authorized to approve the request of American Nuclear Corporation. This approval of an exception to AEC's policy denying use of its burial grounds to licensees is not made on the finding that commercial burying services are not available to the region on a convenient basis. It is made in recognition of the facts that ANC is presently established in the Oak Ridge area, that ANC's decision to locate in that area, which was made prior to the adoption of AEC's present policy on use of burial grounds, was influenced in large part by their expectation that they would be permitted to use ORNL burial grounds and that denial of such use of these grounds will impose a hardship on ANC.

cc: Director, DIP
Director, DP
Director, DOS
Director, OEIC

Materials

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

SEP 23 1964

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER BUNTING
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER TAPE

SUBJECT: 275,000-CURIE COBALT 60 MARINE PRODUCTS DEVELOPMENT IRRADIATION FACILITY, GLOUCESTER, MASSACHUSETTS

This is to inform the Commission that a byproduct material license has been issued to Associated Nucleonics Incorporated (ANI) to check-out the operation of the 275,000-curie Cobalt 60 Marine Products Development Irradiator in Gloucester, Massachusetts. Before the license was issued, representatives of the Division of Materials Licensing and the Division of Compliance inspected the facility.

The staff has under review an application submitted by the Department of the Interior, Bureau of Commercial Fisheries, requesting a license for routine operation of the irradiator after ANI's check-out has been completed. Action will be taken on this application upon completion of the ANI check-out and review by the licensing staff of the ANI and Division of Compliance reports relating thereto.

We have been informed that this facility will be dedicated on September 28, 1964, at which time ANI will demonstrate the operation of the irradiator to participants in the International Conference on Radiation Preservation of Food.

Original Signed by C. K. Beck for

H. L. Price
Director of Regulation

cc: General Manager
Secretary (2)

9-23-64

FORM AEC-304
(9-47)

DATE:

[redacted]

INDEX: Materials 12

[redacted]

TO:

FROM:

SUMMARY: AEC 1148 - REPORT ON IAEA'S PANEL ON SEA DISPOSAL
To consider proposed US comments on the report
of IAEA's panel on the legal implications of disposal
of radioactive waste into the sea.

FILED: IAEA 12-1 Waste Disposal

INDEXER: date of paper: 3-13-64

REMARKS:

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

3-13-64

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MAR 1 ? 1964

Dear Senator Metcalf:

Your letter of February 14, 1964, requests information on a proposal to transport high level liquid radioactive wastes from the Hanford site to a location in Montana where the wastes would be injected into a subsurface formation.

This proposal was submitted to our Division of Reactor Development by Stearns-Roger Corporation in late December, 1963, jointly with the Atomic Storage Company and E. A. Polumbus, Jr., and Associates, all of Denver, Colorado. On January 17, 1964, representatives of the Commission staff met at AEC Headquarters with Mr. R.W.Aherlow of Stearns-Roger and Dr. W.A.Colburn of the Atomic Storage Company for detailed discussion of the proposal. A summary of the January 17 discussions and an evaluation of the proposal were sent to Dr. Colburn by the Division of Reactor Development on February 12, 1964. A copy of that correspondence is enclosed for your information.

The present proposal suggests five possible methods of shipping the radioactive wastes from Hanford to the proposed disposal site and places great emphasis on the importance of low fluid pressures in the geologic formation that would be used as a disposal reservoir.

Any proposal to transport gross quantities of highly radioactive fluids for long distances is, at the outset, faced with prohibitive costs, regardless of the method of transportation; furthermore, most methods involve considerable radiation safety hazards to the public. Fluid pressure in the disposal reservoir is one of a number of factors that must be considered, but is not necessarily of overriding importance. Because of the undesirable transportation aspects, those AEC sites, such as Hanford, Idaho and Savannah River, with large quantities of highly radioactive wastes now in tank storage are actively pursuing programs to develop and initiate methods for processing this waste and storing it on the site for the long term.

The statement in Dr. Colburn's letter to the effect that no nuclear industry is envisioned for Montana was inferred from a discussion of the kinds of nuclear plants that produce relatively large volumes of

3-16-64

liquid wastes, such as chemical processing plants or major laboratories, and the anticipated future need for such plants nation-wide. For example, we do not envision the need for additional large nuclear laboratories such as Oak Ridge in the foreseeable future.

I hope this discussion of the proposal and the enclosed booklet describing waste management at Hanford supply the information you need. If we can furnish any additional information on this matter, do not hesitate to call on us.

Sincerely yours,

(Signed) Glenn T. Seaborg

Chairman

Honorable Lee Metcalf
United States Senate

Enclosures:
1) Letter, Pittman to Colburn dated 2/12/64
2) "Radioactive Waste Management"

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DNS: rf
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RD: rf (2)
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Materials-13-Waste Disposal

MAR 12 1964

Dear Senator Mansfield

Your letter of February 11, 1964, requests information on a proposal to transport high level liquid radioactive wastes from the Hanford site to a location in Montana where the wastes would be injected into a subsurface formation.

This proposal was submitted to our Division of Reactor Development by Stearns-Roger Corporation in late December, 1963, jointly with the Atomic Storage Company and E. A. Polumbus, Jr., and Associates, all of Denver, Colorado. On January 17, 1964, representatives of the Commission staff met at AEC Headquarters with Mr. R. W. Akerlow of Stearns-Roger and Dr. W. A. Colburn of the Atomic Storage Company for detailed discussion of the proposal. A summary of the January 17 discussions and an evaluation of the proposal were sent to Dr. Colburn by the Division of Reactor Development on February 12, 1964. A copy of that correspondence is enclosed for your information.

The proposal is similar to one made by the Petroleum Research Corporation to the Blackfeet Indian Tribe in late 1961. The present proposal suggests five possible methods of shipping the radioactive wastes from Hanford to the proposed disposal site and places great emphasis on the importance of low fluid pressures in the geologic formation that would be used as a disposal reservoir.

Any proposal to transport gross quantities of highly radioactive fluids for long distances is, at the outset, faced with prohibitive costs, regardless of the method of transportation; furthermore, most methods involve considerable radiation safety hazards to the public. Fluid pressure in the disposal reservoir is one of a number of factors that must be considered, but is not necessarily of overriding importance. Because of the undesirable transportation aspects, those AEC sites, such as Hanford, Idaho and Savannah River, with large quantities of highly radioactive wastes now in tank storage are actively pursuing programs to develop and initiate methods for processing this waste and storing it on the site for the long term.

3/2/64

The statement in Dr. Colburn's letter to the effect that no nuclear industry is envisioned for Montana was inferred from a discussion of the kinds of nuclear plants that produce relatively large volumes of liquid wastes, such as chemical processing plants or major laboratories, and the anticipated future need for such plants nation-wide. For example, we do not envision the need for additional large nuclear laboratories such as Oak Ridge in the foreseeable future.

I hope this brief discussion of the proposal supplies the information you need. The proposal and your letter from Dr. Colburn are enclosed, along with a booklet describing waste management at Hanford. If we can furnish any additional information on this matter, do not hesitate to call on us.

Sincerely yours,

[illegible]

Chairman

Honorable Michael J. Mansfield
United States Senate

Enclosures:
1) Letter, Pittman to Colburn
dated 2/12/64
2) "Radioactive Waste Management"
3) Letter, Colburn to Mansfield
dated 2/7/64, plus enclosures

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Inst - 12 - Waste Disposal

MEMBER
UNITED STATES CHAMBER OF COMMERCE
KANSAS STATE CHAMBER OF COMMERCE

The Lyons Chamber of Commerce

OFFICE IN THE HOTEL LY-KAN

Lyons, Kansas

February 17, 1964

Dr. Glenn T. Seaborg, Chrm.
U.S. Atomic Energy Commission
Washington, D. C.

Dear Dr. Seaborg:

We would refer you to news release NR-ORNL-178, Contact D. D. Cowen, dated July 9, 1963, from Oakridge National Laboratory.

You will note that this release has to do with radioactive waste disposal experiments in an abandoned salt mine near Lyons.

We have an active industrial committee within our Chamber of Commerce and it is very much interested in the development of this experiment. Should it be proven that salt formations will be useful for radioactive waste disposal, we sincerely hope that immediate steps will be taken to construct a reactor on the site above the salt formation. This will eliminate expensive transporation of the waste.

No doubt you will visit this experiment, and we look forward to meeting with you at that time.

Very truly yours,

A. R. Pearce

A. R. Pearce, Manager
Lyons Chamber of Commerce

ARP:rg

2/17/64

Materials 12

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FEB 25 1964

MEMORANDUM FOR COMMISSIONER RAMEY

THROUGH Deputy GENERAL MANAGER SIGNED, E. E. HOLLINGSWORTH

SUBJECT: RADIOACTIVE WASTE DISPOSAL

Reference is made to your memorandum of January 6, 1964, which requested an updating of information which was presented to the JCAE in 1959 on estimates pertaining to the magnitude of the future waste disposal problem.

Pages 3 through 5 of the attached summary present a revised estimate of the magnitude of the future high activity waste management situation. As you can see, the estimated volumes are considerably less than given at the time of the Joint Committee hearings.

Also included is a summary of the present waste management research and development program which describes the program objectives, accomplishments and the present status of some of the major projects. It has been prepared in a form which we believe would be useful for answering questions or inquiries on this subject. The material pertaining to production sites has been reviewed by the Division of Production.

We will be pleased to furnish any additional information if so desired.

Frank K. Pittman, Director
Division of Reactor Development

Attachment:
"Management of Radioactive Wastes from the Nuclear Power Industry"

cc: Chairman Seaborg
Duncan C. Clark, PI
Secretariat

bcc: S. G. English, AGMRD

MANAGEMENT OF RADIOACTIVE WASTES FROM THE NUCLEAR POWER INDUSTRY

Introduction

The management or disposal of radioactive waste from the nuclear energy industry has been a recognized and important part of all AEC activities. As in most other industries, waste disposal is not a single problem with a single solution. However, because of the very nature and characteristics of radioactive material - their non-detectability by human senses, their ability to cause damage to human tissues, and their potential danger as an environmental pollutant - it was readily apparent from the beginning that the safe handling and ultimate disposal of waste from this industry were paramount and perhaps more essential than any previous industrial operation developed to date. Because of this fact, the subject of industrial radioactive waste disposal was thoroughly and extensively discussed in the Hearings conducted by the Joint Congressional Committee on Atomic Energy in 1959.

Among the salient conclusions reached as a result of the exhaustive JCAE Hearings on this subject were: 1) radioactive waste management practices have not resulted in any harmful effects on the public, its environment or its resources; and 2) the general problem of radioactive waste need not retard the future development of the nuclear energy industry with full protection of the public health and safety. We believe these conclusions are still valid.

Nature of Radioactive Wastes

Radioactive wastes continue to be considered by most people as an uncategorized entity. The word "radioactive" has been so strongly impressed that it has become an all-inclusive term, to the point where waste from nuclear reactors, from laboratory research, from medical use, from chemical reprocessing of irradiated fuel elements, etc., are all considered as one and the same thing. Important characteristics such as the quantity and concentration of radioactive material involved and its detailed chemical and physical nature are not considered, and most often completely ignored. However, these are paramount to a meaningful understanding and essential to any discussion of radioactive waste operations.

It is important to understand at the outset that radioactive wastes which are generated in routine nuclear reactor operations, in laboratory and medical research, and in other industrial applications of isotopes -- all are generally considered as low level, or low hazard potential wastes. In terms of radioactivity concentration these wastes are normally in the thousandths or millionths of a curie per gallon range. Billions of gallons of low level wastes are produced each year as a result of these operations. Certain of these wastes in which the concentration of radioactivity is only a few times greater than drinking water standards may be disposed of in streams, where dilution will drop the concentration far below the maximum permitted or, under suitable conditions, may be discharged into soils where the hazardous radionuclides are retained. Other low level wastes are treated by processes which have been proven over several years of operation, and which reduce the

level of radioactivity in the wastes to a point where they may be safely discharged to the environment. Present treatment and dispersal methods in use in the United States have been demonstrated to result in concentrations in the environment well below established permissible limits, and these operations are carefully controlled so as to assure that the safe capacity of the environment is not exceeded.

As indicated above, essentially all the radioactive wastes generated at a nuclear power reactor installation fall into the low level or low activity category. For example, a total of only eight millicuries was contained in the 870,000 gallons of waste discharged by the Yankee reactor in 1962. Spent fuel elements removed from the reactor, which are designed to possess high integrity and which, therefore, retain the great majority of the fission products produced in the reactor, are shipped intact to a fuel reprocessing plant for recovery of the unburned uranium and plutonium. It is in this part of the fuel cycle, i.e., the processing of the spent fuel to recover unburned uranium, that all of the high and intermediate level wastes are produced. These high activity wastes, which are generated at present at AEC production sites as a result of the chemical reprocessing of irradiated reactor fuel, and which will be produced in the future at commercial fuel reprocessing plants such as the NFS facility located in New York State, have concentrations of radioactivity in the range of hundreds up to tens of thousands of curies per gallon. Thus, these wastes have radioactivity levels tens or hundreds of millions of times higher than that contained in low activity wastes. However, it is important to note that the total number of gallons which evolve from low and high level waste operations are vastly different. As opposed to the billions of gallons of low level wastes which are produced annually, the volume of high level wastes which have been generated since the beginning of the atomic energy program has amounted to only about 65 million gallons, all of which is stored in underground tanks and intensively monitored.

Objectives of Waste Management Operations

The major objective of waste management in atomic energy operations is control over the radiation hazard that might be produced by these wastes, either in storage or in nature. This requires control not only during operations and discharge, but also over movement and distribution of the waste products in the environment. Two basic disposal concepts are applied:

> Concentrate and contain. The radioactive materials may be confined or isolated within permanently maintained reservations, away from people and useful resources. Highly active liquid wastes originating from the chemical processing of irradiated fuels from reactors must be reduced to a suitable concentrated form and contained indefinitely in this way.

Dilute and disperse. In this other basic concept of waste management, the radioactivity may be reduced to tolerable levels by dilution in nature - in air or water. However, the fact that some wastes can be dispersed directly to the environment makes it essential to control these operations carefully so as to assure that the safe capacity of the environment is not exceeded. A third concept of delay and decay is also practicable in certain situations.

For high activity waste from fuel reprocessing, tank storage, while not an ultimate solution in itself, probably will be an operating part of any final disposal system. However, the inherent restrictions of tank storage, such as potential leakage and the necessity of liquid waste transfer for periods of hundreds of years, have resulted in an extensive research and development program directed at engineering a practical system for conversion of high activity liquid waste to a solid form. Final storage, or disposal of high activity solids would be accomplished in a suitable geologic formation, such as salt.

Magnitude of Future High Activity Waste Management Problem

During the hearings before the Joint Committee on Atomic Energy on the subject of industrial radioactive waste disposal held in 1959, it was estimated that using the then current processing technology the volume of high and intermediate level waste accumulated by 1980 would reach 36 million gallons.

The intervening years have brought improvements in fuels technology and in fuel reprocessing methods which have served to markedly reduce the volume of wastes generated per unit of nuclear power produced. Thus, while estimates of installed nuclear power in 1980 have not changed significantly since the hearings, predicted accumulated waste volume in storage by 1980 ranges between 500,000 and 2,000,000 gallons, depending on the postulated operating procedures of the reprocessing plant. Estimates of waste quantities through the year 2000, based on the predicted growth of the nuclear industry as cited in the 1962 report to the President on Civilian Nuclear Power are summarized in Table I.

TABLE I

Estimate of Wastes Arising From
A Nuclear Power Complex

	YEAR		
	1970	1980	2000
Installed Nuclear Power, MW_e	5,000	40,000	734,000
Fuel irradiation level MWD/T	18,000	25,000	25,000
Volume of high activity waste*			
Annual Volume (gal/year)	40,000	150,000	2,800,000
Accumulated Volume (gal)	180,000	900,000	22,000,000
Total Sr^{90} (megacuries)	40	340	6,700
Total Fission Products (megacuries)	3,000	20,000	530,000

*Based on 200 gallons high activity waste/Ton U processed. Realistic estimates range from 100 gal/ton, in which case the volumes would be 1/2 of those shown, to 400 gal/ton (NFS flowsheet), in which case volumes would be twice those shown. Assumes three-year lag between installation of power plant and first reprocessing of fuel.

The above waste volumes are predicated on the assumption that confinement of the wastes will be accomplished by means of long term tank storage of liquids. Should a conversion-to-solids waste management concept (discussed in the next section) be adopted by, say, 1970, the waste storage picture would approximate that shown in Table II.

TABLE II

Waste Volumes in Storage Under
Conversion-to-Solids Waste Management Concept

	YEAR 1970	1980	2000
Annual Volume of Waste generated (gal/year)*	40,000	150,000	2,800,000
Accumulated liquid held for 5 year interim storage (gal)	165,000	600,000	11,000,000
Accumulated solids in ultimate storage (cu. ft.)**	70	1,550	32,000
Sr^{90} in liquid (megacuries)	37	230	3,350
Sr^{90} in solid (megacuries)	3	110	3,350

*Based on 200 gal waste/ton U processed.
**Based on 1 cubic foot solidified waste/ton U processed.

Economic evaluation studies of the conversion-to-solids waste management concept have indicated that to achieve minimum costs, a period of interim storage is required to permit decay of short-lived fission products and attendant reduction of decay heat generation. The five year figure used in the above table was found to be optimum from the economic point of view. However, recent studies indicate that substitution of interim solid storage under forced cooling conditions for part or all of the interim liquid storage period may be economically attractive. Shorter interim liquid storage periods would, of course, result in storage of a greater fraction of the wastes in solid rather than liquid form.

Research and Development Program

1. Treatment and Disposal of High Activity Fuel Reprocessing Wastes

More than 15 years experience with storage of liquid high activity wastes in tanks has shown it to be a safe, practical means of interim handling. The long term usefulness of this method is limited, however, due to the long effective life of the wastes (hundreds of years) and the comparatively short life of storage tanks, estimated at several tens of years. Accordingly,

the Commission has pursued a vigorous research and development program aimed at developing and demonstrating, on an engineering scale, systems for the conversion of high level liquid wastes to stable solids.

The largest development effort in this area has been the installation of a 60-gallon per hour Waste Calcination Facility at the Idaho Chemical Processing Plant, NRTS, for the fluidized bed calcining of acid aluminum nitrate wastes from MTR-type fuels. Cold engineering development work and successful Na^{24} tracer runs were completed in 1962 and early 1963, and hot operation with wastes stored at the ICPP commenced in December of 1963. It is planned to operate the plant on a full scale production basis during 1964, in an effort to reduce the volume of waste now in storage at the ICPP.

The power reactor waste solidification program has now reached the stage where an intensive effort culminating in full level demonstration is being carried out for a small number of processes which have continued to show real promise during the course of their development. To this end, a Waste Solidification Engineering Prototype Plant is now in the construction phase at Hanford Laboratories. This plant, which will be installed in the Fuels Recycle Pilot Plant Facility, will have a processing capacity of ten gallons per hour and will go into operation with high level wastes during FY 1966. Present plans call for demonstration of the pot calcination and radiant spray calcination processes and/or modifications of these techniques which will result in a more stable ceramic end product, as well as a continuous phosphate glass process. The flexibility of the plant which permits multiple process demonstration is due in large measure to the use by all processes of common feed preparation and off-gas treatment equipment, and to a unique design concept which groups associated pieces of equipment on remotely removable "plug-in" racks, thereby facilitating modification and maintenance.

As a prelude to this demonstration, hot pilot plant studies have been carried out at Hanford during the last one and one half years on the radiant spray and pot concepts, using full level wastes, and have been highly successful. Cold engineering development work on the pot, radiant spray, and continuous glass processes has been carried out by ORNL, Hanford, and BNL, respectively. Thus, the prototype demonstration work will be a national, cooperative effort involving participation of all three sites.

Long term storage or ultimate disposal

After high level liquid wastes are converted to solids, there still exists the requirement for storage or ultimate disposal of these solid wastes. This has led to the investigation of selected geologic formations for this purpose. Salt has been chosen as the most optimum disposal media because of its unique geologic characteristics. Salt formations are dry, impervious to water, and not associated with usable groundwater sources. Because of its plasticity, fractures in salt seal or close rapidly. Deposits of rock salt underlie some 400,000 square miles of the United States and may represent some of the few naturally occurring dry environments in the Eastern part of the country. Extensive laboratory investigations at ORNL and field studies in the Carey Salt Mine, Hutchinson, Kansas, have shown strong promise. A field experiment has been designed using short-cooled MTR fuel elements, to simulate the thermal and radiation characteristics of full-scale power reactor waste such as would exist in a pot containing calcined solids. This field demonstration is planned for early 1965, in the Carey Salt Mine in Lyons, Kansas.

Economic Implications

Long range engineering and economic studies are being conducted to give some indication of the magnitude of waste management costs in a future nuclear power economy. In studies completed to date on the high level waste management concept involving reduction to solids followed by storage in salt, the total cost of interim liquid storage, solidification, interim solid storage, shipment of solids over a 2,000-mile round trip to an ultimate disposal site, and storage in a salt formation, have an estimated total cost range of 0.026-0.030 mills per kilowatt hour electrical. This constitutes approximately one half of one percent of the cost of 6 mill power.

Impact of utilization of fission products

It has been suggested that the costs of waste management might be markedly reduced by the expedient of removing some of the fission products from the waste and thereby simplifying their subsequent management. Using optimistic expectations of waste compositions from future fission product separation processes, it has not been possible to show any substantial economic advantages to waste management. (It should be noted that reference here is made to future power reactor wastes. The Hanford Waste Management Program, discussed below, is a notable exception to the above statement, in that fission product removal makes it possible to utilize existing tanks for long term storage of wastes in salt-cake form.) In a study conducted at ORNL, the cases of 90 and 99% fission product removal have been compared with that for the untreated waste. The cost of managing wastes that are 90 to 99% depleted in fission products is about 70% as much as the cost of managing wastes with no fission products removed. The difference, about $400 per metric ton of uranium processed, is not enough to pay for the separation and handling of fission product concentrates unless there are mitigating circumstances, such as at Hanford. Fission product removal must be justified and paid for by the market for fission product radiation or heat sources, with only a marginal credit from reduced costs of waste management. From an environmental or over-all waste management standpoint, f.p. recovery cannot be equated to f.p. removal.

Other long term waste management methods for the some 65 million gallons of waste in storage at AEC production sites are now in the study of implementation stage. The Waste Calcination Facility at the ICPP has been discussed above. As a possible alternative to high level liquid waste tank storage, the AEC is investigating at its Savannah River Plant the feasibility of storing aged fuel reprocessing waste in deep impermeable (basement rock) formations, approximately 2,000 feet beneath the plant. Several widely spaced exploratory holes have been drilled into the underlying bedrock. Field permeability tests of the basement rock have been made and continuous core samples have been obtained for determination of tensile and compressive strength, thermal conductivity, and chemical compatibility of the rock with Savannah River Plant waste. Technical studies have been conducted with respect to waste characteristics, including heat generation rates, age of waste to be stored, and the physical form of waste considered most desirable. A preliminary safety analysis has been completed, and studies are now underway on methods for removing wastes, including caked sludges, from the storage tanks.

The proposed Hanford Waste Management program is specially designed for existing and future Hanford production wastes. It makes optimum use of the existing facilities and the favorable geology and climate of the area. It involves extraction of most of the strontium-90, cesium-137, promethium-147, and cerium-144. The residual waste with low heating rates is then discharged to existing underground tankage and later solidified to a salt cake by in-situ evaporation. The extracted long-lived fission products are packaged in small, high-integrity containers and placed in storage. Accordingly, large quantities of strontium and cesium will be available on demand for utilization.

Based on past laboratory and engineering scale cold unit operations data and on an expected successful field demonstration and testing program with actual high level wastes, it is firmly believed that waste management operations should not constitute a major obstacle to the development of safe and economical nuclear power.

2. Treatment and Disposal of Low and Intermediate Level Wastes

Radioactive low and intermediate waste management is presently accomplished by single or multiple stage treatment systems involving filtration, chemical precipitation, ion-exchange, evaporation, concrete solidification, vermiculite adsorption and tank storage. Where suitable geohydrologic conditions exist, ground disposal of low and intermediate level wastes with or without treatment is utilized. Wastes are processed by the method which provides the required decontamination at the lowest cost, in accordance with acceptable health and safety standards.

Flocculation and chemical treatment processes have been developed for the decontamination of large volume low activity waste at several AEC installations,. Treatment efficiencies up to 90% have been achieved for strontium and cesium and up to 99% for alpha activity using single stage treatment. Multi-stage treatment is capable of achieving over-all decontamination factors as high as 1,000 (treatment efficiencies of 99.9%), but complexity and cost also increase considerably.

Improved decontamination processes using special ion-exchange materials have been developed and are now in use in laboratory waste and power reactor station treatment systems. Extensive R&D work in this area has been conducted at Argonne, Los Alamos, and Oak Ridge. Decontamination factors for cation exchange resins have ranged from 20 to 50 for mixed fission product waste to as high as 10^5 for mixed-bed units.

Recent studies at Oak Ridge have indicated that a phenolic resin ion-exchange process can provide higher decontamination factors and volume reduction than other current processes for strontium and cesium removal from low level wastes. Results of pilot plant work show that approximately 99.9% of the strontium and cesium, the greatest health hazards, have been removed from 1500-2000 volumes of alkaline wastes with an over-all volume reduction of approximately 2000.

A prime example of ground disposal research and development involves the potential disposal of intermediate level wastes by hydraulic fracturing of shale or other suitable geologic formations. This technique which was obtained from the petroleum industry has been under extensive development by the Oak Ridge National Laboratory for waste disposal application during the past three years. The method consists of injecting a waste-cement-clay mixture under high pressure into an impermeable formation by fracturing. Three pilot plant runs have been successfully completed at ORNL and a full-scale engineering demonstration test with actual ORNL intermediate level waste will be carried out during 1964-65.

A committee of the American Petroleum Institute has studied the feasibility of injecting liquid waste into deep (several thousand feet) permeable formations. Laboratory investigations and theoretical studies on ion sorption, chemical compatibility, corrosion, etc., have been carried out by the Oak Ridge National Laboratory, the Bureau of Mines, and the University of California. Small-scale field tracer tests have been carried out at the University of California. A subcommittee of the American Association of Petroleum Geologists is compiling and evaluating available hydrodynamic data which exists on several deep sedimentary basins in the United States to determine which areas may be suitable for a deep well field scale experiment. With a continual lowering of acceptable limits of radioactivity in our environment, it is envisioned that deep well injection could provide a future method for the disposal of certain types of large volume, low and intermediate activity wastes.

Environmental Studies in Support of the Waste Disposal Program

For safe disposal of low activity waste to the environment after processing and/or monitoring, a wide variety of environmental studies (stream and river, estuary and oceanographic, soil and earth) have been conducted to provide specific information on the fate and behavior of low level effluents dispersed in specific environments. In this manner a more accurate and specific assessment of the environmental effects of waste disposal practices can be made.

An example of the environmental studies being carried out in the waste disposal program is the comprehensive stream investigation which is being conducted on the Clinch and Tennessee Rivers below ORNL. This study involves various federal agencies and scientific disciplines, and has been extremely successful because of the close cooperation and active participation of each group. While normal monitoring practices at ORNL have determined that the concentration of radioactivity in the Clinch and Tennessee Rivers below Oak Ridge is well within internationally accepted standards, it was believed important to obtain further fundamental and applied information on the physical, chemical, and biological dynamics of a flowing freshwater system which is receiving volumes of low level radioactive waste. The ultimate fate and distribution of radionuclides of specific interest at Oak Ridge - strontium-90, cesium-137, ruthenium-106, and cobalt-60 - are being determined. The over-all capacity of the Clinch River for radioactive waste disposal purposes is being evaluated to determine future treatment and management criteria. These studies will also establish more effective long-term monitoring procedures for waste effluent control.

Field studies of physical dispersion of radioactive effluents in estuarine and coastal waters have been conducted for the AEC by the Chesapeake Bay Institute of the Johns Hopkins University. A comprehensive study of New York Harbor, involving field measurements of currents, temperature, and salinity by the U. S. Coast & Geodetic Survey and data analyses by CBI has provided a means for evaluating the safety of nuclear ship operations within the Harbor.

Extensive environmental studies have been carried out in the Atlantic and Pacific Coast sea disposal areas to determine if the discharge of solid packaged low activity waste was causing any adverse effect on the oceanic environment. Seasonal surveys have included the collection of plankton, bottom sediments, fish and seawater samples to the thousand fathom depth. Based on the results of alpha, beta, and gamma low level counting analyses, it was determined that no radioactivity existed in bottom sediment, benthic organisms, and bottom fish that could be distinguished from natural background.

Conclusions

Waste management operational experience at U. S. atomic energy installations, (AEC production and laboratory facilities and nuclear power reactor stations) has been more satisfactory than essentially any other facet of the nuclear fuel cycle. The research and development program has reached the pilot plant and field demonstration phase for several major projects, and it is expected that results of these programs will be available when industrial reprocessing of spent reactor fuels becomes a reality. Present engineering cost studies indicate that waste disposal operations should account for less than one percent of the cost of nuclear power in a 6 mill/KWh economy. Based on an expected successful field demonstration and testing program with high activity waste, it is firmly believed that waste management operations will not consitute a major obstacle in development of the nuclear energy industry - from either a safety or economic standpoint.

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Materials-12

JOINT AEC-DEPARTMENT OF THE INTERIOR RELEASE

B-425

No. G-225
Tel. 973-3335 or
973-3446

FOR IMMEDIATE RELEASE
(Monday, September 28, 1964)

AEC'S MARINE PRODUCTS DEVELOPMENT IRRADIATOR DEDICATED

The Marine Products Development Irradiator was dedicated today with ceremonies at the Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Massachusetts.

The seafood irradiator was built to demonstrate the feasibility of extending the refrigerated storage life of fresh fishery products. It was constructed as part of the Atomic Energy Commission program on radiation-pasteurization of foods. The facility will be operated for the AEC by the BCF Technological Laboratory, Fish and Wildlife Service, Department of the Interior, under an inter-agency agreement.

Principal speakers at the morning dedication were Governor Endicott Peabody of Massachusetts; Representative William H. Bates of Massachusetts, member of the Congressional Joint Committee on Atomic Energy; Dr. Mary I. Bunting, member of the Atomic Energy Commission; Brigadier General Woodrow W. Vaughan, Commanding General, U.S. Army Natick Laboratories; and Charles Butler, Assistant Director, Bureau of Commercial Fisheries, U.S. Department of the Interior.

Mayor Ralph B. O'Maley of Gloucester and other state and local officials witnessed the ceremony, along with officials of the Bureau of Commercial Fisheries, representatives of the fishing, seafood and allied industries, and scientists who are attending an International Conference on Radiation Preservation of Foods, in Boston, September 28 to 30.

Irradiated seafood, like that which will be processed by the facility, was served to luncheon guests following the

9-28-64

(more)

dedication. Guests were served clam chowder made from radiation-processed clams, broiled radiation-processed haddock, and radiation-processed lobster in lobster salad. Buttered parsley potatoes, green beans, dessert and coffee completed the luncheon.

Construction of the seafood irradiator was begun in late July, 1963. The $600,000 facility will operate on a near-commercial scale processing marine products at a rate of up to one ton an hour using a 250,000-curie cobalt-60 irradiation source. The source was installed on September 2.

Fresh food successfully pasteurized by radiation does not lose its characteristic appearance, taste, or odor, but does have a longer refrigerated shelf-life. The energy from the gamma rays passes through the food without leaving traces of radioactivity and reduces the number of bacteria and other spoilage-causing organisms which are normally present.

Radiation-processed seafoods such as flounder, haddock, clams, shrimp, and crab can be kept in ocean-fresh condition for over four weeks under normal refrigeration. Research results to date show that this radiation-pasteurization does not affect food wholesomeness or nutritional values.

The architect-engineer for the Marine Products Development Irradiator was Associated Nucleonics, Inc., Garden City, Long Island, N.Y.

-30-

9/28/64

AEC
UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

F A C T S H E E T

MARINE PRODUCTS DEVELOPMENT IRRADIATOR

The Marine Products Development Irradiator is a part of the Atomic Energy Commission program for radiation-pasteurization of food. The facility containing the irradiator is located at the Bureau of Commercial Fisheries Technological Laboratory, Emerson Avenue, Gloucester, Massachusetts.

The seafood irradiator is to be operated by the Bureau of Commercial Fisheries, under an agreement with the AEC, to investigate the pasteurization of seafood.

The MPDI is a semi-production facility with the capability of processing about 1,000 pounds of marine products at a typical pasteurization dose of 500,000 rads. A rad is a standard unit of measurement of absorbed radiation and may be interpreted, for popular purposes, as "radiation absorbed dose."

The cobalt-60 source employed within the shielded facility is of approximately 250,000 curies. A curie is a standard unit of measurement used to describe the intensity of radioactivity in a given amount of radioactive material. One curie equals the radioactivity associated with one gram of radium.

The MPDI building is a rectangular one-story building. It is divided into a general area and an irradiation cell.

The general area of 2,500 square feet includes the lobby, office, laboratory space for health physics and dosimetry, cold storage room, filleting area, and conveyor loading area.

The irradiation cell has a gross area of 1,250 square feet. It has concrete walls more than five feet thick and

(more)

a four-foot-thick ceiling which has a removable plug for lowering the 7-ton lead shipping casks containing the radiocobalt into the storage well. Operations within the irradiation cell are controlled and viewed remotely with the aid of television and electrical controls.

<u>Source operation</u>: The radiation source is raised by an elevator and is placed in a horizontal position inside an aluminum shroud between the tracks of the conveyor. It is cooled by a stream of air flowing through the shroud. The source plaque is approximately one foot by four feet and is made up of six sub-units. When not in use, the source is stored in 15 feet of water in a stainless steel well within the irradiation chamber.

<u>Safe operation</u>: There are a number of safety interlocks in the irradiation cell to prevent accidental exposure of personnel to radiation from the cobalt-60 source. A number of strategically placed openings in the walls and roof can be used to introduce long-handled tools in the event of elevator malfunction. As another safety feature, the irradiation cell is kept at a lower pressure than the rest of the building. Air is drawn from the building into the cell and then is exhausted through a filter stack.

<u>Processing</u>: The pasteurization process can be introduced with little disturbance to commercial fish distribution procedures. After the fish have been filleted and packed, the packages are sent through the irradiation cell. Fillets of finned fish are handled in rectangular tins holding 30 pounds of product. Shellfish, such as clams, will be packed in commercial No. 10 cans.

In the normal operation of the MPDI, the seafood packages will be brought into the building and placed on movable racks in the cold storage room. The room has a capacity for one and a half day's supply of incoming irradiated seafood and end product, based on a one-shift operation. As an alternate procedure, the filleting can be done inside the building (see general area).

(more)

A high-speed mechanical conveyor carries the product into the irradiation cell through a transfer tunnel. Inside the cell, the packages are transferred to a slow-moving conveyor which carries them past the radiation source. Each package makes a round trip under and over the cobalt-60 gamma ray source. It then comes out of the cell, is shifted by the operator to the other side, then goes back into the cell for a second trip. Total processing time is about one hour. The product normally receives 250,000 rads at a production rate of 2000 pounds per hour. The dose can be reduced to 150,000 rads or less if desired, by increasing the production speed or by removing one or more of the six subsections into which the source is divided.

The AEC radiation-pasteurization program, of which the MPDI operation is a part, aims to develop the technology for demonstrating the practical feasibility of using relatively low doses of radiation to extend the shelf-life of selected perishable foods. Present emphasis is on fish and fruit products. In general, these will still require refrigeration, but the shipping and storage life of fish may be extended severalfold, while a significant reduction in fruit losses during transportation and marketing can be achieved. Extension of this technology to final commercial applications would be carried out by private industry.

Wholesomeness and public health safety: Studies are being carried out to determine the wholesomeness, nutritional adequacy, and safety of low-dose irradiated foods which are of interest to the AEC program. The ultimate objective is to evaluate any possible public health questions which might arise from prolonging refrigerated storage life by application of low doses of radiation.

The findings of these studies will be coordinated with results obtained in the Army Material Command's program on radiation-sterilization of food. These data will be submitted in the form of petition requests to the U.S. Food and Drug Administration for approval of low-dose irradiated foods for unlimited human consumption. Petitions for clearance of several types of lean fish - haddock, halibut, flounder, sole, cod, ocean perch and pollock - will be submitted to FDA within the next three or four months.

(more)

FDA clearance of irradiated products represents only the removal of legal restrictions. Consumer acceptance and the development of radiation facilities are two key factors which require, and are receiving, increased attention. Food irradiation will begin to achieve some significant commercial application in the next few years, judging by current estimates.

-30-

9/28/64

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

5010-107

B-425

UNITED STATES GOVERNMENT

Memorandum

TO : Heads of Divisions and Offices, HQ
Managers of Field Offices

DATE: June 23, 1964

FROM : Nathan H. Woodruff, Director
Division of Operational Safety, HQ

N.H.W.

SUBJECT: WASTE BURIAL DATA

OS:MPS:AFP

Reference is made to the May 14, 1964 notice of the General Manager, subject, Waste Disposal Responsibilities.

This is an interim request that the semiannual waste burial data for the second half of FY 64 be sent to the Production Division as normally required in form and time.

This function will be assumed by the Division of Operational Safety after this reporting period. Further instruction will be issued upon completion of a study to reevaluate and determine the AEC report requirements concerning radioactive effluents.

6-23-64

Materials 12 10

United States Senate

COMMITTEE ON
INTERIOR AND INSULAR AFFAIRS

June 15, 1964

c/I
Sm/R-cm
DL 40/.5

Honorable Glenn Seaborg
Chairman
Atomic Energy Commission
Washington, D.C.

My dear Mr. Chairman:

I am enclosing a letter I have received from Mr. Stuart McLain, president of California Nuclear, Inc. of Lafayette, Indiana, concerning his interest in opening and operation of a low level radioactive waste burial site and service center at Hanford.

The enclosed is self-explanatory, and I would appreciate the comments of the Atomic Energy Commission so that I may best answer Mr. McLain.

Sincerely yours,

Henry M Jackson

Henry M. Jackson, U.S.S.

HMJ:cs
enclosure

6-15-64

CALIFORNIA NUCLEAR, INC.
2323 South Ninth Street
Lafayette, Indiana
742-6737

6 June 1964

Honorable Henry M. Jackson
Senate Office Building
Washington, D. C.

Dear Senator Jackson:-

In January, 1964, California Nuclear, Inc. submitted a proposal to the Richland Operations Office with a copy to the State of Washington's Department of Economics and Development. This proposal covered the opening and operation of a low level radioactive waste burial site and service center for the nuclear industry in the Northwest. This proposal is still pending as it has been necessary to transfer land from the Atomic Energy Commission to the State. This is land located on the Hanford site.

In the attached letter to Mr. Paul G. Holsted of the Richland Operations Office, we are suggesting that we be awarded a contract to operate the waste burial areas and some other facilities for the Richland Operations Office. If we were to be awarded the contract for operation of the waste burial sites, we would immediately open one site to non-Commission users at a burial fee of $0.75 per cubic foot plus such fees as the State of Washington might add ($0.055 per cubic foot is being currently discussed). This compares with $1.50 per cubic foot plus the state charges now being charged FOB the site for the only publicly available site in the Western United States. Recently we have had to bid nearly $75,000 higher than we should have on one proposed contract, and currently we have a bid in for $15,000 rather than $7,500 at a Government laboratory. We believe the fact that only one site is available in the Western part of the United States will cost the Commission about $58,000 in excessive costs on these two contracts.

Also, if we were awarded a contract to open a waste burial site, we would immediately open a technical center at Richland dealing with radioactive materials and serving the nuclear industry in the Northwest. We estimate that we would have about twenty employees at Richland within five years.

Our proposals have been given every consideration by the Richland Operations Office and by the State of Washington. Delays have occurred due to legal problems in transfer of land from the Commission to the State. We plan to expand our operations in the near future throughout the country.

Sincerely yours,

CALIFORNIA NUCLEAR, INC.

Stuart McLain

Stuart McLain, President

SM/ib
Enc.

cc - Beierle

Materials - 12

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Aquatic Controls Corporation

- WISCONSIN FOREST 7-2131

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DL

October 14, 1964

D.. Glenn T. Seaborg
C..airman
Atomic Energy Commission
1717 H Street N.W.
Washington, D.C.

Dear Dr. Seaborg:

On Thursday, September 24, 1964, issue of the Newark Evening News, I noted an article "Pass the Sea Lettuce". The prediction you made regarding the "limitless food supply by learning to farm the sea" is of extreme interest to our Corporation since we have developed a means of harvesting vegetation which can be utilized on a commercial basis.

We had the vision to pioneer this field, and with our own capital, to de- lop a new mechanism which would lead to a development of a future source of food and energy. Of the many machines now in operation, the closest to you is owned by the Department of Tidewater Fisheries, State of Maryland, and is working in the Annapolis area.

With the mechanical means of harvesting already available, we feel that your advice and guidance could bring your predicition that much closer to fruition.

Sincerely yours,

AQUATIC CONTROLS CORPORATION

Howard W. Stern

Howard W. Stern, President

HWS:lp

10-17-64

CROSS-REFERENCE *(Name, number, or subject under which this form is filed)*		MATERIALS 12- [redacted]
IDENTIFICATION OF RECORD	**DATE**	
	TO	
	FROM	
	BRIEF SUMMARY OF CONTENTS	Memo to AEC Chairman and Commissioners . Delegation of Waste Disposal Specialists to USSR. The U.S. delegation is scheduled to visit the following instalations:(a)Institute of Physical Chemistry, Academy of Sciences of the USSR, Moscow (b)Moscow station for Purification of Radiacative wast.(c)Physical Technical Institute, Obninsk.
FILED *(Name, number, or subject under which the document itself is filed)*		SEC. 4-7- EXCHANGE OF VISITS BY US & USSR date of memo 10-5-64

et

10-5-64

Optional Form 21
Feb. 1962
GSA Circular 208

CROSS-REFERENCE

materials 12

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA GEN. REG. NO. 27

OFFICIAL USE ONLY

Res. & Status Br. - GTN

UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: October 2, 1964

FROM : W. B. McCool, Secretary

SUBJECT: AMERICAN NUCLEAR CORPORATION'S USE OF ORNL BURIAL GROUNDS

SECY:JCH

1. At Information Meeting 412 on September 28, 1964, the Commission approved the dispatch of the proposed memorandum to S. R. Sapirie, Manager, Oak Ridge Operations Office (OROO), as attached to Mr. Bloch's September 23, 1964 memorandum to the General Manager, which authorizes OROO to approve a request of American Nuclear Corporation to dispose of their radioactive wastes in the burial ground at ORNL.

2. Mr. Bloch's September 23, 1964 memorandum was circulated to the Commissioners by the General Manager's memorandum of September 25, 1964.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
Asst. Gen. Mgr. for Operations
General Counsel

10-2-64

OFFICIAL USE ONLY

Materials-12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

Comm/I
DR

SEP 2 8 1964

Dear Senator Eastland:

This is in reply to your letter of September 15, 1964, concerning the interest of the American Shrimp Canners Association in having research on the irradiation preservation of shrimp conducted at Pascagoula Technological Laboratory.

I am pleased to provide you a copy of our reply to the Association's September 1, 1964 letter. As you will note, we have been supporting research in this field at Louisiana State University for about two years and we hope to continue and expand this research. We also plan to have a 16 ton on-board ship irradiator in about six months which we will utilize in the Gulf area for further research and development. We hope to have close cooperation between Louisiana State University and the Pascagoula Laboratory in such utilization. Although we have made no final determination on the research proposal submitted by Pascagoula Technological Laboratory, we expect that LSU will continue to be our major contractor in the Gulf area on shrimp research. The work being undertaken at LSU as well as at other locations is a cooperative effort that should redound to the benefit of the shrimp industry as a whole.

Sincerely yours,

(Signed) Glenn T. Seaborg

Chairman

The Honorable James O. Eastland
United States Senate

Enclosure:
Ltr. to John Mavar

9-28-64

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

SEP 1 8 1964

Mr. John Mavar, Jr.
President
American Shrimp Canners
Association
P. O. Box 437
Biloxi, Mississippi

Dear Mr. Mavar:

This is in reply to your letter of September 1, 1964, concerning the desirability of research on the question of irradiation preservation of shrimp. As part of the Atomic Energy Commission's Irradiation Preservation of Foods Program, we are, as you know, investigating typical fish species in various regions of the country, with a view to establishing the potential commercial feasibility of this process. We recognize the fact that the shrimp industry represents a dollar value larger than any other national seafood and, of perhaps as great importance, is the fact that tests show that irradiated shrimp are wholesome and acceptable. With these facts in mind, about two years ago we initiated a research and development program at the University of Louisiana. The chief investigator, whom you may know is:

Dr. Arthur Novak, Head
Department of Food Science
and Technology
Louisiana State University
Baton Rouge 3, Louisiana

You will be interested to know that we are planning to submit a petition to the U. S. Food and Drug Administration by next June and expect to obtain a regulation permitting the commercial sale of irradiated shrimp. In connection with this petition we are supporting additional work also at the University to determine the normal incidence of certain pathogenus (C. botulinum, Type E) in Gulf waters.

We have plans for construction of a 16 ton, 4' x 5' x 8' lead shielded on-ship irradiator which will allow, as the name indicates, irradiation of fish at time of catch. We plan to utilize this irradiator in Gulf waters as well as in other areas. Most likely this work will be done under the direction of the present research group at Louisiana State University. However, as you are aware, we have received a proposal from the Pascagoula Laboratory of the Bureau of Commercial Fisheries of the U. S. Department of the Interior to do research work on radiation treatment of shrimp. The proposal is still under evaluation, but in any case we would hope to see a close cooperative effort between LSU and Pascagoula.

I am enclosing a copy of the latest annual report from LSU "Radiation Pasteurization of Shrimp", plus a copy of AEC's Program on Low Dose Irradiation Processing of Fish" and a summary of contractor accomplishments which include the results of the Louisiana work. The research work which has been carried out in various other regions of the country has an inter-relationship with and acts to support our program on Gulf coast shrimp.

We appreciate your interest and offer of assistance. I will send a copy of your letter and my letter to you to Professor Novak for his information.

Sincerely yours,

Kevin G. Shea, Ph.D., Chief
Radiation Processed Foods Section
Radiation Applications Branch
Division of Isotopes Development

Enclosures:
LSU Annual Rpt.
AEC Program on Low Dose Irradiation
Processing of Fish
Contractor Scope Notes

cc: Dr. Novak w/incoming

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United States Senate

COMMITTEE ON
LABOR AND PUBLIC WELFARE

Zip Code 20510

14 February 1964

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Doctor Glenn T. Seaborg, Chairman
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Doctor Seaborg:

Under date of 19 December 1961 you stated that the Commission "is currently carrying on extensive research and development work investigating many alternate methods for disposal of radioactive waste."

I will appreciate a current status report on this investigation, with particular reference to the enclosed proposal of Atomic Storage Company for development of nuclear industries and for atomic waste storage facilities near Valier, Montana.

Very truly yours,

Lee Metcalf

enclosure

2-1-64

Atomic Storage Co.

1525 JOSEPHINE STREET
DENVER, COLORADO 80206
TELEPHONE 303—322-8892

February 7, 1964

The Honorable Lee Metcalf
The United States Senate
Washington, D. C.

My dear Senator Metcalf:

In reference to my visit to your office January 16, 1964 to inform you of our proposal to AEC for the development of the area near Valier, Montana for the development of nuclear industries and for atomic-waste storage facilities, the following is a summary of the opinions expressed at our meeting with AEC January 17, 1964.

1. Deep-well disposal of the Hanford waste is not being considered by AEC.

2. Current plans by AEC do not include transporting the waste away from Hanford.

3. No nuclear industry is currently envisioned for Montana.

4. Deep-well disposal is being carried out experimentally at other AEC plants.

5. The technical reports on the proposed storage method will be reviewed by AEC.

I am enclosing a copy of our proposal for your reference. I have underlined passages which I feel will be of interest to you.

Two advantages to Montana which would result if the area is developed are (1) one of the pipelines (see page 11 of the proposal) could carry oil and gas from Montana to the West Coast, and (2) the other pipeline could carry water from the Columbia to Montana. The multiple use of these pipelines could amortize the pipelines and greatly benefit the U.S.A. and Montana.

I will continue to keep you informed of our progress.

FEB 10 1964

Additional references to previous versions of this project are letters to Senator Michael J. Mansfield and Dr. Glenn T. Seaborg from Petroleum Research Corporation dated August 11, 1961.

Very truly yours,

ATOMIC STORAGE COMPANY

William A. Colburn

William A. Colburn
President

WAC:cjc
Enclosures

cc: Senator Michael J. Mansfield, The United States Senate
Walter G. Belter, Atomic Energy Commission

MIKE MANSFIELD
MONTANA

Materials -12

United States Senate
Office of the Majority Leader
Washington, D.C.

February 11, 1964

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Seaborg:

As you will recall in 1961 there was some correspondence and discussion about an atomic waste storage facility on the Blackfeet Indian Reservation.

I now have the enclosed letter and attachments from Mr. William A. Colburn of Atomic Storage Company in Denver, Colorado. Apparently, this firm is interested in the further development of this proposal in a different area of my State. I would appreciate any up-to-date information you can give me on this matter which would be helpful in reviewing the proposal as it is presented to me.

Thank you in advance for your comments and please return the enclosures with your reply.

With best personal wishes, I am

Sincerely yours,

Enclosures

2-11-64

material 12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

January 6, 1964

MEMORANDUM FOR DR. PITTMAN
DIRECTOR, DIVISION OF REACTOR DEVELOPMENT

THROUGH THE GENERAL MANAGER

SUBJECT: RADIOACTIVE WASTE DISPOSAL

In 1959, the Joint Committee on Atomic Energy held extensive hearings and prepared a summary-analysis on the subject of radioactive waste disposal. In the summary-analysis (pages 4 and 34-37), estimates were made of the magnitude of the future waste disposal problem.

I would appreciate it if your staff would update this information in light of the latest forecasts on the size of the nuclear power industry.

Your comments on the seriousness of the waste disposal problem also would be helpful to me.

It is my hope that this information could be put in a form whereby it would be useful in answering questions and charges directed at the AEC.

James T. Ramey
Commissioner

cc: Chairman Seaborg
Duncan Clark
Secretariat

1-6-64

Mattin G-12

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : S. R. Sapirie, Manager, OR

DATE: JUL 17 1963

FROM : A. R. Luedecke
General Manager, Hqs. SIGNED, A. R. LUEDECKE

SUBJECT: AEC COOPERATION IN INDUSTRIAL DEVELOPMENT EFFORTS OF COMMUNITIES

This is in reference to your memorandum to the General Manager of July 3, 1963, on the above subject, and to a subsequent telephone conversation of July 9, 1963, between Wende and Mercer regarding Abbott Laboratories' request to be permitted to continue to dispose of their low-level waste in the burial ground at ORNL.

We understand that the request of Abbott Laboratories is the first case arising from the Commission's offer in the Slaton Report to consider requests, on a case-by-case basis, for the provision of specific services which are compatible with AEC operations and program requirements, until they are commercially available to the region on a convenient basis. We further understand that Abbott Laboratories is located within the City of Oak Ridge; that it has limited space available for its operations, including temporary storage of its waste; that it has shipped approximately 50 cubic feet of low-level waste per month to the burial ground; and that the nearest available commercial burial ground is owned and operated by the Nuclear Engineering Company, Inc., at Fleming, Kentucky, approximately 250 miles from Oak Ridge.

The advantage to be obtained by Abbott Laboratories, should their request be approved, would be the convenience of shipping wastes in their own vehicles and disposing of the materials as they accumulate in shorter intervals rather than utilizing limited space available to them for temporary storage in Oak Ridge prior to shipment to more distant burial grounds. A possible additional advantage, in the future, of using the ORNL burial grounds, would be the prompt disposal of carcasses in the event they undertake animal research that they are presently contemplating.

We also understand that only one other industry, Chemical Associations, Inc., has used the ORNL burial ground, which was for one shipment of approximately two cubic feet of waste in February 1963.

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7-17-63

In view of the foregoing, you are hereby authorized to approve the request of Abbott Laboratories. This approval of an exception to AEC's policy denying use of its burial grounds to licensees is not made on the finding that commercial burial services are not available to the region on a convenient basis. It is made in recognition of the facts that Abbott Laboratories is presently established in Oak Ridge, has utilized the ORNL burial grounds over the past several years and that denial of continued use of such grounds will impose a hardship on Abbott Laboratories. Accordingly, similar exceptions, if any, must be limited to firms presently established in Oak Ridge.

DATE:

INDEX: ~~PBC & Reg: Performance Bond by Licensees~~
Materials 12

TO:

FROM:

SUMMARY: Memo for the Commissioners frm. McCool transmitting testimony for Hearings July 17, 1963 before the JCAE on the Omnibus Bill of 1963 (S. 1795 and H.R. 7300)

FILED: Legal & Leg. Program

INDEXER: date of memo: 7-16-63

REMARKS:

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

7-16-63

AEC

Materials 12

B-425

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. F-105
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Tuesday, May 28, 1963)

AEC WITHDRAWS ITS LAND BURIAL SITES FOR LICENSEES

Because of the establishment of land burial sites by private industry the Atomic Energy Commission will withdraw from its "interim land burial" program for disposition of solid low-level radioactive wastes generated by licensed users of nuclear materials.

Land burial services for solid low-level wastes have been available to licensees at the Commission's Oak Ridge National Laboratory in Tennessee and National Reactor Testing Station in Idaho since 1960 under its interim program, pending the availability of permanent regional land disposal sites for licensees. AEC services will no longer be available to licensees for waste materials shipped on or after August 12, 1963. AEC's withdrawal is in line with its policy to foster industrial participation in the atomic energy program.

Land burial sites for low-level wastes have been established by Nuclear Engineering Co., Inc. in Nevada and Kentucky on state-owned land. Burial charges have been established by NECO not to exceed 80¢ per cubic foot at the Kentucky site nor $1.50 per cubic foot at the Nevada site. Arrangements for additional privately operated disposal facilities in New York State are being completed. Operation of the new sites must comply with standards approved by the AEC or state regulatory boards to assure public health and safety. Regular inspections will be conducted for compliance with these standards.

The AEC permits disposal of these low-level wastes by burial at approved federal- or state-owned sites on

(more)

3 rg's

land or by disposal in designated areas of the Atlantic and Pacific Oceans. Sea disposal was used for low-level wastes by a number of Commission licensees before the 1960 land burial program was established. Principally because of economic considerations, more than 95 per cent of the low-level wastes are now buried on land.

- 30 -

(NOTE TO EDITORS AND CORRESPONDENTS: This information is being issued simultaneously by the AEC's operations offices in Idaho Falls, Idaho; Las Vegas, Nevada; and Oak Ridge, Tennessee.)

5/28/63

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ROBERT E. JONES, ALA., CHAIRMAN
JOHN S. MONAGAN, CONN.
J. EDWARD ROUSH, IND.
WILLIAM J. RANDALL, MO.

ROBERT McCLORY, ILL.
GEORGE M. WALLHAUSER, N.J.

CAPITOL 4-[illegible]
EXTENSION [illegible]

EIGHTY-EIGHTH CONGRESS

Congress of the United States

House of Representatives

NATURAL RESOURCES AND POWER SUBCOMMITTEE
OF THE
COMMITTEE ON GOVERNMENT OPERATIONS
HOUSE OFFICE BUILDING
ROOM [illegible], GEORGE WASHINGTON INN
WASHINGTON 25, D.C.

May 24, 1963

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington 25, D.C.

Dear Mr. Chairman:

In its hearing of May 22, concerning the nation's problems of water pollution, the Natural Resources and Power Subcommittee examined the extent of water pollution caused by Federal installations, as shown in the 58 volume study entitled " Waste Water Disposal Practices at Federal Installations ", which was recently compiled by the Department of Health, Education, and Welfare, and the General Services Administration.

At my direction, the Subcommittee staff prepared an extract from those 58 volumes. This Extract lists the Federal installations and discharge points from which there is discharged each day to surface waters or the ground (not into sewers) either untreated sewage or untreated industrial wastes at a rate of 3,000 or more gallons, or non-water-borne wastes of 200 or more persons; and installations which had received notification of pollution conditions.

Enclosed is a copy of that portion of the Subcommittee Staff Extract pertaining to your agency, listing installations of discharge points of your agency which come within the foregoing criteria, as follows:

Atomic Energy Commission - (34)

The Subcommittee requests that your agecy, in cooperation with the Department of Health, Education, and Welfare, examine into each of these discharge points and advise this Subcommittee as follows:

(a) What are the circumstances and extent of the water pollution caused at these discharge points.
(b) What are your specific plans and time schedule for abating and controlling such pollution.

Please let us have your report by not later than June 20th. If you believe you will not be able to complete your examination and report by that date, please let us know promptly when you expect to furnish your report to us.

Sincerely,

Robert E. Jones

Robert E. Jones, Chairman
Natural Resources and Power Subcommittee

Enc.
CC: Hon. Anthony J. Celebrezze
Secretary of Health, Education, and Welfare

SELECTED ENTRIES FROM THE INVENTORY OF WASTE WATER DISPOSAL PRACTICES AT FEDERAL INSTALLATIONS

State	County	City	Dept. Agcy.	Bur	Installation	Pg.	Discharge Point	Sewage		Industrial Wastes				Notif. Date
								Gallons/day	% Trt	Gallons/day	% Trt.	% Cool	Type	
Col.		Grand Junction	AEC		Grand Junction Oper. Office	85	Gunnison River	-	-	6,000	0	20	Rad Ac	
		Grand Junction			Grand Junction Oper. Office	85	Ground	7,200	0					
		Rocky			Rocky Flats Plant	85	Walnut Creek	-	-	20,000	30	0	Rad Ac	
Fla.		Clearwater			Pinellas Plant	85	Cross Bayou Canal	-	-	25,000	40	45	Rad Ac	
Ia.		Burlington			Iowa Ordnance Plant	86	Plant sewers	-	-	-	-	-	-	9[illegible]59
		Burlington			Iowa Ordnance Plant	86	Brush Creek	-	-	-	-	-	-	9/2/59
Ky.		Paducah			Union Carbide Co.	86	Big Bayou Crk.	-		200,000	0	50	Rad Ac	
Mo.		Kansas City			Bendix Plant	87	Indian Creek			954,000	0	2	Misc.	5/17/60
		Weldon Spring			Mallinckrodt Chem. Works	87	Missouri R.			2,700,000	20	80	Rad Ac	
N.Mex		Albuquerque			Sandia Area Office	87	Ground			140,000	0	0	Misc.	
Ohio		Miamisburg			Mound Laboratory	88	Miami River			365,000	15	85	Rad Ac	
		Piketon			Goodyear Atomic Corp.	88	Scioto River			60,000	0	80	Rad Ac Misc.	
Penn.		West Mifflin			Bettis Atomic Power Lab.	88	Bull Run Stream			596,000	2	75	Rad Ac	
		West Mifflin			Bettis Atomic Power Lab.	88	Thompson Run			50,000	0	90	Rad Ac	
		West Mifflin			Bettis Atomic Power Lab.	88	Bull Run Stream			100,000	1	60	Rad Ac	
S.C.		Aiken			Savannah River Plant									
					300 - 700 Area	88	Ground			4,100	0	0	Rad Ac	
					200 - H Area	88	Ground			38,300	0	0	Rad Ac	
					200 - F Area	88	Ground			95,600	0	0	Rad Ac	
	Barnwell				400 - D Area	88	Savannah R.			50,000,000	0	50	Rad Ac	
Tenn.		Oak Ridge			Oro Y-12 Plant	89	E.Fk.Poplar Cr			10,091,000	0	25	Rad Ac Chem.	
					Oro Y-12 Plant	"	Ground			5,000	0	0	Rad Ac Chem.	
					Oak Ridge Natl. Lab.	89	Clinch River			2,200,000	0	80	Rad Ac	
					Oak Ridge Natl. Lab.	89	Clinch River			85,000	0	85	Rad Ac	
	Roane				Oak Ridge Gas Diff. Plant	89	Poplar Creek			360,770,000	1	99	Rad Ac	

SELECTED ENTRIES FROM THE INVENTORY OF WASTE WATER DISPOSAL PRACTICES AT FEDERAL INSTALLATIONS

State	County	City	Dept. Agcy.	Bur	Installation	Pg.	Discharge Point	Sewage Gallons/day	Sewage % Trt	Industrial Wastes Gallons/day	Industrial Wastes % Trt.	Industrial Wastes % Cool	Type	Notif. Date
Wash.		Richland	AEC		Hanford Oper. Office									
					100 B-C Reacto Area	89	Ground			700,000	0	93	Rad Ac	
					100 D-DR Reacto Area	89	Ground			690,000	0	87	Rad Ac	
					100 H Reacto Area	89	Ground			380,000	0	79	Rad Ac	
					100 F Reacto Area	89	Ground			350,000	0	86	Rad Ac	
					300 Area	90	Ground			2,368,000	0	0	Rad Ac	
					New Production Reactor	89	Ground	35,000	0					
					White Bluffs Area	90	Ground	28,800	0	115,200	0	0	Rad Ac	
					Biology Lab	90	Columbia River			80,400	0	0	Rad Ac	
					Biology Lab	90	Ground	46,600	0					
	Benton				PU Recy Reactor Fab PP	90	Ground	20,000	0					

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

MAY 23 1963

Honorable John O. Pastore
Chairman
Joint Committee on Atomic Energy
Congress of the United States

Dear Senator Pastore:

Reference is made to my letter of February 25, 1963, to Mr. Conway regarding the withdrawal of the Commission from radioactive waste disposal operations.

In May of 1960 the Commission announced that AEC licensees could use interim burial sites at Oak Ridge and Idaho pending the establishment of permanent burial sites. It had previously been determined that permanent burial sites should be established on Federal or state-owned land but would be operated by private contractors.

In September of 1962 the Nuclear Engineering Company, Inc., was licensed by AEC to perform land burial of low-level solid waste materials at a site in Nevada owned by the State of Nevada. Subsequently the company developed an arrangement with the State of Kentucky in accordance with which Nuclear Engineering conducts a waste burial operation on state-owned property. Since Kentucky is an agreement state with AEC, the latter operation is licensed by the state and not by the Commission.

As a part of its program to promote industrial participation in the atomic energy program and to avoid further use of AEC sites for the burial of licensee generated materials, the Commission, in view of the Nuclear Engineering Company action, is withdrawing its offer of interim waste burial services for shipments made after August 12, 1963.

It is recognized that AEC's withdrawal will require licensees at this time to use the services of Nuclear Engineering Company for land burial or the services of one of the commercial firms offering sea burial. This requirement caused AEC to examine the price structure offered by Nuclear Engineering Company as well as to examine the services to be offered. The services and prices have been found to be reasonable. It is anticipated that competitive services will be developed in due course. The State of New York has already given indications that a waste burial service will be offered in connection with its Western New York Nuclear Center. However, in the event there are any appreciable increases over the price structure offered by Nuclear Engineering Company, in the absence of other commercial firms offering similar services at these or lower prices, it will be necessary for the Commission to again offer to handle licensee waste material.

The Commission itself expects to utilize the private burial facilities for certain unclassified Commission generated low-level waste. However, wherever AEC has on-site burial facilities these will continue to be used for wastes generated at that site, but wherever waste must be shipped off-site for burial, such wastes may be sent to the private facility.

The attached public announcement will be issued in the near future.

If you have questions about this matter, we would be pleased to answer them.

Sincerely yours,

(Signed) Dwight A. Ink

Assistant General Manager

Attachment:
Public Announcement

bcc: General Manager
Office of Congressional Liaison (2)
Secretariat (2)

AEC WITHDRAWS ITS LAND BURIAL SITES FOR LICENSEES

Because of the establishment of land burial sites by private industry the Atomic Energy Commission will withdraw from its "interim land burial" program for disposition of solid low-level radioactive wastes generated by licensed users of nuclear materials.

Land burial services for solid low-level wastes have been available to licensees at the Commission's Oak Ridge National Laboratory in Tennessee and National Reactor Testing Station in Idaho since 1960 under its interim program, pending the availability of permanent regional land disposal sites for licensees. AEC services will no longer be available to licensees for waste materials shipped on or after August 12, 1963. AEC's withdrawal is in line with its policy to foster industrial participation in the atomic energy program.

Land burial sites for low-level wastes have been established by Nuclear Engineering Co., Inc. in Nevada and Kentucky on state-owned land. Burial charges have been established by NECO not to exceed 80¢ per cubic foot at the Kentucky site nor $1.50 per cubic foot at the Nevada site. Arrangements for additional privately operated disposal facilities in New York State are being completed. Operation of the new sites must comply with standards approved by the AEC or state regulatory boards to assure public health and safety. Regular inspections will be conducted for compliance with these standards.

The AEC permits disposal of these low-level wastes by burial at approved federal or state owned sites on land or by disposal in designated areas of the Atlantic and Pacific Oceans. Sea disposal was used for low-level wastes by a number of Commission licensees before the 1960 land burial program was established. Principally because of economic considerations, more than 91 per cent of the low-level wastes are now buried on land.

MAY 2 1 1963

H. L. Price
Director of Regulation

Ernest B. Trammel, Director
Division of Industrial Participation

EFFECT OF WITHDRAWAL OF AEC LAND DISPOSAL SITES ON THE USE OF SEA DISPOSAL

You expressed concern at the Commission Meeting on May 14, 1963, that the Nuclear Engineering Company-Nevada ceiling price for disposal of $1.50 per cubic foot as compared to seventy cents per cubic foot to licensees at AEC-Idaho, may result in increased use of sea disposal on the West Coast. Since the Kentucky price of eighty cents is so close to the present licensee price at Oak Ridge of seventy cents, there does not seem to be a parallel question on the East Coast.

We have talked to our San Francisco Office, who are unaware of any companies now offering sea disposal to licensees on the Pacific Coast and to our New York Office, who have in turn talked to people formerly in the sea disposal business in the East (particularly Cross Roads Marine). We also talked to NIH and the American Mail Line of Seattle, Washington who have a unique arrangement involving sea burial of waste generated at Boeing (they are not licensed to dispose of any other waste and do not offer any other service). As far as we are aware from conversations with Operations Offices and the Division of L&A, who has individual information on all sea disposals, the only two sea disposal activities now conducted are by American Mail Line and NIH.

American Mail Line charges $40.15 per 2,000 pounds of waste encased in concrete. This is material delivered to AML at their Seattle dock and does not include the cost of preparation, concrete, transportation to the dock. This amounts to a figure of approximately $2.90 per cubic foot from ship side to sea bottom. This price may go up if AEC becomes more restrictive as to disposal location. Heretofore, American Mail Line has been able to dispose of material once they had passed the continental shelf but "has heard that AEC may require them to go to a different location, not just 1,000 fathoms." If so, the price will go up.

AEC 180/23
Nits + 552

5/29/63

NIH ships about 50 tons per year of materials, including the weight of the concrete. The cost to NIH to prepare the waste and to move it to the Norfolk dock, from which the Coast Guard takes it to sea, is $10.37 per cubic foot. This figure does not include the Coast Guard charges.

By way of comparison, the total cost in the San Francisco Bay area for land burial at Nevada will be $3.00 to $6.00 per cubic foot primarily depending upon volume. This is the cost of collection, transportation and burial.

We have some earlier figures which show that the cost to the Navy for disposal, that is, excluding packaging and transportation to the sea port, were approximately $5.50 per cubic foot. The last information which the San Francisco Office has on this matter is a disposal bid of $3.50 per cubic foot, not including packaging in ICC approved containers.

The Naval Radiological Defense Laboratory in San Francisco has a license for sea disposal. In the past they have handled certain Livermore wastes; however, they are not handling Livermore material currently nor are they making sea disposals themselves. They are nevertheless retaining their license. Their last sea disposal was several years ago and cost approximately $7.50 per cubic foot, not including transportation charge to dockside (the material was generated near the site).

The view of the San Francisco Office and the New York Office, which I share, is that the withdrawal of AEC's land disposal sites will not tend to increase the use of sea disposal.

cc: Dr. Glenn T. Seaborg, Chairman
Commissioner James T. Ramey
W. B. McCool, Secretary
[illegible]

Matrix-12

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OPTIONAL FORM NO. 10
5010-104

Reference Section

UNITED STATES GOVERNMENT

Memorandum

TO : Ernest B. Tremmel, Director
Division of Industrial Participation

DATE: May 17, 1963

FROM : W. B. McCool, Secretary

Original signed by W. B. McCool

SUBJECT: AEC 180/23 - LOW-LEVEL SOLID RADIOACTIVE WASTE BURIAL

SECY:JPG

1. At Meeting 1932 on May 14, 1963, the Commission:

a. Approved the conclusions given in paragraph 18 of AEC 180/23;

b. Noted that Nuclear Engineering Company will be notified by letter such as Appendix "L", as revised, to AEC 180/23;

c. Noted that the Joint Committee on Atomic Energy will be informed by letter such as Appendix "K" to AEC 180/23; and

d. Noted that a public announcement such as Appendix "J", as revised, to AEC 180/23, will be made.

2. The Commission requested paragraphs 2 and 3 of the letter to Nuclear Engineering Company (NECO) be revised to reflect clearly that the Commission is not guaranteeing to provide NECO all AEC off-site waste materials and will re-establish its position on handling the waste burial matter in the event there are any appreciable increases in NECO's price structure and no other commercial firms are available offering similar services at or below NECO's prices.

3. The Commission also requested paragraph 2 of the proposed public announcement be revised to indicate the AEC's withdrawal of services pertains to "low-level" wastes. The announcement is to be augmented to reflect the fact that safety requirements have been carefully considered by the Commission.

4. You will recall that Commissioner Ramey requested he be provided with Livermore Radiation Laboratory cost data.

5-17-63

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Ernest B. Tremmel -2- May 17, 1963
AEC 180/23

5. You will also recall that Mr. Ink said staff would "double-check" the safety of NECO's sea disposal procedures.

6. The General Manager has directed you to take the action required by the above decision and requests. It is our understanding that your office is preparing the correspondence to the JCAE and Nuclear Engineering Company. Copies of these letters together with other pertinent correspondence should be provided the Office of the Secretary.

cc:
Chairman
Commissioner Ramey
Director of Regulation
General Manager
Deputy General Manager
Asst. General Manager
Asst. Gen. Mgr. for R&D
General Counsel
Controller
Director, Reactor Development
Director, Isotopes Development
Director, Research
Director, Operational Safety
Director, Radiation Protection Standards
Director, Production
Director, Military Application
Director, Public Information
Congressional Liaison

Materials 12

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May 10, 1963 — COPY NO. 75

AEC 180/23

ATOMIC ENERGY COMMISSION

LOW-LEVEL SOLID RADIOACTIVE WASTE BURIAL

Note by the Secretary

The General Manager has requested that the attached report by the Director of Industrial Participation be circulated for consideration by the Commission at an early date.

W. B. McCool

Secretary

DISTRIBUTION	COPY NO.	DISTRIBUTION	COPY NO.
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5-10-63

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X. PRC-1-1-Reg Radiation Protection Reg.

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AEC 180/23
MAR 10 1962

ATOMIC ENERGY COMMISSION

LOW-LEVEL SOLID RADIOACTIVE WASTE BURIAL

Report to the General Manager by the Director of the Division of Industrial Participation

THE PROBLEM

1. To consider withdrawal of AEC interim waste burial services to licensees in favor of privately operated low-level solid waste burial, and utilization by AEC of privately operated burial facilities for certain of its own waste materials.

BACKGROUND AND SUMMARY

2. In January 1960 the Commission determined and announced that regional disposal sites for permanent disposal of solid low-level packaged radioactive waste materials should be established as needed on State or Federal government-owned land, (Appendix "A"). It was indicated that these publicly owned disposal installations would be operated by private contractors or licensees or by the Federal or State Governments and would be available to all users of radioactive materials. At that time a number of AEC licensees were disposing of certain of their low-level waste material by transfer to commercial sea disposal firms operating under AEC licenses. It was stated that the latter activities would be affected by the AEC's land disposal policy only if convenience or economic factors induced disposal firms to use land burial facilities in preference to sea disposal sites.

3. Pending the establishment of permanent sites the Commission, in May of 1960, announced that AEC licensees could use interim land burial sites operated by the AEC at Oak Ridge and Idaho, (Appendix "A"). Licensees using these sites would be

required to package waste in accordance with Inter-State Commerce Commission regulations, pay transportation costs to the site, and pay a burial charge of seventy cents per cubic foot with a minimum charge of $21. These conditions and charges are in effect at the present time. The burial charge itself was developed on the basis of a "conceptual" burial ground, the details of which are set forth in Appendix "B". It will be noted that these charges include a factor for AEC overhead and allowances for land depletion and equipment depreciation, allowances for interest on unamortized investment during the actual burial period, costs during the custodial period and inflation, but do not include provisions for taxes, profit, R&D expenses, etc., which must be included in the development of a price for any commercial service. It may also be recalled that at least two companies objected to the AEC land burial program at the time it was initiated on the grounds that means for disposal were available to licensees (sea disposal).

4. Although sea disposal is still licensed by AEC, the existence of the AEC interim land burial sites and the resulting economics of disposal no longer make it an important service. More than 95% of low-level wastes are now buried on land. The Commission has no present plans to designate additional sites for disposal of low-level waste into the ocean since the present number of sites is more than adequate. Current licensees for sea and/or land disposal are listed in Appendix "C".

5. As indicated by its title, the Interim Waste Disposal Program was undertaken by the Commission as a means of providing licensees a place for land disposal of certain wastes prior to the time that alternate facilities were developed.

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6. The Nuclear Engineering Company, Inc. (NECO) which had been licensed to collect, transport and dispose of low-level waste at sea or at AEC interim waste disposal facilities, has completed an arrangement with the State of Nevada under which burial of radioactive waste on State-owned land is accomplished. The Company was licensed by AEC on September 10, 1962, to perform the burial services at the Nevada site. The Company also has an arrangement with the State of Kentucky in accordance with which Nuclear Engineering conducts a waste burial operation on a State-owned site in Kentucky. Since Kentucky is an agreement state with AEC, the operation is licensed by Kentucky and not by the AEC. It is expected that a third site will be placed in service in upper New York State in 1963 when arrangements for its management and operation are completed.

7. In a series of communications and a meeting with Nuclear Engineering, the Company emphasized strongly that its entry into the solid waste burial field was undertaken pursuant to its reading of AEC policy statements to the effect that the Commission would withdraw from supplying services in the atomic energy field when private sources are available. The Company particularly quoted the recent AEC report to the President, "Civilian Nuclear Power" which in discussing Service Industries (page 59) stated that: "Many of these are already under way since they could start on a small scale, and since they have been given considerable business by the AEC. They should be encouraged in every reasonable way. The AEC should give them as much of its own business as reasonable economy will permit, and, on no account, should it compete with them for private business except as an accommodation to industry in cases where no private capability exists."

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8. In a letter dated September 18, 1962, addressed to Dr. Seaborg, the Nuclear Engineering Company requested AEC to withdraw from the supply of low-level waste disposal burial services to licensees and to withdraw from the use of AEC waste burial facilities for all AEC off-site contractors, (Appendix "D").

9. In view of the stated AEC policy of discontinuing "actions currently performed in Government-owned facilities if and when commercial facilities are available to do the job at reasonable cost" (page 23, Annual Report of AEC for 1962), Nuclear Engineering was asked to provide cost and price information relative to their proposed services, so that AEC could ascertain the reasonableness of the cost of their service. Appendix "E" contains the cost information provided by the Company.

10. With respect to the prices and conditions of their services, the Company has now proposed to AEC a series of possible actions, and the resultant price structure, listed according to their preferences. Their letter of January 16, 1963, attached as Appendix "F", contains the following proposals:

a. NECO would charge not more than $ .80 per cubic foot at their Kentucky burial site if ORNL would accept no licensee or AEC off-site prime contractor waste.

b. NECO would charge not more than $1.50 per cubic foot at the Beatty, Nevada, site with Arco, Idaho, accepting no off-site waste, either licensee or prime contractor, with the exception of the Rocky Flats, Colorado, facility.

c. NECO would charge not more than $1.50 per cubic foot at the Kentucky site with ORNL accepting no off-site licensee waste.

d. NECO would charge not more than $1.75 per cubic foot at the Nevada site with Arco accepting no off-site licensee waste.

11. The reasonableness of these prices may be measured against three yardsticks:

a. The "adjusted" cost of AEC burial experience;

b. The anticipated costs of burial by Nuclear Engineering and resultant profits;

c. The effect upon the users of the service.

12. The Controller has examined AEC costs of burial at Oak Ridge and Idaho and has revised these to include additives required by Budget Bureau Bulletin 60-2. The detailed figures are set forth in Appendix "G". In the case of Oak Ridge, the cost of $0.73 per cubic foot is reasonably close to the $ .80 per cubic foot proposed charge by Nuclear Engineering in Kentucky. The cost at Idaho of $0.45 per cubic foot* is appreciably less than the Nuclear Engineering Company figure of $1.50 per cubic foot for its Nevada site. Nuclear Engineering Company has said that its Nevada unit charge is at this level because of the low load assumed under the terms of the offer, and the additional safety requirements imposed by Licensing & Regulation.

13. With respect to the anticipated cost of burial by Nuclear Engineering Company and the resultant profits, the rough NECO cost estimates and the proposed price structure indicate that NECO will probably be able to profitably operate the Kentucky site but may not be in a profitable position at the Nevada site until the volume of throughput increases.

14. Further analysis of the figures indicates that, as is frequently the case in comparing AEC and private operations, the significant factor is volume of throughput. The high fixed cost attendant upon such an operation as waste burial gives a rather great leverage effect of volume upon unit cost. The problem is illustrated by the fact that acceptance of the NECO proposal in FY 1962 would have resulted in burial by NECO of only 228,000 cubic feet, or 32% of the total burials at Oak Ridge and Idaho of 721,000 cubic feet.

*Excludes allowance for profit.

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15. The dollar effect upon AEC, other federal agencies and licensees utilizing the services of Nuclear Engineering Company, assuming adoption of proposals a. and b. of paragraph 10, and FY 1962 as base, are as follows:

Increased Annual Cost	Total All Users	AEC	Other Federal Agencies	Licensees
Table I				
A. Nevada rather than Idaho	$39,344	$27,062	$2,397	$9,885
B. Kentucky rather than Oak Ridge	14,312	7,363	1,291	5,658
	$53,656	$34,425	$3,688	$15,543

The explanation and details of the above are given in Appendix "H". However, if AEC does not use the Nuclear Engineering Company Service, but withdraws its offer to bury licensee material at Oak Ridge and Idaho, the added costs to licensees will be:

Table II:				
A. Nevada rather than Idaho	$12,974			$12,974
B. Kentucky rather than Oak Ridge	45,263			45,263
	$58,237			$58,237

The details of this are in Appendix "H".

16. The distribution of these effects upon individual licensees have been considered by reviewing the quantities of licensee material shipped by the individual licensees in FY 1962 and applying the differential dollar increases to them. It was noted that by far the largest number of licensees shipped very small quantities of material. (Appendix "I") Thus the increased cost to them is only a matter of a few dollars per year--certainly not enough to discourage their interest in atomic energy. (It may also be noted that companies like Nuclear Engineering provide a collection and handling service, the cost of which includes the burial cost; thus the total dollar charges to the small licensee-generators of waste material will not change appreciably by virtue of the change in the burial cost component.)

In the cases of the few shippers of waste such as Westinghouse, General Electric, General Dynamics, etc., the increased costs amount to more dollars but these are an insignificant part of the atomic energy expenditures of these companies. Accordingly, it does not appear that the proposed charges would, in the case of adoption of the Nuclear Engineering Company proposals a. and b. in paragraph 10 above, have any observable effect upon the atomic energy efforts of the licensees. If AEC itself does not use the commercial facilities, the situation, particularly with the respect to eastern licensees, becomes more burdensome to the licensees but still would not appear to provide a significant deterrent to the licensees' interest in development of the atomic energy field.

17. Certain low level wastes generated at AEC and contractor operations are classified and must be sent to a burial ground meeting appropriate security requirements. Therefore, any classified AEC waste must continue to be buried at an AEC burial ground until a commercial burial operation is certified for security burials and maintenance. Other special situations may also arise which would preclude the use of commercial services.

CONCLUSION

18. It is concluded that AEC should:

a. Withdraw, effective 90 days after Commission action of this paper, from its low-level waste disposal service to licensees.

b. Utilize commercial facilities for unclassified wastes as long as no undue financial or other burden on AEC results.

c. Accept, as reasonable, the following Nuclear Engineering Company pricing proposals as given in paragraph 10 a. and b. above and in Appendix "F":

(1) NECO to charge not more than $ .80 per cubic foot at the Kentucky burial site. ORNL to accept no off-site licensee or prime contractor waste.

(2) NECO to charge not more than $1.50 per cubic foot at the Beatty, Nevada, site with Arco, Idaho, accepting no off-site waste, either licensee or prime contractor, with the exception of the Rocky Flats, Colorado, facility.

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STAFF JUDGMENTS

19. The Controller and the Divisions of Reactor Development, Research and Radiation Protection Standards concur in the recommendation of this paper. The Division of Production concurs in the principle of having burial services for licensees performed by private industry and further that the prices to be charged for the Kentucky location appear to be reasonable for AEC use. However, the prices for burial services at the Nevada location are too high to be considered reasonable for AEC use. The Division of Military Application interposes no objection. The Office of the General Counsel has no legal objection. The Division of Public Information concurs in recommendation 20 d. and the Office of Congressional Liaison concurs in the letter to the Joint Committee.

RECOMMENDATION

20. The General Manager recommends that the Atomic Energy Commission:

a. Approve the conclusions given in paragraph 18 above.

b. Note that Nuclear Engineering Company will be notified by letter such as Appendix "L".

c. Note that the Joint Committee on Atomic Energy will be informed by letter such as Appendix "K".

d. Note that a public announcement such as Appendix "J" will be made.

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LIST OF ENCLOSURES

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AEC

APPENDIX "A"

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-12
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Thursday, January 28, 1960)

AEC FORMULATES POLICY FOR LAND DISPOSAL OF RADIOACTIVE WASTES; GOVERNMENT-CONTROLLED SITES TO BE ESTABLISHED AS NEEDED

The Atomic Energy Commission has determined that regional disposal sites for permanent disposal of low-level packaged radioactive waste materials shall be established, as needed, on State or Federal Government-owned land.

Placement of the waste materials in Government-owned lands, under long-term Government control, will assure adequate protection of the public health and safety throughout the period of any potential hazard.

Preliminary to the selection of regional sites, the Commission would conduct detailed studies of the geologic, hydrologic and topographic factors in connection with any proposed site in order to ascertain that a proposed site would retain the buried materials without contamination of the environment. Once a site is put into use, monitoring procedures will be established to insure that the operations are performed in a manner which will not endanger the surrounding area.

The Commission does not contemplate that the ownership and control of the sites must necessarily be restricted to the Federal Government. As the atomic energy industry grows and the need for new sites is established, the Commission anticipates that State Governments may wish to assume some responsibility in the establishment and control of sites for the benefit of their citizens.

(more)

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The publicly-owned disposal installations would be operated by private contractors or licensees under strict Government controls or by the Federal or State Government and would be available to all users of radioactive materials. Currently a number of Commission licensees are disposing of low-level waste material by transfer to commercial sea disposal firms operating under Commission license. Such activities would be affected by the Commission's land disposal policy only if convenience or economic factors induce disposal firms to use land burial facilities in preference to sea disposal sites.

Land requirements for disposal sites will not be large, as evidenced by the fact that over the last 15 years low-level solid or packaged wastes at Oak Ridge have been safely handled in approximately 60 acres. On the basis of this experience it is estimated that all such wastes generated between now and 1980 in the 16 states in the Northeast area, for example, could be safely disposed of in a 200 to 300 acre site.

Long-range estimates of the need for waste disposal facilities, arising out of the growth of the atomic energy industry, indicate that the establishment of the land disposal facilities will be required from time to time to insure continued maximum protection of the public health and safety.

It is expected that the first regional site will be needed in the northeastern part of the country where there is a relatively heavy and growing concentration of industrial, medical, university and other users of radioisotopes. The needs of other regions will be met later on as they develop.

Meanwhile, pending the establishment of permanent sites, consideration is being given to the use of interim sites located at AEC installations.

The types of low-level wastes to which the Commission's policy applies include broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia and other similar things which can no longer be used in experiments. Low-level liquid wastes are treated and disposed of at their points of origin under existing Government controls and regulations. High level wastes resulting from the chemical processing of irradiated fuels removed from reactors will continue to be stored in the

(more)

specially designed underground storage tanks at the Commission's Idaho; Hanford, Washington; and Savannah River, South Carolina, sites where these fuel elements are processed.

A pricing schedule for use of the land burial facilities is being established by the Commission. When the schedule is completed it will be published along with instructions detailing the procedures to be followed in disposal of wastes at approved sites.

In connection with the policy announced today, the Commission will propose an appropriate amendment of its regulation on standards for protection against radiation (Part 20). Under the existing Part 20, Commission licensees may dispose of very low concentrations of radioactive waste by burial in the soil. Under the proposed amendment, licensees could continue this practice for their own wastes, but the Commission would not approve an application for license to receive waste material from other persons for disposal on land not owned by the Federal or State Governments. The proposed amendment will be published in the Federal Register in the next few days. Interested persons may submit written comment within 30 days after publication.

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AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-85
Tel. HAzelwood 7-7831
Exc. 3446

FOR IMMEDIATE RELEASE
(Monday, May 9, 1960)

AEC DESIGNATES OAK RIDGE AND IDAHO FALLS AS INTERIM LAND BURIAL SITES FOR SOLID, PACKAGED RADIOACTIVE WASTES

The Atomic Energy Commission has established two interim land burial sites for the disposal of solid, packaged radioactive wastes generated by AEC licensees. The sites are located at the Commission's Oak Ridge National Laboratory grounds, Oak Ridge, Tenn., and at the National Reactor Testing Station near Idaho Falls, Idaho.

The two sites have been established pending later designation of permanent land burial sites to serve various areas of the country.

The sites at Oak Ridge and Idaho Falls are immediately available to licensees for disposal of packaged wastes. Wastes must be packaged as required by Interstate Commerce Commission regulations. Licensees will pay transportation costs. Charges for burial will be at a rate of 70 cents per cubic foot with a minimum charge of $21 for 30 cubic feet of packaged waste, or less.

The types of radioactive wastes to which the Commission's land burial policy applies include broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia, etc. Highly radioactive liquid wastes resulting from the chemical processing of irradiated fuels removed from reactors will continue to be stored in the specially designed underground storage tanks at the Commission's Idaho Falls, Idaho; Hanford, Wash.; Savannah River, S.C., and Oak Ridge, Tenn., sites.

(more)

Details concerning the disposal service available to licensees may be obtained by writing to:

Mr. E. J. Witkowski
Oak Ridge National Laboratory
P. O. Box F
Oak Ridge, Tenn.

or

Controller Branch
Phillips Petroleum Co.
P.O. Box 2067
Idaho Falls, Idaho

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APPENDIX "B"

DEVELOPMENT OF BURIAL CHARGES TO LICENSEES AT
OAK RIDGE AND IDAHO

	FUNDS REQUIRED TO BE SUPPLIED DURING 20 YEAR OPERATING PERIOD		
	Idaho 1/	Oak Ridge 1/	Total
Site and Development (Including 4% Interest on Unamortized Balance)	$ 817,240	$ 589,880	$ 1,407,120
Cost of operations (during burial period) (Including 15% added factor and inflation factor)	2,027,287	2,078,148	4,105,435
Custodial period costs (after burial ground area is filled) (Including 15% added factor and inflation factor)			
Fences	9,000	21,700	30,700
Wells	38,540	8,320	46,860
Water samples, caretaker, building maintenance, etc.	234,664	320,320	554,984
TOTAL	$3,126,731	$3,018,368	$ 6,145,099
Estimated volume of waste material to be buried in 80 acres (cu. ft.)			
	5,400,000	3,920,000	9,320,000

Cost per unit 6,145,099 ÷ 9,320,00 = $0.659 per cu. ft.

Recommended minimum charge: $ 21,00 for 30 cu. ft. or less.

Recommended price: Round $ 0.659 to $ 0.70 per cu. ft.

(This table is from the April 15, 1960, memorandum from the General Manager to the Commission entitled, "Burial of packaged radioactive wastes")

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APPENDIX "C"

PARTIES LICENSED FOR SEA AND/OR LAND BURIAL

As of November 30, 1962, there were six organizations licensed to conduct commercial services involving the disposal at sea of low activity, packaged radioactive waste. No new organizations were licensed during 1962. The licensed firms are: American Mail Line, Seattle, Washington; Allied-Crossroads Nuclear Corporation (formerly Crossroads Marine Disposal Corp.) Dorchester, Mass.; California Salvage Co., San Pedro, Calif.; New England Tank Cleaning Co., Cambridge Mass.; Nuclear Engineering Co., Pleasanton, Calif.; and Beatty, Nevada; and the Walter Tracking Co., New Britain, Conn.

With the exception of American Mail Line, the firms listed above are also authorized to conduct commercial waste disposal services by transfer to Commission-designated sites in Tennessee and Idaho for land burial. The following companies are authorized to conduct commercial waste disposal services by transfer for land burial only: Bay Cities Transportation Co., San Francisco, Calif.; Industrial Waste Disposal Corp., Houston, Texas; Laboratory for Electronics, Inc., Tracerlab Div., Waltham, Mass.; Long Island Nuclear Service Corp., Smithtown, N. Y.; Nuclear-Chem Disposal Corp.; Long Island, N. Y. ; Radiological Services Corp., Long Island, N. Y.; and U. S. Nuclear Corp., Burbank, Calif.

In addition, seven organizations continue to be authorized to dispose of their own low-activity packaged radioactive waste at sea. The licensed organizations are: California Research Laboratory, Richland, Calif.; National Institites of Health, Bethesda, Md.; Socony Mobile Oil Co., Paulsboro, N. J.; U. S. Fish and Wildlife Service, Beaufort, N. C.; U. S. Naval Radiological Defense Lab., San Francisco, Calif.; University of Georgia, Sapelo, Island, Georgia; and University of Hawaii, Honolulu, Hawaii.

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APPENDIX "D"

LETTER FROM NUCLEAR ENGINEERING COMPANY TO CHAIRMAN SEABORG
DATED SEPTEMBER 18, 1962

Dr. Glenn T. Seaborg, Chairman
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Seaborg:

Nuclear Engineering Company, Inc., respectfully requests that the Atomic Energy Commission notify all off-site generators of radioactive waste that in the future low and medium level waste materials will be disposed of through private agencies rather than at the National Reactor Test Site in Idaho or at the Oak Ridge National Laboratory in Tennessee.

Nuclear Engineering Company, a California corporation, is licensed by the Commission to dispose of radioactive wastes. We have been so licensed since 1957 and have provided disposal services for nuclear facilities throughout the United States. We pride ourselves in the fact that we have an unmarred radiological safety record for these five years of operation. We plan to continue the practice of extreme caution in all phases of our waste disposal operations.

On September 10, 1962, the Commission issued an amendment to our license authorizing the disposal of radioactive waste land burial in a site leased for that purpose for 99 years from the State of Nevada located near Beatty, Nevada. This is the first such license issued to private enterprise.

Nuclear Engineering's application for a similar license is currently being considered by the Atomic Energy Authority of the State of Kentucky. It is planned that this burial site be located near Flemingsburg, Kentucky. When this license is issued, Nuclear Engineering will have facilities capable of servicing and convenient to all nuclear facilities in the entire United States.

The Nevada site is located about 100 miles north of Las Vegas, Nevada, and is readily accessible by an all weather highway. Reno and its suburb, sparks to the north are divisional points on the South Pacific Railroad and Western Pacific Railroads. Las Vegas is a principal city on the Union Pacific Railroad. Flemings-burg is centrally located so as to be convenient to any prospective generator east of the Mississippi River. There are adequate rail and highway facilities from all points east of the Mississippi. It is thus readily apparent that no one will bear an extra burden if he is required to use one of these private facilities rather than the Commission-operated sites in Idaho and Tennessee.

We believe that the Commission is committed to a policy of withdrawing from competition with private industry in all areas involving applications of atomic energy where in national defense and public health and safety do not require their direct participation. We believe this policy is particularly applicable in the area of disposal of low and medium level radioactive waste. The Atomic Energy Act, itself, indicates in many areas Congress' intent that there be no competition between government and private enterprise when national defense or public health and safety are not endangered. Our belief is further bolstered by the fact that the news relase which announced that off-site waste would be accepted at Arco and Oak Ridge, described these areas as interim disposal sites.

It is stated Commission policy that we request be followed in this matter.

We realize that our company would be the only immediate beneficiary by this action. Others will stand to benefit in the future, however, the first probably being Nuclear Fuel Services, Inc., of Baltimore, Maryland, in their proposed New York Operations.

We will appreciate your serious consideration of the foregoing matter.

Sincerely yours,
NUCLEAR ENGINEERING COMPANY

Sgd. Terry D. Hufft
President

APPENDIX "E"

COST PROJECTIONS FROM NUCLEAR ENGINEERING COMPANY

BEATTY, NEVADA

	NEVADA	COST	YEARLY
1.	Building	$ 20,000	$ 1,000
2.	Fence	7,000	700
3.	Instruments	13,000	3,250
4.	Maintenance		1,500
5.	Lab Maintenance		1,200
6.	Crane	25,000	2,500
7.	Fork Lift - Large	13,500	1,350
8.	Fork Lift - Small	6,000	600
9.	Tractor	15,000	1,500
10.	Auto (1)	3,500	350
11.	Tanker	4,000	400
12.	Truck Tractor	8,000	800
13.	Gasoline	1,000 gal./Mo @.32¢	3,840
14.	Diesel Fuel	600 mo./ @.26¢	1,872
15.	Licenses (Auto-Truck)		2,360
16.	H. P. Supplies		1,500
17.	Site Maintenance		2,400
18.	Protective Clothing		3,500
19.	Equipment Maintenance		5,000
20.	Water Pump	4,000	400
21.	Storage Tank	4,000	400
22.	Insurance		4,000
23.	Telephone & TWX		3,600
24.	Office Overhead		2,400
25.	Travel Expense		5,000
26.	Bookkeeping		2,400
27.	Legal		3,600
28.	Misc. & Contingency		6,000
29.	Additional Fencing (1 Year)		1,000
30.	On Site Payroll & Taxes		48,079
31.	Administration		44,567
32.	.05 State of Nevada		5,000
		Totals	$ 162,0[illegible]3.00

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1 - Health Physicist	$ 900	
2 - Operating Engineer's	792 each	
2 - Laborers	500 each	
Overhead on Wages 15%		
November T. &. B.	$ 22,721	For 11 months
Administration	$ 79,567	
	$102,168	
	.40%	
	$ 40,867	
	$ 44,567	Adjusted for 12 months

Note:

These figures are based on 100,000 cubic feet per year.

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NUCLEAR ENGINEERING COMPANY, INC.

INSURANCE SCHEDULE - BEATTY, NEVADA

I.	COMPREHENSIVE LIABILITY:		
	A. Premises Liability	$ 121.85	
	B. Kenworth Trailer	1,116.60	
	C. 2 - 1962 Utility Trailers	634.48	
	D. 1 - 1962 Utility Converter Dollie	238.59	
	E. 1 - Utility Tank Trailer	81.53	
	F. 1 - Chevrolet Station Wagon	177.65	$2,370.70
II.	N.E.L.I.A. FACILITY POLICY		2,000.00
III.	BUILDING - OFFICE AND WAREHOUSE		579.40
IV.	EQUIPMENT:		
	A. D-8 Caterpiller Gerlinger Fork Lift Clark Fork Lift Northwest Crane	1,433.50	
	B. Storage Tanks, Instruments, Laboratory Equipment, Tools, Office Furniture and Fixtures	448.00	1,881.50
			6,831.60

Appendix "E"

ANNUAL RADIATION PROTECTION COSTS
ASSOCIATED WITH THE OPERATION OF A NUCLEAR
ENGINEERING COMPANY SITE FOR THE BURIAL OF
RADIOACTIVE WASTES

1. Radiation Detection Instrumentation for radiation monitoring.

2 - Juno, alpha, beta-gamma sensitive survey meters	@	$ 325.00	$ 650.00
2 - CP, beta-gamma sensitive survey meters	@	$ 275.00	$ 550.00
2 - CP, High range beta-gamma survey meters	@	$ 343.00	$ 686.00
3 - Thyac alpha sensitive GM survey meters	@	$ 225.00	$ 675.00
2 - Thyac alpha sensitive survey meters	@	$ 525.00	$1050.00
1 - Remote area monitoring system with four station units			$2045.00
6 - Pocket Dosimeters	@	$ 35.00	$ 210.00
2 - Staplex Air Samplers	@	$ 165.00	$ 330.00
1 - Minometer charger-reader for pocket dosimeter			$ 295.00

2. Radiation instrumentation for radioanalysis.

One laboratory type system for alpha beta-gamma radioanalysis of soil, vegetation, water and air samples.			$4000.00
Laboratory equipment forpreparation of soil, vegatation, and water samples.			$2600.00

3. Protective clothing and equipment.

(a) Clothing 3500 sets/yr.	@	$ 1.80	$3500.00
(b) Respirators, filters, decontamination suppliers, etc.			$1500.00

4. Maintenance.

Annual maintenance of instruments			$2500.00
Annual maintenance of laboratory equipment			$1200.00
		TOTAL	$20,79100

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ESTIMATED ANNUAL OPERATING COSTS

MOREHEAD, KENTUCKY

	KENTUCKY	COST	YEARLY
1.	Building	$ 20,000	$ 1,000
2.	Fence	7,000	700
3.	Instruments	13,000	3,250
4.	Maintenance		1,500
5.	Lab Maintenance		1,200
6.	Crane	25,000	2,500
7.	Fork Lift - Large	13,500	1,350
8.	Fork Lift - Small	6,000	600
9.	Tractor	15,000	1,500
10.	Auto (2)	7,000	700
11.	Tanker	4,000	400
12.	Truck Tractor	8,000	800
13.	Gasoline	1,000 gal./mo. @.32¢	3,840
14.	Diesel Fuel	600 mo./ @.26¢	1,872
15.	Licenses (Auto-Truck)		1,000
16.	H. P. Supplies		1,800
17.	Site Maintenance		2,400
18.	Protective Clothing		3,500
19.	Equipment Maintenance		5,000
20.	Storage Tank	4,000	400
21.	Insurance		6,900
22.	Telephone & TWX		3,600
23.	Office Overhead		2,400
24.	Travel Expense		2,500
25.	Bookkeeping		2,400
26.	Legal		2,400
27.	Misc. & Contingency		6,000
28.	Additional Fencing (1 year)		1,000
29.	On Site Payroll & Taxes		59,340
30.	Administration		44,567

31. .05 State of Kentucky		12,500
32. Site Acquisition	42,000	2,100
	TOTALS	$ 177,819.00

1 - Manager	$ 1,000
1 - Health Physicist	1,000
1 - Monitor	700
2 - Operating Engineer's	700 each
2 - Laborers	300 each
1 - Secretary	300
Overhead on Wages 15%	

November T. &. E.	$ 22,621	For 11 months
Administration	$ 79,567	
	$102,168	
	.60%	
	$ 40,867	
	$ 44,567	Adjusted for 12 months

Note:

These figures are based on 250,000 cubic feet per year.

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APPENDIX "F"

NUCLEAR ENINGEERING COMPANY PROPOSED CHARGES AND SERVICES
JANUARY 16, 1963

Maj. Gen. A. R. Luedecke (USAF Ret.)
General Manager
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear General:

Nuclear Engineering Company, Inc., entered the radioactive waste disposal field in 1956. In January of 1961, the Atomic Energy Commission opened the Arco, Idaho, and Oak Ridge National Laboratory burial sites to all licensees and prime contractors, when previous to that time they were not allowed to dispose of their waste at AEC sites. In November of 1962, NECO opened its waste disposal site at Beatty Nevada. In February of this year we will open our site in Kentucky.

Following are various proposals in order of our preference that we respectfully submit:

(1) NECO to charge not more than \$ .80 per cubic foot at the Kentucky burial site. ORNL to accept no off-site licensee or prime contractor waste.

(2) NECO to charge not more than \$1.50 per cubic foot at the Beatty, Nevada, site with Arco, Idaho, accepting no off-site waste, either licensee or prime contractor, with the exception of the Rocky Flats, Colorado, facility.

(3) NECO to charge not more than \$1.50 per cubic foot at the Kentucky site with ORNL accepting no off-site licensee waste.

(4) NECO to charge not more than \$1.75 per cubic foot at the Nevada site with Arco accepting no off-site licensee waste.

As of this date we have established a published price of \$ .80 per cubic foot at our Kentucky site. However, if ORNL continues in competition we, of course, cannot guarantee to hold to that price. We will greatly appreciate your early action on this matter.

Very truly yours,

Terry D. Hufft
President

APPENDIX "G"

COMPARISON OF AEC WASTE BURIAL COSTS WITH NUCLEAR ENGINEERING'S ESTIMATES

1. The attached table compares AEC's waste burial costs at Oak Ridge and Idaho for FY 1962 with Nuclear Engineering's estimated annual costs for the Kentucky and Nevada sites, on a BOB 60-2 basis. In addition, Nuclear Engineering's projected revenues and profit or loss are shown based on projected volume and the proposed prices for burial of licensee and AEC wastes except for Rocky Flats wastes and other AEC wastes buried on site.

2. Unit costs for the Kentucky and Nevada sites are based on annual quantities of burials, in cubic feet, estimated by Nuclear Engineering. An analysis of burials at Oak Ridge and Idaho in FY 1962 shows that annual quantities that would have been available in that year for burial at Kentucky and Nevada substantially lower than the Nuclear Engineering estimates. Thus, unit operating costs for the new sites may be higher than the estimates shown in the table unless there is an appreciable increase in waste volume.

3. An analysis of the costs and estimates presented in the table reveals the following:

a. Nuclear Engineering's estimated unit operating costs at the Nevada site are disproportionately high because of the projected low volume of burials.

b. From the interest on investment figures, computed at 4% per annum, it appears that Nuclear Engineering's investment at both sites is minimal as compared with AEC investment.

c. Estimated insurance costs at the Nevada site are 70% greater than at the Kentucky site, even though the projected volume at the Nevada site is 60% lower.

d. Total costs on a BOB 60-2 basis are about the same at Kentucky and Oak Ridge. However, the Nevada total is 276% greater than the Idaho total and 129% greater than the Oak Ridge total.

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AEC COST OF BURIAL AT OAK RIDGE AND IDAHO FOR FY 1962
COMPARED WITH ESTIMATED COSTS AND PRICES OF BURIAL AT
NUCLEAR ENGINEERING'S KENTUCKY AND NEVADA SITES

	USAEC - Oak Ridge FY 1962		Nuclear Engineering Inc. - Kentucky		USAEC - - Idaho FY 1962		Nuclear Engineering Inc. - Nevada	
	Annual Cost	Cost per Cu. Ft.	Annual Cost	Cost per Cu. Ft.	Annual Cost	Cost per Cu. ft.	Annual Cost	Cost per Cu. Ft.
Total Operating Costs	$247,200	$ .582	$ 97,452	$ .390	$ 87,351	$ .294	$ 85,501	$ .8[illegible]
Interest on Investment	28,325	.067	5,000	.020	18,356	.062	3,000	.03[illegible]
Insurance	10,275	.024	4,000	.016	10,246	.035	6,832	.0[illegible]
Administration	4,143	.010	63,867	.255	1,464	.005	67,567	.6[illegible]
Sub-Total	289,943	.683	170,319	.681	117,417	.396	162,900	1.6[illegible]
Caretaker Costs	21,233	.050	12,500	.050	14,833	.050	5,000	[illegible]
Administration - Caretaker costs	356	.001	-	-	249	.001	-	
Total Costs - BOB 60-2 Basis	$311,532	$ .734	$182,819	$.731	$ 132,499	$ .447	$167,900	$1.679
Profit or (Loss)			17,181	.069			(17,900)	([illegible])
Estimated Revenue and Price			$ 200,000	$ .800			$150,000	$1.500
Cubic Feet of Disposals	424,651		250,000		296,655		100,000	

NOTES

Total costs on a BOB 60-2 basis do not include an allowance for profit.

Nuclear Engineering's costs and burial quantities based on data submitted by the Company.

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APPENDIX "E"

COST EFFECT ON AEC, OTHER FEDERAL AGENCIES AND LICENSEE USERS OF NUCLEAR ENGINEERING COMPANY SERVICES

Part I - Assumes that AEC, other federal agencies and licensees will use Nuclear Engineering Company services at Kentucky and Nevada in accordance with proposals 1 and 2 of their letter of January 16, 1963 Appendix "F". All quantities based on FY 1962 experience.

			Increased Cost over Burial at AEC Site		
Source	Cu. Ft.	Price or Cost Differential Per Cu. Ft.	AEC	Other Federal Agencies	Licensees
A. Nevada rather than Idaho					
AEC	25,700	$1.053	$27,062		
Other Federal Agencies	2,276	1.053		$2,397	
Licensees	12,356	.800			$ 9,885
B. Kentucky rather than Oak Ridge					
AEC	111,560	.066	7,363		
Other Federal Agencies	19,554	.066		1,291	
Licensees	56,579	.100			5,658
	228,025		$34,425	$3,688	$15,543

Part II - Assumes AEC licensees will use Nuclear Engineering Company services at Kentucky and Nevada but AEC will not, in accordance with proposals 3 and 4 of their letter of January 16, 1963 (See Appendix "F"). All quantities based on FY 1962 experience.

			Increased Cost over Burial at AEC site		
Source	Cu. Ft.	Price or Cost Differential Per Cu. Ft.	AEC	Other Federal Agencies	Licensees
A. Nevada rather than Idaho					
Licensees	12,356	$1.05			$12,974
B. Kentucky rather than Oak Ridge					
Licensees	56,579	.80			45,263
					$58,237

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APPENDIX "I"

SUMMARY OF WASTE MATERIAL BURIED AT OAK RIDGE AND IDAHO

DISTRIBUTION OF BURIALS BY LICENSEES (ACCORDING TO VOLUME)
(FY 1962)

Quantity of Material Buried	Number of Licensees ORNL	IDAHO
Small (1-100 cu. ft.)	45	6
Intermediate (100-1000 cu. ft.)	21	2
Large (over 1,000 cu.ft.)	8	3

DISTRIBUTION BY TYPE OF SOURCE
(in cu. ft.)

OAK RIDGE NATIONAL LABORATORY

	Jul.-Dec. -61	Jan.-June '62	Jul-Dec. '62
I Cost-Type Contractors	----- 111,560 -----		75,408
II Federal Agencies	----- 19,554 -----		349
III Licensees	----- 56,579 -----		35,733

NATIONAL REACTOR TESTING STATION

	Jul.-Dec. -61	Jan.-June '62	Jul-Dec. '62
I Cost-Type Contractors			
(a) Rocky Flats		52,715	44,104
(b) All Other	21,386	4,315	15,551
II Federal Agencies	1,556	720	254
III Licensees	6,418	5,938	7,246

APPENDIX "J"

DRAFT PUBLIC ANNOUNCEMENT

AEC WITHDRAWS ITS LAND BURIAL SITES FOR LICENSEES

1. The Atomic Energy Commission will withdraw from its "interim land burial" program for disposition of low-level radioactive wastes generated by licensed users of nuclear materials because of the establishment of land burial sites by private industry.

2. Land burial services have been available to licensees at the Commission's Oak Ridge National Laboratory in Tennessee and National Reactor Testing Station in Idaho since 1960 under its interim program, pending the availability of permanent regional land disposal sites for licensees. These services will no longer be available to licensees for waste materials shipped after /date to be supplied/.

3. The Atomic Energy Commission permits disposal of packaged low-level radioactive wastes by burial at approved federal or state owned sites on land or by disposal in designated areas of the Atlantic and Pacific Oceans. Sea disposal was used for low-level wastes by a number of Commission licensees before the 1960 land burial program was established. Principally because of economic considerations, more than 95% of the low-level wastes are now buried on land.

4. Land burial sites have been established by private industry in Nevada and Kentucky on state-owned land, and arrangements for disposal facilities in New York State are being completed. AEC's withdrawal is in line with its policy to foster industrial participation in the atomic energy program.

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APPENDIX "K"

DRAFT LETTER TO THE JOINT COMMITTEE ON ATOMIC ENERGY

1. Reference is made to my letter of February 28, 1963, to Mr. Conway regarding the withdrawal of the Commission from radioactive waste disposal operations.

2. In May of 1960 the Commission announced that AEC licensees could use interim land burial sites at Oak Ridge and Idaho pending the establishment of permanent burial sites. It had previously been determined that permanent burial sites should be established on federal or state-owned land but could be operated by private contractors.

3. In September of 1962 the Nuclear Engineering Company, Inc., was licensed by AEC to perform land burial of low-level solid waste materials at a site in Nevada owned by the State of Nevada. Subsequently the company developed an arrangement with the State of Kentucky in accordance with which Nuclear Engineering conducts a waste burial operation on state-owned property. Since Kentucky is an agreement state with AEC, the latter operation is licensed by the state and not by the Commission.

4. As a part of its program to promote industrial participation in the atomic energy program and to avoid further use of AEC sites for the burial of licensees generated materials, the Commission, in view of the Nuclear Engineering Company action, is withdrawing its offer of interim waste burial services for shipments made on or after /date to be supplied/.

5. It is recognized that AEC's withdrawal will require

licensees at this time to use the services of Nuclear Engineering Company for land burial or the services of one of the commercial firms offering sea burial. This requirement caused AEC to examine the price structure offered by Nuclear Engineering Company as well as to examine the services to be offered. The services and prices have been found to be reasonable and satisfactory. It is anticipated that competitive services will be developed in due course. The State of New York has already given indications that a waste burial service will be offered in connection with its Western New York Nuclear Center.

6. The Commission itself expects to utilize the private burial facilities for certain unclassified Commission generated waste. However, wherever AEC has on-site burial facilities these will continue to be used for wastes generated at that site, but wherever waste must be shipped off-site for burial, such wastes may be sent to the private facility.

7. The attached public announcement will be issued on ____________________.

8. If you have questions about this matter, we would be pleased to answer them.

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APPENDIX "L"

PROPOSED LETTER TO NUCLEAR ENGINEERING COMPANY

1. In your letter of January 16, 1963, you submitted various proposals, in your order of preference, with respect to the burial of radioactive waste materials. The Commission, in accordance with its general policy to withdraw from its offers of services to the atomic energy industry when such services are available at reasonable prices from commercial sources, will cease to accept licensee generated low-level wastes shipped to Oak Ridge and Idaho, effective /date to be supplied/.

2. With respect to most waste materials generated by AEC or its contractors at sites not possessing burial facilities, AEC intends to use commercial facilities. As you know, competitive commercial burial sites are expected and the foregoing does not mean that you will automatically receive for burial AEC's off-site, unclassified waste materials. I do suggest, however, that you propose to the responsible AEC officials under whose jurisdiction off-site waste materials are generated, your specific proposals with respect to their materials.

3. In the event that there are any appreciable increases over the price structure stated in your January 16, 1963 letter, <u>and in the absence of other commercial firms offering similar services at these prices or below, it will be necessary for the Commission to review its position on its handling of the waste burial matter.</u>

[illegible] Waste Processing & Disposal

MAY 7 1963

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER HAWORTH
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER WILSON

Deputy
THROUGH GENERAL MANAGER

MAY 15 1963

(Signed)
R. E. Hollingsworth

SUBJECT: LARGE WASTE SHIPMENT FROM BNL TO OR

Brookhaven National Laboratory will make a shipment of radioactive waste by rail to Oak Ridge, Tennessee, scheduled to leave on May 19, 1963.

Since this is a large shipment (in physical size) and would be of public and industry interest, you may wish to have the following information:

The shipment is composed of 240 concrete vaults (about 19 tons each) containing contaminated steel piping, laboratory wastes, fission products from the research reactor and slurry, with about 3,030 curies radioactivity total. These vaults have been accumulating in a fenced-in area at the laboratories, since sea disposal was suspended.

A 34-car Pennsylvania Railroad train with the concrete vaults will leave Upton, New York, on May 20, 1963, at 1 p.m., scheduled to arrive at Oak Ridge on May 23 at 7 a.m. Since levels of radiation at the surfaces of the vaults may exceed the ICC requirements of 200 mr/hr at the surface at the time of loading by 250 or 350 mr/hr the shipment is escorted to avoid difficulties or misapprehension. En route, it will go to Long Island City, New York; transfer on floats to Greenville,

5-7-63

MAY 7 1963

[illegible] delivery by Pennsylvania Railroad to Cincinnati, Ohio, transfer to L and N railroad to Oak Ridge, where the casks will be transferred to [illegible] trucks to the burial ground at Oak Ridge.

No press release is being planned. Dresden, Brookhaven National Laboratory, Commission Offices, and the Oak Ridge Operations Office are prepared to answer inquiries, should they arise.

ORIGINAL SIGNED BY
Nathan H. Woodruff

Nathan H. Woodruff, Director
Division of Operational Safety

cc: AGMO
GM
Off. of the Sec. (2)
PI

OS:LRFF	OS:DIR	AGMO	AGM	GM	GM
Hayes:rel	Woodruff	Black			
5-7-63	5- -63	5- -63	5- -63	5- -63	5- -63

10

United States Senate

COMMITTEE ON APPROPRIATIONS

May 6, 1963

Honorable Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Chairman:

I understand that a hearing on the problems posed by atomic waste will be held by the Commission here in Washington within the next few weeks.

I would appreciate very much, if it has not already been done, having Mr. Alexander Grendon, Coordinator for California Atomic Energy Development and Radiation Protection, Room 1033, State Capitol, Sacramento, invited to testify.

With kindest regards,

Sincerely yours,

Thomas H. Kuchel

THOMAS H. KUCHEL
United States Senator

K:Hj

5-9-63

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GM/A DL 2294 K

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
WASHINGTON

MAR 12 1963

Dear Mr. Chairman:

Thank you for your letter of February 28, 1963. We are delighted to receive your most generous offer of cooperation in our efforts to assure optimal waste water disposal practices at Federal installations.

We appreciate as well your designation of Mr. Dwight A. Ink to act as coordinator for your agency, and we shall be pleased to call upon his assistance in any matters of mutual concern that may arise.

Sincerely yours,

James M. Quigley

James M. Quigley
Assistant Secretary

Honorable Glenn T. Seaborg
Chairman, United States
Atomic Energy Commission
Washington 25, D. C.

Gen Reference Section

FEB 2 8 1963

Dear Mr. Calebrezze:

The Atomic Energy Commission is most anxious to cooperate with the Department of Health, Education, and Welfare in the program of water pollution abatement referred to in your February 13 memorandum. As you know, the two agencies have cooperated for many years in the study, evaluation and resolution of many matters of mutual interest including waste disposal and water pollution control. The referenced pollution abatement program is therefore regarded as an extension of this established relationship rather than a new venture.

Mr. Dwight A. Ink, Assistant General Manager of this agency had previously been designated as coordinator in working with the Department of Health, Education, and Welfare on other matters and will serve as coordinator for this program as well.

We wish every success in the attainment of the goals of this effort and offer our cooperation to this end.

Sincerely yours,

(Signed) Glenn T. Seaborg

Chairman

Honorable Anthony J. Celebrezze
Secretary of Health, Education,
and Welfare

BCC: Chairman Seaborg (2)
A. R. Luedecke, GM
E. J. Bloch, AGMO

OS:MPS
ASchoen:as
2/26/63

OS:DIR	AGMO	AGM	DGM	GM
Woodruff	Bloch	Ink	Hollingsworth	Luedecke
2/ /63	2/ /63	2/ /63	2/ /63	2/ /63

Materials - #2 - Waste Disposal

OFFICIAL USE ONLY

Reference Section

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : File

DATE: February 27, 1963

FROM : W. B. McCool, Secretary

SUBJECT: AEC COMMENTS ON WASTE DISPOSAL TESTIMONY

SECY:JFG

1. At Meeting 1913 on February 21, 1963, Commissioner Haworth requested submission of appropriate AEC comments to the JCAE on testimony made by M. King Hubbert, National Academy of Sciences, at the 202 hearings on February 21.

2. AEC comments were subsequently forwarded to the JCAE by the General Manager's letter of February 26, 1963, copies of which are on file in the Office of the Secretary.

cc:
Chairman
General Manager
Deputy General Manager
Asst. General Manager
General Counsel
Asst. General Manager for Operations
Asst. Gen. Mgr. for Plans & Production
Director, Operational Safety
Director, Reactor Development
Director, Production
Congressional Liaison

Cy filed: MM-7-JCAE-202-Hearings

OFFICIAL USE ONLY

2-26-63

Materials 12 Waste Disposal

FEB 26 1963

Honorable John O. Pastore
Chairman
Joint Committee on Atomic Energy
Congress of the United States

Dear Senator Pastore:

During his testimony at the 202 hearings on February 21, Dr. M. King Hubbert made reference to the practice employed at certain AEC sites of disposing of low-level radioactive liquid wastes to the ground. He particularly noted that ground contamination at the Hanford site was approaching the bank of the Columbia River. We believe that the information to which Dr. Hubbert referred was that contained in an August 1962 report by the General Electric Company at Hanford, entitled "Fission Products Tritium in Separations Wastes and in the Ground Water." This letter is to provide additional information on this matter, which indicates that there is no reason at this time for believing that any health hazard is resulting from this practice.

The extent to which low-level radioactive liquid wastes may safely be discharged to the ground depends primarily on local soil and ground water conditions. The conditions prevailing at Hanford are particularly favorable for the adsorption of radionuclides in the soil, as a result of which large volumes of low-level liquid wastes have been discharged to the ground. The concentrations of radioactivity and the migration of radioactivity in ground water is carefully monitored by sampling from a large number of wells spaced over the plant site; at the present time, there are about 600 wells. Data obtained in this monitoring program indicates that the low-level wastes discharged in the separations areas, which are the primary sources of these wastes, tend to migrate in a southeasterly direction, toward the Columbia River. The most rapidly moving radionuclide is tritium, which would be expected since as tritium oxide it moves along with other water rather than being adsorbed in the soil. The only other radioisotope showing marked movement is ruthenium-106 which has a half-life of one year. Our well measurements indicate that the leading edge of tritium contamination is within one-half mile of the Columbia River at the present time where

mtg 1913

Cy in D.C. 2/21

the activity level is just about at the current routine detection limit of 10^{-5} microcuries per cc. The leading edge of the ruthenium contamination is about one and one-half miles from the river, and the activity level at this point is about 10^{-7} microcuries per cc. In contrast to these measured levels of activity, in the ground water the maximum permissible concentrations (MPC) applicable to the general population, for tritium and Ru-106, are respectively, 10^{-3} microcuries per cc and $3x10^{-6}$ microcuries per cc. Thus, the activity levels measured in the wells closest to the river are currently about one to three per cent of the maximum permissible concentrations.

The levels of concentration found in the ground water would, of course, be greatly reduced should the radioisotopes ever seep as far as the river. Indeed, it has been estimated that if all the fission product tritium generated at the Hanford plant were discharged directly to the Columbia River, the dilution would be such that the resulting concentration, 10^{-6} microcuries per cc, would represent only about 0.1 per cent of the MPC. If all the Ru-106 now being discharged to the ground should enter the Columbia River, the concentration would be so low as to be undetectable.

The above represents the best information currently available on the Hanford situation mentioned by Dr. Hubbert. Our measurements on the proximity of contamination to the Columbia River were obtained from 3 wells in that location. Obviously, additional data are needed before firm conclusions can be drawn. The activity levels vary from time to time due to a variety of factors, principally the level of the river and temperature gradients. Further data are to be obtained from new wells to be drilled as part of our continuing monitoring program.

Continuing efforts are being made to improve existing waste management techniques at AEC installations. For example, Oak Ridge has for several years been utilizing seepage pits for the disposal of intermediate level wastes. Realizing the limitations of this method from a long term standpoint, a new waste treatment facility is now being constructed and operation is planned for late 1964.

Concerning the statement that the waste disposal R&D program is suffering from budget limitations - it perhaps can be stated that all scientific or technical research and development programs could make good use of additional funds. The main

Page 2 ~~retyped~~ Rewritten
Lue lacke: lj
2-26-63

FEB 26 1963

objective of the radioactive waste management R&D program, i.e., to develop safe and economical methods for the treatment and final disposal of wastes resulting from reactor operations and reactor fuel reprocessing in the forthcoming nuclear power industry, is being accomplished, we believe, in a practical and reasonable manner. During the past one to two years the waste management R&D program has been in a transition from analytical and laboratory scale investigations to engineering scale field tests and demonstrations. Funds to cover the increased costs for such field tests have been allocated. As a result, engineering demonstration projects on the processing and ultimate disposal of high activity wastes have been initiated and are now satisfactorily proceeding.

In summary, we do not believe that the achievement of the major objectives of the waste disposal R&D program are being adversely affected in any significant way because of budgetary problems. The program is under continuing surveillance and it is firmly believed that waste management systems for the ultimate disposal of high activity wastes will not constitute any obstacle to the development of economical nuclear power and fuel reprocessing.

Sincerely yours,

SIGNED, A. R. LUEDECKE

General Manager

bcc: A. R. Luedecke, GM
F. P. Baranowski, Dir., PROD
F. K. Pittman, Dir., RD
R. X. Donovan, Cong. Rel.
Secretariat

Prod., DRD and DOS
have seen. G.F.Q.

ACMPP AGM DGM GM

GFQuinn/hm

2/25/63

3. On February 11, 1963, in celebration of Edison Day, high school students visited outside parts of the Hanford laboratory. Eight students, in two groups of four each, under General Electric escorts and wearing shoe covers and laboratory coats, entered room 104. Prior to departing from the building, all of the students were given hand and foot counts but were not surveyed with a thin window probe capable of detecting the soft beta radiation of promethium. After the spread of contamination became evident, the two General Electric escorts were surveyed and no contamination was detected on their clothing. The lunchroom where the students ate and the bus that transported them to the site were surveyed and no contamination was found. However, as a precautionary measure, at least five of the eight students and their homes will be surveyed. If any contamination is detected, the remaining three students and their homes will be surveyed.

4. The homes of the General Electric employees found to be contaminated by the incident were surveyed and contamination found in seven of them. The highest reading was a spot on a sofa, 14,000 d/m. The contaminated spots were removed.

The investigation is still continuing, and we will advise you of the latest developments.

The Joint Committee on Atomic Energy has been advised by telephone of the additional information on the incident.

ORIGINAL SIGNED BY
Nathan H. Woodruff

Nathan H. Woodruff, Director
Division of Operational Safety

bcc: GM
AGMO
Off. of the Sec. (2)
PI
INS
P&R
[illegible]
RD
CO

OS:ISFP	OS:ISFP	OS:DIR	AGMO	AGM	DGM	GM
Kley:arl	Haynes	Woodruff	Bloch			
2-10-63	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Mat 12 Waste Disposal

FEB 1 5 1963

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER HAWORTH
COMMISSIONER PALFREY
COMMISSIONER RAMEY
COMMISSIONER WILSON

THROUGH GENERAL MANAGER SIGNED, A. R. LUEDECKE

SUBJECT: ADDITIONAL INFORMATION ON THE SPREAD OF LOW-LEVEL CONTAMINATION AT RICHLAND

Reference is made to our memorandum dated February 15, 1963, informing you of a spread of low-level radioactive promethium 147 contamination on February 12, 1963.

The following additional information has developed during the investigation of the incident:

1. Testimony of some employees indicated that the contamination leakage actually occurred on Monday, February 11, at 11:45 a.m., rather than February 12.

2. While decontaminating laboratory room 309 on February 12, evidence of a small leak was noted on the floor below some lead-shielded vials containing promethium. Investigation revealed that a female employee on February 11, while preparing dilution samples for counting in laboratory room 303, noted a high reading of approximately 300 mr/hr on a lead container having five or six small vials of promethium. The employee took the lead-shielded vials to room 309 and requested her supervisor to assist in diluting the samples to the radiation level which the employee is authorized to handle. A slight amount of contamination was found on the clothing worn on February 11, 1963, by the female employee when her home was surveyed on February 13.

2-15-63

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THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON

February 13, 1963

Dear Mr. Ch irman:

This Dep tment is grateful for the cooperation of your staff in helping us compile the federal inventory, "Waste Water Dispos Practices at Federal Installations." A copy of the published report, relates to your operations, is being sent to you with this r.

In o to carry out the President's instructions of December 14, which were relayed to you by White House memorandum of December 17, this Department has set up the action program which is described in the attached memorandum. We believe this program will make it possible to meet the President's wishes that our Federal establishments sho an example in water pollution abatement.

Mr. . Quigley, Assistant Secretary of this Department, has been designated coordinator of this program and it is hoped that you will wish to designate someone in your organization who will be able to work with him where necessary on national developments and olving problems. However, the program as we envision it will primarily carried on at regional level, through the Regi Program Directors of this Department working with the head operating installations in the field.

We will be pleased to send you a supply of the attached field memorandum which you in turn can send on to your people in the field. Extra copies of "Waste Water Disposal Practices at Federal Installations" are also available if you wish them.

Sincerely

Secretary

Hon e lenn T. Seaborg
Cha omic Energy Commission
Wash 25, D. C.

Encl.

Mtg. 63-12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D.C.

JAN 11 1963

Honorable John O. Pastore
Joint Committee on Atomic Energy
Congress of the United States

Dear Senator Pastore:

This is to confirm the response to telephone inquiries made by your staff concerning the Navy plans for holding nuclear waste at the Davisville, Rhode Island, Naval Base.

The Navy awarded a contract in December for the construction of a small concrete pad with a fence enclosure to be used for temporarily holding Antarctic nuclear power plant waste before shipment to a disposal site.

Shipment of the waste out of the Antarctic area has nothing to do with the level of radioactivity of the material. The planned shipments result from the fact that to accommodate the wishes of several nations and in order to encourage special research in background type radiation, the United States agreed to the inclusion of a provision in the Antarctic Treaty prohibiting the disposal of radioactive wastes in Antarctica.

No shipments of nuclear waste from the Antarctic have as yet been made nor has a disposal contractor been selected. It is anticipated that one shipment of waste per year will be made beginning in 1964.

The waste is not of a high radiation level and can be disposed of safely. It includes such items as spent ion exchange resins (chemical compounds used to purify water), rags, paper and glassware. The waste material will be packaged in the Antarctic in conformance with the same ICC and Coast Guard regulations that pertain to the packaging of such wastes in the United States. Approximately 10 drums of resin waste and 35 drums of waste of the rags and paper type will be shipped each year. The first year's shipment will be in greater quantities because of previous accumulation.

Info Mtg 230 & 231

1-11-63

Shortly after the waste is brought to Davisville, it will be shipped by an AEC-licensee to an authorized burial site. Present practices for this type of disposal provide for shipment to a government site such as Oak Ridge, Tennessee, for land burial.

Current Navy policy on radioactive waste disposal provides that commercial services will be used whenever available. Such commercial firms must be licensed by the AEC.

In closing, we should like to emphasize that the waste holding operations at Davisville will in no way endanger the health and safety of the public or the personnel involved in the operations.

We will be glad to provide you with any additional information you may require.

This letter has been coordinated with the Navy Department.

Sincerely yours,

SIGNED, A. R. LUEDECKE

General Manager

DISTRIBUTION:
Subject
Reading
GM (2)
AGMRD
Cong. Liaison (2)
RD:D
RD rdg (2)
Army rdg
NPD/OCE/MC
WRB (Myers)

RD:PA
Jackson:lep/fjb

Secretariat

DL

Materials - B-Waste Reasoning

DEC 1 1962

Dear Mr. Westland:

Reference is made to your letter dated November 14, 1962, requesting information on waste disposal. In this connection, I am enclosing a number of reprints, copies of technical articles, and two annual reports. The Atomic Energy Research Report for 1961 covers waste management studies on the research and development activities in this field; details on this work begin on page 263. A second annual report, dated January, 1962, covers major activities in the AEC programs and includes a summary of the waste management activities on pages 129 to 135. Details of the waste disposal programs were featured in the 1959 Annual Report to Congress and a reprint of this material is enclosed, entitled "Management of Radioactive Wastes, January 1960.

As you will recall, the most comprehensive report on the treatment and disposal of radioactive wastes is covered in Volumes 1-5 (over 3100 pages), Industrial Radioactive Waste Hearings Before Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, 86th Congress, First Session, on Industrial Radioactive Waste Disposal, January 28 to February 3, 1959. A set of these volumes is being forwarded under separate cover for your convenience.

I hope that this material will be helpful.

Chairman (2)
GM
AGMRD
CONG (2)
LR

Sincerely yours,

(Signed) Glenn T. Seaborg

Chairman

Honorable Jack Westland
House of Representatives

Enclosures:
As listed above (13)

12-1-62

NOV 1 4 1962

Honorable Thomas N. Downing
House of Representatives

Dear Mr. Downing:

This letter is in reply to your letter to Chairman Seaborg dated August 16, 1962, concerning a proposed "American Shellfisheries Act of 1963." Conversations with Mr. Norman L. Dobyns of your office revealed that the chief intent of your letter to Chairman Seaborg was to solicit our views with respect to whether procedures for radioactive waste disposal into the oceans and seas should be included in the proposed "American Shellfisheries Act of 1963."

Pursuant to the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has established procedures which govern the disposal of radioactive waste into the oceans and seas. Public notice is given when a person files a license application for such disposal. After the AEC has reviewed the safety of the proposed operations and decides that such operations will not unduly endanger the health and safety of the public, public notice is again published stating that the AEC proposes to issue the license and offering the applicant and any interested person the opportunity to request a hearing. Public notice is again given when the AEC finally issues the license. The AEC keeps the officials in the state of residence of the applicant fully informed of the licensing action.

The safety criteria used by the AEC for disposal of radioactive wastes take into account the potential adverse effect of radioactivity on marine life, including shellfish. The AEC authorizes the disposal of packaged low level radioactive waste in designated areas in the Atlantic and Pacific Oceans at a minimum depth of 1000 fathoms (6000 feet). This requirement assures safe dilution and disposal of any radioactivity which ultimately may be released so that there will be no adverse effects on marine life, including shellfish.

Environmental surveys of the Atlantic and Pacific radioactive waste disposal sites have been periodically conducted. These surveys have shown within experimental error that no radioactivity above natural background radiation in the water, sediments or in marine life in the disposal areas.

11-16-62

In its continuing program of development of safety criteria for disposal of radioactive waste in the ocean, the AEC carefully considers recommendations and reports of the Committee on the Effects of Atomic Radiation in Oceanography and Fisheries of the National Academy of Sciences, the National Committee on Radiation Protection and Measurements, the Federal Radiation Council, and the results of research in this area from other authoritative scientific groups.

The AEC has also entered into a procedure of cooperation with the Fish and Wildlife Service of the Department of Interior under which the Fish and Wildlife Service will keep the AEC advised of results of research which might indicate the need for revisions in the criteria and standards for waste disposal as they relate to permissible concentrations of radioactivity in sea water for marine life. The AEC also informs and seeks the advice and recommendations of the Fish and Wildlife Service of AEC activities that might affect the condition of fish and wildlife.

In 1960 the Commission designated its facilities at Oak Ridge, Tennessee, and Idaho Falls, Idaho, as sites to which AEC licensees could ship low level waste for land burial. A license was also recently issued for burial of low level waste on state owned land in Nevada. Principally because of economic considerations, more than 95% of the low level waste generated in the United States are now buried on land.

No new licenses for the disposal of radioactive waste into the oceans have been issued since August, 1959, pending a study of the integrity of sea disposal containers. The AEC is currently preparing a regulation which will specify requirements and criteria for sea disposal containers for radioactive waste.

We believe that the measures we have described are adequate to protect the public health and safety as well as marine life; and that, consequently, there is no apparent need for coverage of radioactive waste disposal in the proposed "American Shellfisheries Act of 1963."

If we can be of any further assistance to you, please do not hesitate to write.

Sincerely yours,

(Signed) Dwight A. Ink

Assistant
General Manager

Materials - 12

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. E-340
Tel. HAzelwood 7-7831
Ext. 3446

FOR USE IN NEWSPAPERS OF
SUNDAY, SEPTEMBER 30, 1962

NOTE TO EDITORS AND CORRESPONDENTS:

The following information is being provided by the Atomic Energy Commission in connection with publication of a study by a working group of the Committee on Oceanography of the National Academy of Sciences-National Research Council, entitled "Disposal of Low-Level Radioactive Wastes Into Pacific Coastal Waters." This report is being made available today by the National Academy of Sciences, for use in newspapers of Sunday, September 30.

The Atomic Energy Commission permits disposal of packaged low-level radioactive wastes by burial at approved sites on land or by disposal in designated areas of the Atlantic and Pacific Oceans. Disposal has been performed by authorized AEC licensees or Commission contractors. The Commission requires that sea disposal of these packaged low-level wastes be made at a minimum depth of 1,000 fathoms (6,000 feet) to assure safe dilution and dispersal of any radioactivity which ultimately may be released.

In 1958 AEC requested the National Academy of Sciences-National Research Council Committee on Oceanography to study disposal of these low-level wastes into deep waters of the Pacific Ocean. The report being released today is in response to that request. Further, it deals with considerations and recommendations for planning future waste disposal in the Pacific. The Commission has no present plans to designate any additional sites for disposal of low-level wastes into the ocean. Three designated sites off the Pacific Coast have been used in the past. All of these sites have a minimum depth of 1,000 fathoms.

9-30-62

(more)

The NAS report will be carefully considered by AEC, together with results of other research work which has been performed on this subject, as part of the Commission's continuing program of research, evaluation and criteria development concerning sea disposal.

Typical low-level wastes disposed of at sea are paper wipes, rags, broken glassware and other laboratory paraphernalia which are packaged in concrete to assure that the containers maintain their integrity while descending to 1,000 fathoms in the ocean, the minimum depth required by AEC.

The principal site for ocean disposal off the Pacific Coast has been an explosives dumping area on the seaward side of the Farallon Islands, approximately 48 miles west of the Golden Gate. Since 1946 approximately 14,800 curies of radioactive material (at the time of preparation for disposal) have been disposed of at this site; of this total, approximately 600 curies have been disposed of in the last four years.

Other sites which have been used in the past are in the Santa Cruz Basin, approximately 32 miles southwest of Port Hueneme, California, where approximately 100 curies of low-level waste (at the time of preparation for disposal) have been disposed of, and a site 130 miles southwest of Point Arguello, California, in about 2,000 fathoms of water, where approximately 33 curies of low-level waste (at the time of preparation for disposal) have been buried. The Santa Cruz Basin site no longer is used for ocean disposal.

Extensive environmental surveys of the Farallon Islands and Santa Cruz Basin sites have been conducted. These surveys, made in 1957 and again in 1960, showed no radioactivity above natural background radiation in the water, sediments or marine life in the disposal areas.

The National Academy of Sciences panel notes that, if needed, as many as 20 sites for sea disposal of low-level radioactive waste could be safely established from the Mexican Border to the Columbia River, with a similar number north of the Columbia River. As noted above, AEC has no present plans to increase the number of sea disposal sites for packaged waste, since the present number of sites is more than adequate to handle the small amount of low-level wastes being disposed of at sea.

In 1960 the Commission designated its facilities at Oak Ridge, Tennessee, and Idaho Falls, Idaho, as sites to which AEC licensees can ship low-level wastes for land burial. AEC recently issued a license for burial of low-level wastes on state-owned land in Nevada. Principally because of economic considerations, more than 95 per cent of the low-level wastes now are buried on land.

- 30 -

(NOTE TO EDITORS AND CORRESPONDENTS: This information is being issued simultaneously by the Commission's San Francisco Operations Office at Berkeley, California.)

9/30/62

FORM AEC-204
(8-47)

DATE:

~~Materials 9~~

INDEX: Materials 12 Waste Disposal

TO:

FROM:

SUMMARY: AEC 1067/7 - REVIEW OF NAVY INSTRUCTIONS FOR MANAGEMENT OF RADIOACTIVE MATERIALS, WASTES AND ACCOUNTABILITY OF SNM
To consider instructions submitted by the Navy for control and disposition of materials re the above.

FILED: MRAS 3 Hazards of Military Reactors

INDEXER: date of paper: 8-3-61

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: E.A.Ruhl 6-30-99 DOE/NN-523

THIS PAGE ONLY

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

☆ U. S. GOVERNMENT PRINTING OFFICE—1960—

JUL 13 1961

Dear Senator Schoeppel:

Reference is made to your letter dated June 26, 1961, concerning a contract between the Union Carbide Nuclear Company and the Carey Salt Company providing for the use of the Lyons, Kansas mine for carrying out waste disposal experiments.

The enclosed copies of the above-mentioned contract and supplements thereto are being forwarded as requested. The basic agreement gives the Union Carbide Nuclear Company the right to use radioactive materials and tracers in the Lyons mine and radioactive tracers in the Hutchinson mine, subject to approval of the Carey Salt Company.

The experimental programs planned at Hutchinson and Lyons during Fiscal Year 1962 do not contemplate the use of radioactivity. They will consist of additional heat flow measurements, using electrical heat sources, and measurements of the movement of salt under various conditions of heat and stress. Current plans do not include use of tracers, however, should tracer tests be considered advisable as the program progresses, it is expected that quantities less than 1 curie of strontium or cesium would be used.

If results meet our expectations on the experimental work programs, it is planned to use solid calcined high-activity waste in the Lyons mine that has been processed and sealed in containers in the Idaho Chemical Processing Plant. The wastes will not be available before July 1962, so these experiments, which may involve multicurie quantities of radioactive wastes of the full spectrum of fission products, will not be started before July 1963.

Plans for tracer experiments, if any, and more specific plans for high-activity radioactivity studies, when available, will be reviewed with the Kansas State Board of Health and State Geological Survey before initiation of any work involving radioactivity. The

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7/7/61	7/ /61	7/ /61		7/ /61		7/ /61	7/ /61

7-13-61

experimental work that has been carried out in the past also has been handled in this manner.

It is hoped that the above information will be useful. We will be glad to answer any further questions you may have on this matter.

Sincerely yours,

(Signed) Glenn T. Seaborg

Chairman

Honorable Andrew F. Schoeppel
United States Senate

Enclosures:
Subcontract No. 2070
Purchase Order Subcontract 961-A2126-[illegible]
and Supplements No. 1, 2, 3, 5

Filed in Bulky Package

Subj
RC rdg
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OS
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Cong Rel (2)

Materials-12 G-819

August 10, 1962

Honorable Clair Engle
United States Senate

Dear Senator Engle:

Your request to the Department of State for general information regarding the disposal of radioactive wastes has been referred to the U. S. Atomic Energy Commission for response. I am pleased to enclose a copy of a report entitled "Management of Radioactive Wastes," U. S. Atomic Energy Commission, January 1960. This report is a review of the AEC program for the management of radioactive wastes.

Should you desire further information on specific aspects of our program such as sea disposal, ground disposal or treatment of high level wastes, we will be very happy to make this available to you.

Sincerely yours,

SIGNED

Charles H. Palmer
Acting Director
Division of Special Projects

Enclosure:
Report "Management of Radioactive Wastes"

CC: Cong. Liaison, H. Donovan (2)
Secretariat
Russell Price, Dept. of State, [illegible], Rm 4207
[illegible] Reading File

DSP	DSP	CONG. LIAS.
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8/10/62	8/10/62	8/ /62

Smith

Material - 12 - W - [illegible]

LOVINGOOD STONE AND BRICK, INC.

301 SCHOOL AVENUE
P. O. BOX 2064
SARASOTA, FLORIDA

PHONE [illegible]

December 3, 1962

Atomic Energy Commission
Washington, D. C.

Attention: Dr. Glen Seaborg, Director

Dear Dr. Seaborg:

For years I have found interest in and followed the efforts of the Atomic Energy Commission to dispose of its waste products and have just witnessed a TV program pertaining to this problem.

I realize that it is presumptuous for a layman to offer any suggestion to such a highly competent and learned department; however, through experience gained in our own small free enterprise, it has become increasingly obvious that if but given sufficient time, the waste products of today in some future time become more valuable than the prime product. This is true here in our State in the citrus industry. At first, the only recognizable value was the orange juice but today literally thousands of far more valuable products are being extracted from yesterday's waste.

In our own small retail stone and building material business, I have found that the majority of our sales come from products that were once considered to be waste. The mere fact that there was no danger involved in the disposition of these waste products enabled them to be preserved for a useful purpose at this time.

It has occurred to me, therefore, that a similar situation could possibly exist in your own department and that the waste products of today could, in all probability, be stored in some of the thousands of abandoned coal mines or other underground operations. The Georgia Marble Company in Tate, Georgia, for an example, have through their underground quarrying, excavated giant rooms hundreds of feet below the mountains with ceilings up to 200 feet in height and literally acres of floor space.

12-3-62

9m/A
1445

I am so firmly convinced that the minds of man will unlock the hidden treasures of the products that this department now finds to be a most difficult and costly task to dispose of that I offer this simple suggestion in hopes that its merits will be given the fullest consideration in behalf of the coming generations.

Respectfully yours,

Joe Z. Lovingood

JZL:jh

M AEC-204
(3-57)

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: Materials 12 Waste Disposal

TO:

FROM:

SUMMARY: ~~Memo~~ ltr. to the Dept. of State re disposal of packaged low-level radioactive waste in the Gulf of Mexico.

FILED: IR&A 6 Reg. Industrial Waste Disposal Corp.

INDEXER: date of ltr: 12-28-61

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: E.A. Pohl 6-30-97 DOE/NN-523
THIS PAGE ONLY

12-28-61

Ma (?) - 12

UNCLASSIFIED

November 27, 1961

AEC 180/21

COPY NO. 58

ATOMIC ENERGY COMMISSION

ATOMIC WASTE STORAGE FACILITY ON BLACKFEET INDIAN RESERVATION

Note by the Secretary

The attached letter responding to Senator Mike Mansfield's letter of October 20, 1961, is circulated for the information of the Commission.

W. B. McCool
Secretary

AEC 180/21

attachments to file in B P

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1. P3C-1-Reg. By-product Reg.
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P3C-1-Reg. Source Material
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Security & Reg. Materials

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

November 20, 1961

Dear Senator Mansfield:

This is in reply to your letter of October 20, 1961* regarding the proposed development of an atomic waste storage facility on the Blackfeet Indian Reservation in Montana. In light of Petroleum Research Corporation's proposal to inject high activity radioactive waste into preferred geologic formations, the answers have been confined to this type of waste only. The questions have been numbered in the order in which they appear in your letter.

1. Approximately 99% of the high-activity radioactive waste is generated at uranium and plutonium processing plants. The great potential hazard of the waste, coupled with the unknown effects of releasing copious quantities of high-energy (and therefore heat-producing) radioactive waste to the environment, has resulted in the storage of these liquid wastes in specially constructed underground tanks located within the site of the fuel processing plants. Though the wastes are thus contained, intensive measures are still taken to monitor the storage sites so that any leakage would be quickly detected. For the above reasons of safety and because of the obvious economies inherent in maintaining storage facilities as close to the source as practicable, the Commission has not sought off-site facilities for the storage of high-level radioactive liquid wastes.

2. Tanks used for storage of high-activity radioactive waste have an average finite life of between 10 and 20 years. Therefore a tank replacement program will be continuous. However, the Commission is currently sponsoring research at Hanford, the National Reactor Testing Station, Oak Ridge National Laboratory and Brookhaven National Laboratory, to investigate methods of solidifying the waste and fixing the product in a solid matrix to immobilize the hazardous radionuclides. A project at the Savannah River Plant, also sponsored by the Atomic Energy Commission, is investigating the possibility of storing high-activity radioactive waste in tunnels mined out of crystalline rock which underlies the plant. These two concepts visualize interim storage of the waste solutions for sufficient radionuclide decay prior to final handling and storage to eliminate any heat problems which could possibly arise in this new state or environment. The process of "fixation" reduces the volume of the liquid waste several-fold. Added to this, changes in fuel reprocessing operations have reduced the volumes of liquid waste generated. These developments indicate that present requirements for storage facilities are being satisfactorily met and that future demands will be determined by replacement requirements.

Under the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has the authority to regulate and license the

*Circulated as AEC 180/18

handling, storage and disposal of source, byproduct or special nuclear material radioactive waste by private concerns regardless of whether such waste originates in government or private activities. Several licenses have been issued to private concerns for the collection, packaging, storage and disposal of low level wastes at sea or for return of such waste to Commission installations for land burial. To date all high-level waste resulting from the processing of spent fuel elements have been processed and stored at Commission-owned facilities. No licenses have been issued to private concerns for processing and storage of high-level waste.

3. The hazards involved in transporting high-activity radio-active wastes are those that are associated with transportation accidents resulting in the release of hazardous waste to the environment. The probability of an accidental and uncontrolled release of highly radioactive materials is dependent on such factors as accident frequency, severity and conditions, design and integrity of containers, the nature and quantity of material being shipped. The Atomic Energy Commission has sponsored a program at The Johns Hopkins University to investigate the problems of transporting highly radio-active materials. The result of this research effort is currently being published and should soon be available for distribution. As a result of this work, a contract was negotiated with the Franklin Institute of Philadelphia to study the dynamics of accidents involving shipping containers and to culminate in tests on models of, and/or actual shipping containers under any foreseeable accident conditions. Enclosed for your information is a copy of a proposed regulation 10 CFR 72,** governing the shipment of irradiated fuel elements.

4. In addition to investigating the storage of high-activity radioactive wastes in the crystalline rock underlying the Savannah River Plant, the Atomic Energy Commission has contracts with the Bureau of Mines, the U. S. Geological Survey, the University of California, the American Association of Petroleum Geologists, each investigating various facets of storing low and intermediate level wastes in selected geologic formations. Because of the promise of being able to apply calcination methods to fixing the radionuclides in an immobile, non-leachable and relatively safe mass, research on injection of high-activity wastes into the ground is of a long-range nature and is dependent on the results of studies indicated above.

5. All activities involving handling, storage and disposal of radioactive waste by a private concern, as indicated in the enclosed AEC Regulations 10 CFR, Parts 20, 30, 40 and 70,* are subject to regulatory and licensing requirements described therein. Prior to the issuance of such a license, the Atomic Energy Commission requires the applicant to submit detailed information on the proposed activity, including a hazards analysis, to enable the Commission to evaluate the proposal and determine that such activities could be safely conducted and therefore not jeopardize the health and safety of the public. Your attention is invited to Section 2.302 of 10 CFR 20, which provides, among other things, that "The Commission will not approve any application for a license to receive licensed material from other persons for disposal on land not owned by the Federal Government or by a State Government." In issuing this regulation, the Commission stated that placement of the waste materials in government-owned lands,

* On file in the Office of the Secretary - filed in Bulky Package

under long-term government control, will assure adequate protection of the public health and safety throughout the period of any potential hazard.

6. Early in 1960, Petroleum Research Corporation submitted to our Division of Reactor Development an informal outline of a possible research and development project which would have investigated the feasibility of injecting high-activity radioactive wastes in specific deep permeable formations. For the reasons delineated in answers 1 through 4, a project to investigate this disposal method was not initiated. The Atomic Energy Commission has not been approached by the Petroleum Research Corporation concerning the possibility of the Corporation disposing of high-level wastes nor has the Commission been a party, in any way, with Petroleum Research Corporation's negotiations with the Blackfeet Indian Tribe. As indicated in previous discussions with representatives of the Blackfeet Tribal Council, it is suggested that the Divisions of Licensing and Regulation and Industial Participation, and the Office of the General Council, be contacted by PRC and the Council prior to the completion of contract negotiations by these two groups. We would also like to inform you that we have recently received a letter from the Attorney for the Blackfeet Indian Tribe on this matter.*

If you have any additional questions, we would be pleased to answer them.

Sincerely yours,

/s/ Glenn T. Seaborg

Chairman

The Honorable Mike Mansfield
United States Senate

Enclosures:
AEC Regulations 10 CFR, Parts 20, 30, 40, 70 and 72**

* Circulated as AEC 180/19.
**On file in the Office of the Secretary. - Filed in Bulky Package

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November 9, 1961

AEC 180/20

COPY NO. 51

ATOMIC ENERGY COMMISSION

PROPOSED ATOMIC WASTE STORAGE FACILITY ON BLACKFEET INDIAN RESERVATION

Note by the Secretary

The attached correspondence is circulated for the information of the Commission. The matter has been referredto the General Manager for appropriate action.

W. B. McCool

Secretary

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AEC 180/20

11-9-61

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UNITED STATES SENATE
Committee on
Interior and Regular Affairs

3 November 1961

Dr. Glenn T. Seaborg, Chairman
U.S. Atomic Energy Commission
Washington 25, D.C.

Dear Dr. Seaborg:

Cedor B. Aronow of Shelby, Montana, has sent me a copy of his letter to you under date of 30*October, when he asked for your comments on the Petroleum Research Corporation proposal to store atomic waste material on the Blackfeet Indian Reservation.

Senator Mansfield and I have met several times with Mr. Aronow, members of the tribe and Commission respresentatives. We will appreciate receiving a copy of your reply to Mr. Aronow. We also would like to be informed of future developments in this case..

Very truly yours,

/ s / Lee Metcalf

*Circulated as AEC 180/19.

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November 13, 1961

AEC 180/19

COPY NO. 53

ATOMIC ENERGY COMMISSION

PETROLEUM RESEARCH CORPORATION AGREEMENT WITH BLACKFEET INDIANS

Note by the Secretary

1. The attached letter from Cedor B. Aronow, Attorney, is circulated for the information of the Commission.

2. The letter has been referred to the General Manager for appropriate action.

W. B. McCool

Secretary

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AEC 180/11

11-13-11

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CEDOR B. ARONOW
53 MAIN STREET
SHELBY MONTANA

October 30, 1961

Dr. Glenn T. Seaborg, Chairman
U. S. Atomic Energy Commission
Washington 25, D.C.

Dear Dr. Seaborg:

I am writing to you at the request of the Blackfeet Indian Tribe of Browning, Montana, in regard to a proposal by Petroleum Research Corporation, of Denver, Colorado, to store atomic waste material in deep holes on the Blackfeet Indian Reservation. When I was in Washington, D. C., at the end of August, with two representatives from the Blackfeet Indian Tribe, we met at Senator Mike Mansfield's office with representatives of your Commission and particularly Mr. Walter Belder, Mr. A. E. Peckham, of the USGS, who had been loaned to your department as I understand it and a representative of Public Health. When I was in Washington,D.C. this month I talked to Mr. Belder on the phone at some length and had a lengthy conference with representatives of the USGS.

For your information I am enclosing a copy of the proposed contract which Petroleum Research has offered to the Blackfeet Indian Tribe and which sets out their proposal.

The Blackfeet Tribe would like to know from the Atomic Energy Commission, if they entered into the proposed contract or one like it after certain modifications have been made, whether or not the PRC proposal is feasible and if so what would be the problems with respect to licensing, regulatory from the standpoint of the commission regulations and what legal problems might be involved and their respective implications.

We would also like to know what has been the experience of your office of industrial participation as to the possibility of attracting industry to the area of the Blackfeet Indian Reservation if such a waste disposal program became a reality. Another problem that strikes us would be that of transporting the high level waste material from Hanford, Washington, to the Blackfeet Indian Reservation. PRC has represented to the Tribe that the high level liquid waste could be converted to a solid for transportation purposes and then reconverted to liquid for injection into the ground.

Please consider this letter as a formal request from the Blackfeet Indian Tribe for the comments of the Atomic Energy Commission in regard to the PRC proposal.

Sincerely yours,

/s/ Cedor B. Aronow

CEDOR B. ARONOW

UNCLASSIFIED

A G R E E M E N T

THIS AGREEMENT, dated this _____ day of ____________, 1961, by and between the BLACKFEET TRIBE OF THE BLACKFEET INDIAN RESERVATION, a federal corporation (hereinafter called "the Tribe"), acting by and through the Blackfeet Tribal Business Council, of Browning Montana, and PETROLEUM RESEARCH CORPORATION, a Colorado corporation, Denver Colorado (hereinafter called "PRC").

W I T N E S S E T H:

OBJECTIVES

A. PRC has developed a method for selecting and evaluating a subsurface reservoir for the safe injection and permanent storage of fluids which are toxic by-products of various industries. This method is referred to in this Agreement as "the technique."

B. The Tribe owns or may acquire control of certain lands in the Blackfeet Indian Reservation containing a potentially valuable natural resource discovered by PRC consisting of a subsurface reservoir having certain properties which may be favorable for the injection and safe, permanent storage of toxic fluids.

C. The interests of the Tribe and PRC are complimentary so that each feels it desirable to pursue jointly and share equally in profits derived from the development of (i) a fluid injection and storage facility on the Reservation and (ii) a program of controlled land development for the area adjacent to the storage facility to promote industrial, commercial, academic, and residential development.

For the foregoing reasons, the Tribe and PRC make the following agreement:

1. The Tribe and PRC will jointly pursue the objectives of this Agreement as a nonincorporated joint venture under the name

of Blackfeet Industrial Development Company (hereinafter called "BIDCO"). The Tribe and PRC will each own an undivided one-half interest in BIDCO.

2. BIDCO will be governed by a seven-man Board of Directors, three of the members selected annually by the Tribe and three selected annually by PRC. Annually, the seventh member will be selected by a simple majority of the other six members. The Board by simple majority vote will appoint the necessary administrative officers to handle the normal operations of BIDCO and will designate the term of office, salary and other compensation, duties, responsibility, and authority of each appointed officer.

3. PRC will contribute to BIDCO at no charge to BIDCO the use of the technique, the results to this date of its research and development in the occurrence and cause of the fluid pressure anomalies which are necessary for evaluating the feasibility and safety of the technique, and the results to this date of its regional hydrodynamic napping program and detailed data analysis pertaining to the Blackfeet Reservation, which have led to the discovery on the Reservation of a subsurface reservoir for safe, permanent storage of fluids. PRC also will recommend to BIDCO a program for exploratory well drilling and evaluation so that specific subsurface data may be obtained from which the economics and safety of applying the technique to a specific subsurface reservoir within the boundaries of the Reservation can be determined.

4. Prior to October 1, 1961, the Tribe and PRC shall each pay its own expenses. Subsequent to October 1, 1961, all normal and reasonable costs incurred by the Tribe and PRC in fulfilling the objectivies of this Agreement and carrying out agreed-upon

programs shall be charged to BIDCO, but neither shall be reimbursed until financing has been obtained; if no financing is received, then each shall bear its own expenses and shall not expect contribution from the other. PRC's normal published consulting fees shall be included as cost paid by BIDCO for services or work done by PRC for BIDCO. Prior to undertaking such work or services, PRC will submit to BIDCO for approval an outline of the work to be performed and a maximum limit which its consulting fees will not exceed.

5. To finance the costs involved in accomplishing the objectives of this Agreement, BIDCO will pursue all available financing means which are approved by both the Tribe and PRC, such means including the Rural Area Redevelopment Fund, other federal and state grants and loans, dry-hole contributions from oil companies, sale or farmout of oil and gas leases, sale of produced formation water for water-flood purposes, and private financing. If it is necessary to borrow money, anticipated income to BIDCO may be pledged for repayment; but under no circumstances shall an agreement be made which would obligate either the Tribe or PRC to repay debts of BIDCO. To accomplish part of this financing, BIDCO may attempt to interest oil companies in drilling a series of wells for oil and gas exploration purposes in locations suitable for finding and evaluating proposed storage sites. The Tribe will cooperate with BIDCO is this effort by attempting to make suitable arrangements with other land-owners to consolidate a series of land blocks to be put up for lease bid with certain stipulated performance requirements recommended by BIDCO, such as drilling dates, drilling depths, testing and evaluation program, dry-hole disposition, and lease termination dates.

6. When sufficient financing is obtained, BIDCO will have the necessary test wells drilled under supervision of qualified consultants or employees hired by BIDCO. Those consultants or employees shall evaluate the data and give BIDCO a report which (i) summarizes the evaluation of the data, (ii) outlines possible storage sites, each of sufficent size to handle the anticipated volume of toxic waste to be stored including adequate buffer zone for monitoring wells, (iii) recommends operating procedures for each site, (iv) lists the advantages and disadvantages of each site, (v) recommends an industrial park site adjacent to each site, and (vi) recommends acquisition of water rights, dam sites, and water storage rights for the industrial park adjacent to each storage site. PRC may be selected as the consultant for part or all of this work, in which event it shall be paid its normal consulting fee up to a maximum amount agreed to in advance for the amount of work specified, but there is no obligation to hire PRC.

7. After completing the exploratory drilling and evaluation program, the Tribe will use its best efforts to acquire complete ownership of surface, mineral, and all other rights on all land within the recommended storage site and will grant a 99 year lease with a 99 year renewal option to BIDCO at no cost to BIDCO all such surface, mineral, and other rights to all land within the storage site. If sufficient land cannot be obtained in the recommended site, these same provisions will apply to the alternate site selected. The Tribe will use its best efforts to acquire the recommended water rights, dam sites, and water storage rights for the industrial park adjacent to the storage site and will grant a 99 year lease with a 99 year renewal option to BIDCO at no cost to BIDCO for both the previously-

owned and newly-acquired water rights, dam sites, and water storage rights applicable to the industrial park area adjacent to the storage site being developed. If necessary, BIDCO may loan to the Tribe the money necessary for it to acquire the land interests or rights of others, and the Tribe's share of profits from BIDCO and the land interests acquired with the money loaned by BIDCO shall be pledged to repay this loan. Interest on this loan shall be at a rate set by the BIDCO Board to represent the equivalent cost of such money to BIDCO.

8. BIDCO will develop an industrial park site adjacent to the storage site for use by industrial plants and commercial and residential building developments. This industrial park site will be managed by BIDCO as a single-unit operation under contractual agreement with each individual landowner. Participation in the industrial park unit by any landowner within the unit's boundaries shall be voluntary and shall be on the basis of a contractual agreement with each landowner. This agreement with each participating landowner will be prepared by BIDCO and separately approved by both the Tribe and PRC and will provide for a periodic disbursement of one-half of the net profits of the industrial park unit to BIDCO and the other one-half of the net profits of the industrial park unit to the participating landowners, to be prorated among them on an equitable formula based on factors such as the amount and type of land ownership contributed by each and the time each joined the unit.

9. Rates to be charged for the use of the storage site and industrial park site shall be set from time to time by BIDCO and separately approved by both the Tribe and PRC.

10. During the term of this contract, the Tribe will not develop, participate in development, lease land or grant easements for development, or otherwise permit development of any

other subsurface toxic fluid storage or disposal sites on any lands or affecting any lands owned or controlled by the Tribe other than the toxic fluid storage sites developed by BIDCO.

11. In performing the objectives of this Agreement, commercial oil and gas may be discovered by BIDCO or a favorable prospect for oil and gas exploration may be developed by BIDCO. BIDCO will at all times attempt to help the Tribe and other participating landowners in the industrial park unit by assisting them in getting their oil and gas resources developed and in getting their oil and gas prospects drilled on a favorable basis. If BIDCO succeeds in increasing the net revenue to the Tribe or other participating landowners in the industrial park unit to an amount greater than the royalties, bonuses, and rentals normally obtained in leasing of mineral rights in rank wildcat areas not involved in an active oil company land play and not near known production, then this additional revenue will be assigned as income to the industrial park unit. That portion of the total revenue from each specific oil and gas lease which is normal as defined in this paragraph is retained by the owner of the mineral rights covered by that specific lease. If commercial oil and gas should be discovered by the test wells drilled on leases held by BIDCO such as may occur as the result of test wells BIDCO will drill or cause to be drilled as indicated in paragraph 6 herein, the ownership of the oil and gas rights will be as specified in the specific leases involved.

12. The term of this Agreement shall be for 10 years and so long thereafter as BIDCO is in existence; subject, however, to the prior termination on the following basis:

(a) If the financial arrangements for drilling or causing to be drilled one or more test wells has not been completed and if the drilling of such a test well has not been started within three years of the date this Agreement is approved, this Agreement will terminate automatically.

(b) If waste fluid injection on an income-producing basis has not been started within 10 years of the date this Agreement is approved, this Agreement shall terminate automatically.

(c) If the gross income to BIDCO from the injection of waste fluid in this storage site or from industrial development is less than $100,000 during any five-year period following the first 10 years after this Agreement has been approved, this Agreement shall automatically terminate.

(d) In the event of termination, any leases or other interests or rights in land on the Reservation acquired by BIDCO shall be assigned to the Tribe subject only to the repayment of any loan made to the Tribe by BIDCO as provided in paragraph 7.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed as of the date set forth above.

BLACKFEET TRIBE OF THE BLACKFEET INDIAN RESERVATION, acting by and through the Blackfeet Tribal Business Council of Browning, Montana

Attest:

By ______________________
Chairman

____
Secretary

PETROLEUM RESEARCH CORPORATION

Attest:

by ______________________

____
Secretary

Approval recommended this _____ day of ________________, 1961.

____
Commissioner of Indian Affairs

Approved this ______ day of ____________________, 1961.

____
Secretary of the Interior

Materials -12-

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October 30, 1961

AEC 180/18

COPY NO. 51

ATOMIC ENERGY COMMISSION

PROPOSED ATOMIC WASTE STORAGE FACILITY ON BLACKFEET INDIAN RESERVATION

Note by the Secretary

The attached letter from Senator Mike Mansfield of Montana is circulated for the information of the Commission. The letter has been referred to the General Manager for preparation of a reply for the Chairman's signature.

W. B. McCool

Secretary

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AEC 180/18

10-30-61

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United States Senate

COMMITTEE ON FOREIGN RELATIONS

October 20, 1961

Honorable Glenn T. Seaborg, Chairman
Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Chairman:

During my recent visit to Montana I encountered considerable discussion of the proposal to develop an atomic waste storage facility and adjacent atomic industrial park and research center on the Blackfeet Indian Reservation. These discussions between the Petroleum Research Corporation of Denver, Colorado, and the Blackfeet Tribal Council have given rise to considerable comment, both pro and con.

The storage of atomic wastes is an area with which the general lay person is completely unfamiliar. The Atomic Energy Commission has been most helpful in providing available information and in consulting with the Montana Congressional offices and local interests in Montana. During my travels in the State I have cautioned all concerned that this is a matter which may have considerable potential, but it is also a very technical subject and the ramifications are very complex.

So that I may be more fully informed on this subject, I am proposing several questions which have arisen and with the appropriate answers they will help to clarify the present status of this proposal for storing atomic wastes on the Blackfeet Indian Reservation.

Has the Atomic Energy Commission sought additional sites for storage of atomic wastes outside of its present facilities?

Can you predict when there will be a need for additional storage facilities? Are any atomic wastes available for storage in private facilities at the present time?

What are some of the hazards involved in transporting atomic waste from a plant to the storage site?

Has the Atomic Energy Commission conducted any studies on the [illegible] of storing atomic wastes for long period of time in specially selected geological formations?

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Does the Commission have the authority to regulate and license the storage of atomic wastes by private concerns received from both Federal and private atomic developments?

Has any formal contact been made with the Atomic Energy Commission by the Petroleum Research Corporation, the private concern proposing this development in Montana? If so, with what division or divisions? What departments of the Atomic Energy Commission would be involved in such a proposal? Has Petroleum Research Corporation been in touch with them?

Answers to these questions will be of considerable value in keeping in close contact with this situation so that I might be in a better position to respond to my constituent inquiries.

Thanking you and with best personal wishes, I am

Sincerely yours,

Mike Mansfield

matusch -12

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. D-293
Tel. HAzelwood 7-7831
Ext. 3446

ADVANCE FOR USE IN NEWSPAPERS
SUNDAY, NOVEMBER 5, 1961

REPORT SHOWS NO RADIOACTIVITY ATTRIBUTABLE
TO WASTE DISPOSAL IN TWO PACIFIC SITES

The Atomic Energy Commission has received a report on environmental surveys conducted at two deep sea sites off the Pacific Coast which are designated by the Commission as areas where low-level radioactive wastes may be disposed. These surveys reveal that there is no detectable radioactivity attributable to waste disposal operations at the two sites.

The two sites are (1) on the seaward side of the Farallon Islands, approximately 48 miles west of the Golden Gate; and (2) in the Santa Cruz Basin, approximately 32 miles southwest of Port Hueneme, California. Water depth at both of these sites is at least 1,000 fathoms (6,000 feet), the minimum depth at which AEC permits sea disposal. These sites long have been designated as explosive and chemical dumping grounds. Since 1946 some 14,000 curies of radioactive material in 22,000 packages have been disposed of at the Farallon Islands site. Disposal of radioactive material in the Santa Cruz Basin site began in 1953 and at the time the survey was made approximately 60 curies in 3,000 packages had been disposed of there.

In addition to the surveys of these two sites, similar studies were conducted at a third site, an area not used for disposal, for background comparisons. This site was off Point Arguello, California.

Samples of sea water, sediments and marine life were collected for measurement of their radioactivity level. Photographs of the ocean floor also were taken. The surveys were made during oceanographic cruises in March, April and November, 1960. Different seasons of the year were chosen in order to detect seasonal differences in biological life and the environs. Assays of samples of bottom sediment, organisms and bottom-caught fish revealed no evidence of radioactivity above natural background levels.

(more)

11-5-61

A primary objective of the survey was to obtain all information possible in the immediate vicinity of the ocean area where there has been the greatest concentration of disposal operations. The specific areas in which sampling for the surveys was done were determined by using data recorded in the logs of ships engaged in waste disposal operations at the two sites.

Standard oceanographic equipment such as otter trawls, plankton nets and coring tools were used to obtain sea water, sediment and biological samples. The latest developments in oceanographic equipment also were employed, including underwater cameras which were used to photograph animal activity on the sea floor and terrain conditions in each area; the Isaacs-Kidd fish traps, and deep moored marker buoys.

The surveys were made for the Commission under contract by Advanced Systems Development Division of Pneumo Dynamics Corporation, El Segundo, California. Photographic work was performed by Edgerton, Germeshausen and Grier, Inc., of Santa Barbara, California. Sharp Laboratories, Inc., La Jolla, California, did the radioactivity analyses, and personnel from Scripps Institution of Oceanography, La Jolla, supervised biological, geological and chemical aspects of the work. A copy of the report on these environmental surveys is available for inspection in AEC's Public Document Room, 1717 H Street N.W., Washington, D. C.

As a continuation of AEC's program for environmental studies of ocean disposal sites, the U. S. Coast and Geodetic Survey, the U. S. Public Health Service and the Bureau of Commercial Fisheries currently are cooperating with the Commission in a study of two Atlantic Ocean sites designated by AEC for the disposal of low-level radioactive waste. These sites are 150 and 230 miles southeast of Sandy Hook, New Jersey, both in waters at least 1,000 fathoms (6,000 feet) in depth.

- 30 -

11/3/61

Part 8
AEC 180/21

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

NOV 20 1961

Dear Senator Mansfield:

This is in reply to your letter of October 20, 1961 regarding the proposed development of an atomic waste storage facility on the Blackfeet Indian Reservation in Montana. In light of Petroleum Research Corporation's proposal to inject high activity radioactive waste into preferred geologic formations, the answers have been confined to this type of waste only. The questions have been numbered in the order in which they appear in your letter.

1. Approximately 99% of the high-activity radioactive waste is generated at uranium and plutonium processing plants. The great potential hazard of the waste, coupled with the unknown effects of releasing copious quantities of high-energy (and therefore heat-producing) radioactive waste to the environment, has resulted in the storage of these liquid wastes in specially constructed underground tanks located within the site of the fuel processing plants. Though the wastes are thus contained, intensive measures are still taken to monitor the storage sites so that any leakage would be quickly detected. For the above reasons of safety and because of the obvious economies inherent in maintaining storage facilities as close to the source as practicable, the Commission has not sought off-site facilities for the storage of high-level radioactive liquid wastes.

2. Tanks used for storage of high-activity radioactive waste have an average finite life of between 10 and 20 years. Therefore a tank replacement program will be continuous. However, the Commission is currently sponsoring research at Hanford, the National Reactor Testing Station, Oak Ridge National Laboratory and Brookhaven National Laboratory, to investigate methods of solidifying the waste and fixing the product in a solid matrix to immobilize the hazardous radionuclides. A project at the Savannah River Plant, also sponsored by the Atomic Energy Commission, is investigating the possibility of storing high-activity radioactive waste in tunnels mined out of crystalline rock which underlies the plant. These two concepts visualize interim storage of the waste solutions for sufficient radionuclide decay prior to final handling and storage to eliminate

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11/2/61	11/2/61	11/ /61	11/ /61	11/ /61	11/ /61	11/ /61

* Circulated as AEC 180/18

Not 11

any heat problems which could possibly arise in this new state or environment. The process of "fixation" reduces the volume of the liquid waste several-fold. Added to this, changes in fuel reprocessing operations have reduced the volumes of liquid waste generated. These developments indicate that present requirements for storage facilities are being satisfactorily met and that future demands will be determined by replacement requirements.

Under the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has the authority to regulate and license the handling, storage and disposal of source, byproduct or special nuclear material radioactive waste by private concerns regardless of whether such waste originates in government or private activities. General licenses have been issued to private concerns for the collection, packaging, storage and disposal of low level wastes at sea or for return of such waste to Commission installations for land burial. To date all high-level waste resulting from the processing of spent fuel elements have been processed and stored at Commission-owned facilities. No licenses have been issued to private concerns for processing and storage of high-level waste.

3. The hazards involved in transporting high-activity radioactive wastes are those that are associated with transportation accidents resulting in the release of hazardous waste to the environment. The probability of an accidental and uncontrolled release of highly radioactive materials is dependent on such factors as accident frequency, severity and conditions, design and integrity of containers, the nature and quantity of material being shipped. The Atomic Energy Commission has sponsored a program at The Johns Hopkins University to investigate the problems of transporting highly radioactive materials. The result of this research effort is currently being published and should soon be available for distribution. As a result of this work, a contract was negotiated with the Franklin Institute of Philadelphia to study the dynamics of accidents involving shipping containers and to calibrate in tests on models of, and/or actual shipping containers under any foreseeable accident conditions. Enclosed for your information is a copy of a proposed regulation 10 CFR 72, governing the shipment of irradiated fuel elements.

4. In addition to investigating the storage of high-activity radioactive wastes in the crystalline rock underlying the Savannah River Plant, the Atomic Energy Commission has contracts with the Bureau of Mines, the U. S. Geological Survey, the University of California, the American Association of Petroleum Geologists, each investigating various facets of storing low and intermediate level wastes in selected geologic formations. Because of the promise of

being able to apply calcination methods to fixing the radionuclides in an immobile, non-leachable and relatively safe mass, research on injection of high-activity wastes into the ground is of a long-range nature and is dependent on the results of studies indicated above.

5. All activities involving handling, storage and disposal of radioactive waste by a private concern, as indicated in the enclosed AEC Regulations 10 CFR, Parts 20, 30, 40 and 70, are subject to regulatory and licensing requirements described therein. Prior to the issuance of such a license, the Atomic Energy Commission requires the applicant to submit detailed information on the proposed activity, including a hazards analysis, to enable the Commission to evaluate the proposal and determine that such activities could be safely conducted and therefore not jeopardize the health and safety of the public. Your attention is invited to Section 2.302 of 10 CFR 20, which provides, among other things, that "The Commission will not approve any application for a license to receive licensed material from other persons for disposal on land not owned by the Federal Government or by a State Government." In issuing this regulation, the Commission stated that placement of the waste materials in government-owned lands, under long-term government control, will assure adequate protection of the public health and safety throughout the period of any potential hazard.

6. Early in 1960, Petroleum Research Corporation submitted to our Division of Reactor Development an informal outline of a possible research and development project which would have investigated the feasibility of injecting high-activity radioactive wastes in specific deep permeable formations. For the reasons delineated in answers 1 through 4, a project to investigate this disposal method was not initiated. The Atomic Energy Commission has not been approached by the Petroleum Research Corporation concerning the possibility of the Corporation disposing of high-level wastes nor has the Commission been a party, in any way, with Petroleum Research Corporation's negotiations with the Blackfeet Indian Tribe. As indicated in previous discussions with representatives of the Blackfeet Tribal Council, it is suggested that the Divisions of Licensing and Regulation and Industrial Participation, and the Office of The General Council, be contacted by PRC and the Council prior to the completion

Pages 3 and 4
typed 11-17-61
OGM

NOV 20 1961

Senator Mansfield - 4 -

[illegible] regulations by these two groups. We would also like to inform you that we have recently received a [illegible] from the attorney for the Blackfeet Indian Tribe on this matter.xxx

If you have any additional questions, we would be pleased [illegible] them.

Sincerely yours,

[illegible] T. Seaborg

Chairman

The Honorable Mike Mansfield
United States Senate

Enclosures:
AEC Regulations [illegible] CFR, [illegible] [illegible], 30, [illegible], 70 and 72**

Orig & cc
GM
Cong. Rel. (2)
Chairman (2)
Secretariat

** On file in the Office of the Secretary
*** Circulated as AEC 180/19

Mat · 12 - Waste Disposal

W

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. D-313
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Friday, November 17, 1961)

SEA DISPOSAL CONTAINER DESIGNS NOW BEING STUDIED FOR AEC

Recommendations for the design and construction of containers used in the disposal of low-level radioactive waste at sea are being developed for the Atomic Energy Commission by Southwest Research Institute of San Antonio, Texas. Southwest Research Institute will correlate and analyze the results of sea tests which were conducted on actual waste containers early this year off the coast of Southern California and the data from laboratory studies on the effects of high pressure on different packaging methods under controlled laboratory conditions.

Purpose of this testing program was to determine the integrity of containers used to confine the low-level radioactive wastes during descent to a depth of 6,000 feet in the sea, the minimum level required by the Commission for sea disposal. Information developed in the sea tests and the laboratory work will provide a basis for sea disposal container criteria.

A report has been received from Pneumo Dynamics Corporation of El Segundo, California, which conducted the sea tests under contract for the Commission. Southwest Research Institute also has submitted its report on laboratory studies on the relationship of container design, packaging and pressure equalization systems to the integrity of containers from pressures that are encountered in 6,000 feet of water. Southwest Research Institute is correlating and analyzing data from these two reports and developing recommendations on design and construction of sea disposal containers. These recommendations will take into consideration types of containers, reinforcement, concrete mixes and setting times, pressure equalization systems and other factors necessary to provide maximum assurance that the containers descend to at least 6,000 feet of water without rupture or loss of contents.

(more)

11-17-61

Radioactive wastes which may be disposed of at sea have a low-level of radioactivity and typically are contaminated paper wipes, rubber gloves, broken glassware and other laboratory paraphernalia. These wastes are packaged with concrete and disposed at designated sites in the Atlantic and Pacific Oceans at a minimum depth of 6,000 feet.

The inherent safety of sea disposal is that any low-level radioactivity released from the containers would be safely diluted and dispersed by the huge mass of ocean water. As an added safety factor, however, the Commission has stressed the desirability of confining the low-level wastes until they reach at least the required 6,000 foot level in the sea. In order to make maximum use of this added safety factor, the Commission initiated the testing program.

The sea testing of containers was conducted early this year by Advanced Systems Development Division of Pneumo Dynamics Corporation at an AEC-designated waste disposal site in the Santa Cruz Basin, approximately 32 miles southwest of Port Hueneme, California. Edgerton, Germeshausen and Grier, Inc., of Santa Barbara, California, provided photographic engineering and radiological health services.

One hundred sixty-two containers were tested at sea in one of two ways, either by controlled lowering to 6,000 feet and photographing them at 12 second intervals on the way down to "see" how they withstood pressure, or by uncontrolled lowering of the containers and tracing their descent by means of a depth sounding device. Both methods were used simultaneously whenever possible.

Most of the containers tested at sea were actual packages used by Commission contractors and licensees. They were selected at random from all the operating sea disposers of the United States. Some of the large 10 ton concrete packages were fabricated on the West Coast to save cross-country shipping costs.

More than 94 per cent (153) of the 162 containers tested remained intact in descending to the required 6,000 feet in the ocean. Nine containers were deformed to the degree that some of their contents were exposed to water. As noted above, any radioactivity released from the containers would be safely diluted and dispersed by the huge mass of ocean water. Evidence indicated that all the containers and contents went to the bottom of the sea.

(more)

It is expected that the final phase of the container research program - the work now being done by Southwest Research Institute to develop recommendations for design and construction of containers - will require approximately four months to complete.

The report from Pneumo Dynamics Corporation on the sea tests of containers is available for $2.50 from the Office of Technical Services, U. S. Deparment of Commerce. It is TID No. 13226. Both the report from Pneumo Dynamics Corporation and the report on laboratory tests conducted at Southwest Research Institute are available for inspection in AEC's Public Document Room, 1717 H Street, N.W., Washington, D. C.

- 30 -

11/17/61

Waste Processing + Disposal

OPTIONAL FORM NO. 10

UNITED STATES GOVERNMENT

Memorandum

TO : Heads of Divisions and Offices, HQ
Managers of Field Offices

DATE: October 27, 1961

FROM : for A. R. Luedecke
General Manager

SUBJECT: DISPOSAL OF PACKAGED RADIOACTIVE WASTE

Reference is made to my previous memorandum on this subject dated June 9, 1960. There has been considerable experience, discussion and correspondence since then, and it seems appropriate that the AEC policy in this matter be updated and clarified.

As previously stated, land burial services for packaged solid radioactive wastes are available at the Oak Ridge and NRTS sites. These services are available to all AEC contractors and licensees generating solid waste contaminated with source, special nuclear and by-product material. Sea disposal service for such wastes is also available from duly licensed commercial firms. The choice between land burial or sea disposal should be made by objective evaluation of the economic and other appropriate operating considerations in each particular situation to determine which of the disposal methods is more advantageous. It is no longer necessary to submit such evaluations to the Division of Production; however, a written evaluation should be available for review and discussion should the need arise.

Whichever disposal method is selected, the actual waste shipments and shipping containers must conform to the appropriate ICC or other established shipping regulations. Exempt (escorted) shipments and those made under special permits must conform to the intent if not the letter of the regulations (i.e., where other than specified containers, curie amounts, etc. are involved, an equivalent or appropriately greater degree of container integrity, radiation protection and contamination control must be provided). Furthermore, packaging, shipment and provision for handling by the receiver must be in accordance with any special requirements of the burial ground operator or the sea disposal firm. Contractor proposals for sea disposal services should be specifically reviewed by the contractor or the field office to assure that proposed shipments are consistent with established shipping and sea disposal health and safety requirements. Proposals which will require amendment of a sea disposal firm's existing license should be referred to the Division of Operational Safety, Headquarters, for coordination with the Division of Licensing and Regulation.

The frequency with which the AEC has had to investigate suspected waste disposal "incidents" and the sensitivity of the press, the public and special interest groups in regard to this subject make it mandatory that special care and attention be given to the packaging, handling, shipment and disposal of radioactive waste.

FORM AEC-204
(9-57)

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: Meetings Waste Disposal

TO:

FROM:

SUMMARY: AEC 460/71: SECOND AEC CONFERENCE ON GROUND DISPOSAL OF RADIOACTIVE WASTES AND SEVENTH AIR CLEANING CONFERENCE. Memo to the General Manager from the Director, Div. of Reactor Development informing the GM of the scheduling of two conferences sponsored by the Division of Reactor Development

FILED:

INDEXER: O&M-6-Meetings

REMARKS: date of paper: 9-15-61
date of memo: 9-8-61

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: [illegible] EA DNI 6-24-99 DOE/NN-523
THIS PAGE ONLY

9-3-61

Am ll .. b ..

UNCLASSIFIED

August 17, 1961

AEC 180/17

COPY NO. 49

ATOMIC ENERGY COMMISSION

PETROLEUM RESEARCH CORPORATION NEGOTIATIONS WITH BLACKFEET INDIANS

Note by the Acting Secretary

AEC 180/17

The attached letter and enclosure from the President, Petroleum Research Corporation, is circulated for the information of the Commission. The item has been referred to the General Manager for appropriate handling.

Harold D. Anamosa

Acting Secretary

DISTRIBUTION	COPY NO.
Secretary	1
Commissioners	2 - 6,54
Dir., of Regulation	7
General Manager	8
Deputy Gen. Mgr.	9
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8-17-61

UNCLASSIFIED

PETROLEUM RESEARCH CORPORATION
P.O. BOX 8377
5330 South Quebec
Denver, Colorado

August 11, 1961

Dr. Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington, D. C.

Dear Dr. Seaborg:

We have been informed that Senator Mansfield has received a complaint about our company's negotiations with the Blackfeet Indians concerning our proposed development of an atomic industrial park and research center on the Reservation in conjunction with a safe subsurface waste-product storage facility. We understand that this letter of complaint has been forwarded to your office for information. Since the complaint received by Senator Mansfield was apparently based on inadequate information, we wish to describe briefly our research on industrial waste disposal and our negotiations with the Blackfeet Tribe.

For several years, our company has been searching for a site which possesses just the right combination of surface features, geographic location, subsurface geology, and formation-fluid pressures for the development of an atomic industrial park and research center. The most stringent requirement for such a future industrial development would be the absolute safety of a permanent storage facility for the radioactive by-products or wastes created by an atomic industry. This absolute safety, together with extremely favorable economics, can be found in the injection of the by-product or waste fluids into certain unique subsurface reservoir rocks which contain fluids under unusually low pressures. Based on our detailed analysis of data presently available, we believe that this unique subsurface environment required for permanently safe fluid storage exists under a portion of the Blackfeet Indian Reservation. If the data from our proposed exploratory drilling program confirm the existence of this safe fluid storage environment, it will constitute a natural resource of great value to the Blackfeet Indian Tribe. Consequently, the Blackfeet Indian Tribe and Petroleum Research Corporation are jointly interested in developing this potentially great natural resource.

PRC's extensive field mapping and systematic study of bottom-hole fluid-pressure measurements from deep holes drilled for oil and gas exploration throughout the United States and many foreign countries have led to our discovery of naturally occurring subsurface pressure relationships which had not been anticipated by oil geologists or other earth scientists. For the past ten years, PRC's staff has concentrated its research efforts on determining the occurrences and causes of these subsurface fluid-pressure relationships and the mechanics of flow of ground water in deep subsurface formations. Through this research, PRC has developed a permanently safe and economic method for the underground

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storage of radioactive by-products or wastes. In February 1960, PRC submitted to the AEC a report entitled "Underground Disposal of Radioactive and Other Toxic Fluids," a copy of which is enclosed.* In April 1960, this same report, together with an explanatory cover letter, was submitted to the American Association of Petroleum Geologists Research Subcommittee on Atomic Waste Disposal. A copy of the cover letter addressed to Mr. John C. Maxwell, acting chairman of this committee, is also enclosed.* In April 1961, a report entitled "Underground Disposal of Atomic Waste (Possible Sites in Washington and Oregon)" was submitted to both the AEC and the AAPG subcommittee. A copy of this report is also enclosed.* All of this research work and field studies have been completely financed by PRC. Although no department, bureau, division, or agency of the Federal Government or any state government has participated, directed, or been responsible for any portion of our company's work and no government or other public funds have been used in developing this system, we have kept certain responsible persons of the AEC and the USGS informed of the progress of this work.

Early in June 1961, PRC initiated business negotiations with the Blackfeet Tribal Council for the joint development of an atomic industrial park and research center. This development is made possible by the discovery and proposed future joint development of the Blackfeet's most valuable resource--a permanently safe subsurface fluid-storage environment to handle the industrial by-products and waste. If a system of dry solid-state transport of radioactive ions now under development is economically successful, then radioactive by-products now stored as hot liquids in temporary surface tanks at the various existing AEC plants may be moved to this site for permanently safe subsurface storage. Consequently, the geographic proximity to the Hanford Atomic Products Operation at Richland, Washington, is an additional very attractive feature of the Blackfeet Reservation site. If this site can be developed and this transport system perfected, then a very substantial income from this source would accrue of the Blackfeet Indians for the use of their subsurface storage facilities. Likewise, the Government and all taxpayers will realize great saving of costs now involved in temporary tank storage or in future alternate storage facilities.

The attraction of industries and research laboratories to the Blackfeet Reservation site for use of the low-cost and permanently safe subsurface storage facility is greatly enhanced by the scenic beauty of Glacier National Park, the superb hunting and fishing, and the many other natural attractions of this area. Such factors are certainly significant in the attraction of outstanding research scientists to this facility. In turn, the influx of scientists, engineers, technicians, and other professional people would provide a great academic stimulation for the Blackfeet youth to advance their educational goals and standards. Both the industrial and research laboratory developments would provide employment for a large number of Blackfeet Indians in all degrees of skills, such as well drillers, laborers, grocery store clerks, machinists, secretaries, technicians, instrument operators, engineers, or scientists.

We regret that you may have been inconvenienced by criticism resulting from premature release of insufficient information about our company's proposal to the Blackfeet Tribal Council. Of

*On file in Division of Reactor Development.

particular concern to us and probably to you was the accusation that the Federal Government (presumably some agency such as the AEC) was proposing to dump or store hazardous material in a dangerous condition on the Blackfeet Reservation. It should be made completely clear that no agency of the Government has been involved in making our proposal. On the contrary, the Blackfeet Indians are giving favorable consideration to our proposal that the Blackfeet Tribe and PRC jointly develop the unique subsurface environment discovered by PRC under the Blackfeet Reservation. This joint development of a permanently safe and low-cost subsurface storage facility could produce substantial income for the Tribe both from the possible permanent storage of existing atomic wastes (such as those located at Hanford) and the future development of new industries and research facilities on the Reservation. Of course, the Blackfeet have been seeking the technical advice of such government agencies as the USGS and the Bureau of Indian Affairs. Also, it is recognized that at a later date the safety of the project would be fully evaluated by the AEC and the Bureau of Public Health. The fluid-injection and storage facility may actually be operated either by the AEC or by the joint Blackfeet-PRC Company under very close direct supervision by the AEC.

If we can be of any further service to your office or answer any questions you may have in this regard, please feel free to contact us at any time.

Very truly yours,

PETROLEUM RESEARCH CORPORATION

/s/
Gilman A. Hill
President

Enclosures

UNCLASSIFIED

PETROLEUM RESEARCH CORPORATION
P.O. BOX 8377
5330 South Quebec
Denver, Colorado

August 11, 1961

The Honorable Michael J. Mansfield
The United States Senate
Washington, D. C.

My dear Senator Mansfield:

We have been informed that one of your constituents has complained to you of our company's negotiations with the Blackfeet Indians concerning our proposed development of an atomic industrial park and research center on the Reservation in conjunction with a safe subsurface waste-product storage facility. This complaint was apparently based on inadequate information. Since neither the Atomic Energy Commission nor any other governmental organization has had any responsibility for or direction over our activities, we wish to supply you with the complete information.

Included with this letter are copies of correspondence dealing with development of the storage facility under consideration. We shall summarize the information for you in this letter. For several years, our company has been searching for a site which possesses just the right combination of surface features, geographic location, subsurface geology, and formation fluid pressures for the development of an atomic industrial park and research center. The most stringent requirement for such a future industrial development would be the absolute safety of a permanent storage facility for the radioactive by-products or wastes created by an atomic industry. This absolute safety, together with extremely favorable economics, can be found in the injection of the by-product or waste fluids into certain unique subsurface reservoir rocks which contain fluids under unusually low pressures. Based on our detailed analysis of data presently available, we believe that this unique subsurface environment required for permanently safe fluid storage exists under a portion of the Blackfeet Indian Reservation. If the data from our proposed exploratory drilling program confirm the existence of this safe fluid-storage environment, it will constitute a natural resource of great value to the Blackfeet Indian Tribe. Consequently, the Blackfeet Indian Tribe and Petroleum Research Corporation are jointly interested in developing this potentially great natural resource.

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We regret that you may have been inconvenienced by criticism resulting from premature release of insufficient information about our company's proposal to the Blackfeet Tribal Council. Of particular concern to us and probably to you was the accusation that the Federal Government (presumably some agency such as the AEC) was proposing to dump or store hazardous material in a dangerous condition on the Blackfeet Reservation. It should be made completely clear that no agency of the Government has been involved in making our proposal. On the contrary, the Blackfeet Indians are giving favorable consideration to our proposal that the Blackfeet Tribe and PRC jointly develop the unique subsurface environment discovered by PRC under the Blackfeet Reservation. This joint development of a permanently safe and low-cost subsurface storage facility could produce substantial income for the Tribe both from the possible permanent storage of existing atomic wastes (such as those located at Hanford) and the future development of new industries and research facilities on the Reservation. Of course, the Blackfeet have been seeking the technical advice of such government agencies as the USGS and the Bureau of Indian Affairs.

If we can be of any further service to your office or answer any questions you may have in this regard, please feel free to contact us at any time.

Very truly yours,

PETROLEUM RESEARCH CORPORATION

/s/

Gilman A. Hill
President

Th [illegible] 2-Waste Disposal

UNCLASSIFIED

June 30, 1961

AEC 180/15

COPY NO. 17

ATOMIC ENERGY COMMISSION

UTILIZATION OF RADIOACTIVE MATERIALS IN KANSAS MINE

Note by the Secretary

1. The attached correspondence from Senator Andrew F. Schoeppel is circulated for the information of the Commission.

2. The matter has been referred to the General Manager for preparation of a reply for the Chairman's signature.

W. B. McCool

Secretary

DISTRIBUTION	COPY NO.
Secretary	1
Commissioners	2-6, 22-23
General Manager	7
Deputy Gen. Mgr.	8
Asst. Gen. Mgr.	9
Asst. to the GM	10
Congr. Relations	11
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D. C. Office	14-16
Secretariat	17-21

UNCLASSIFIED

UNITED STATES SENATE
COMMITTEE ON APPROPRIATIONS

June 26, 1961

Honorable Glenn T. Seaborg
Chairman
Atomic Energy Commission
Washington 25, D. C.

Dear Doctor Seaborg:

My attention has been invited to a contract recently completed between the Carey Salt Company and the Union Carbide Nuclear Company, providing for the utilization of radioactive materials in the Lyons, Kansas mine.

As you know, it has been my position that no radioactive material should be used in experimentation until the simulated experiments have demonstrated beyond all doubt that under no circumstances could radioactive material be released into ground waters or other environment of the State of Kansas.

Consequently, may I request a copy of the agreement aforementioned, between the Carey Salt Company and the Union Carbide Nuclear Company, plus a specific statement from the Commission as to the quantity of radioactive material which will be utilized and the specific isotopes which this radioactive material will contain. Upon receipt of this information it is my intention to consult with the State Board of Health of the State of Kansas and with the Governor of the State, to make absolutely certain that this new contract does not in any way potentially jeopardize the health of the people of my State.

Your expeditious attention to this matter will be appreciated.

Sincerely,

/s/

Andy Schoeppel

FORM AEC-604
(8-57)

U. S. ATOMIC ENERGY COMMISSION
CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: Materials 12

TO:

FROM:

SUMMARY: AEC 1067/2 - HANDLING AND DISPOSAL OF RADIOACTIVE MATERIALS FROM NAVAL ACTIVITIES
Ltr. to AEC concerning the development of instructions for the above.

FILED: MH&S 3 Hazards of Military Reactors

INDEXER: date of paper: 6-16-61

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: E.A. Pohl 6-24-99 DOE/NN-523
THIS PAGE ONLY

6-16

Materials-12

MAY 15 1961

MEMORANDUM FOR CHAIRMAN SEABORG
COMMISSIONER GRAHAM
COMMISSIONER WILSON
COMMISSIONER OLSON
COMMISSIONER HAWORTH

SUBJECT: ANNOUNCEMENT OF PAPER ON DISPOSAL OF RADIOACTIVE WASTES

Attached for your information is a public announcement issued by the Commission concerning a paper on "Recent Developments in the Processing and Ultimate Disposal of High-Level Radioactive Wastes", presented during the 16th Annual Purdue Industrial Waste Conference at Lafayette, Ind., May 2-4, 1961.

We plan to mail this announcement Wednesday, May 17, 1961, to specialized business and industrial publications and to representatives of business concerns.

(signed) Phillipps G. Jacques
for

Duncan Clark, Director
Office of Public Information

Attachment
Announcement

cc: A. R. Luedecke, General Manager
W. McCool, Secretary
D. Clark, OPI

RECEIVED
U. S. Atomic Energy Commission
Office of the Secretary
MAY 16 1961
A.M. 7 8 9 10 11 12 1 2 3 4 5 6 P.M.

OPI OPI OPI

J.Townsend/lh
5/15/61

AEC

PROOF COPY

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. IN-208
Tel. HAzelwood 7-7831
Ext. 4463

FOR IMMEDIATE RELEASE

Note to Editors and Correspondents:

Attached is a paper on "Recent Developments in the Processing and Ultimate Disposal of High-Level Radioactive Wastes" which was presented by Walter G. Belter of the Commission's Division of Reactor Development during the 16th Annual Purdue Industrial Waste Conference, May 2-4, 1961, at Lafayette, Ind. The paper is being sent you at this time because of the industry-wide interest in the subject.

- 30 -

ATTACHMENT - Cy on file in Div. of Public Information

DATE:

[redacted]

INDEX: Materials 12 Waste

[redacted]

TO:

FROM:

SUMMARY: Memo of Conversation written by Oakley, re a mtg. between Dept. of State and AEC. Discussed was Prof. Emelyanov's attitute at Vienna during the recent Board of Governors Meeting on the exchange program; waste disposal exchange of visits; and the forthcoming consideration of a Director General of the IAEA.

FILED: IA 2 US-USSR Exchange Agreement

INDEXER: date of memo: 2-17-61

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: [signature] EA Pohl 6-30-99 DOE/NN-523
THIS PAGE ONLY

2-17-61

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

FORM AEC-204

★ U. S. GOVERNMENT PRINTING OFFICE: 1949 - 832162

Mat. 12 -

Mat 12

January 4, 1961

Mr. James T. Ramey, Executive Director
Joint Committee on Atomic Energy
Congress of the United States

Dear Mr. Ramey:

Attached for your information is a copy of an exchange of correspondence with an advisory group to the Atomic Energy Commission from the Earth Sciences Division of the National Academy of Sciences - National Research Council, on the subject of disposal of radioactive wastes into the ground.

Sincerely yours,

General Manager

Attachments:
Cy ltr from Dr. Hess to Chairman
Cy ltr from General Manager to Dr. Hess

Subj
RD rdg
Pittman rdg
NT rdg
M&S rdg
ESE rdg
AGMRID
GM
Cong. Rel. (2)

rd;NT;ESE	RD:NT	RD:DIR:OPS	CONG. REL.	AGMRID	GM
JHLieberman/edb	GWKavanagh	FKPittman			
11/29/60	11/ /60	11/ /60	/ /60	/ /60	/ /60

AEC 180/13

(1-4-61)

AEC

ML & 12-Waste

WW

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. D-4
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Thursday, January 5, 1961)

AEC TO TEST CONTAINERS USED
IN SEA DISPOSAL OF RADIOACTIVE WASTE

The U. S. Atomic Energy Commission will conduct a project off the coast of Southern California beginning January 12, 1961 to test the integrity of containers used to confine low-level radioactive wastes during descent to a depth of 1,000 fathoms in disposal at sea.

Containers will be immersed to 1,000 fathoms (6,000 feet) and will be photographed before and during immersion. The tests will be conducted in an area of the Santa Cruz Basin, approximately 32 miles southwest of Port Hueneme, California. This area presently is designated by the Commission as a waste disposal site.

The Commission requires that disposal of low-level radioactive wastes at sea be made at not less than 1,000 fathoms. These wastes include broken glassware, paper wipes, rags and laboratory paraphernalia. It is not expected that wastes periodically disposed of at sea will be contained indefinitely. Standards used by the Commission are based on the fact that the ocean will safely dilute and disperse any low-level wastes which are permitted to be disposed of at sea so that they are undetectable in the ocean.

As an added safety factor, the Commission stressed in a recent waste disposal case the desirability of confining the wastes until they reach the minimum required depth of 1,000 fathoms.

The Advanced Systems Development Division of Pneumo-Dynamics Corporation of El Segundo, California, has been awarded a

(more

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contract by the Commission to conduct the sea tests of containers. Edgerton, Germeshausen and Grier, Inc. of Santa Barbara, California, under sub-contract, will provide photographic engineering and radiological health services for the tests.

The tests are designed to determine the structural behavior of the various types of containers now used for waste disposal in the sea at depths of 1,000 fathoms (pressures up to approximately 3,000 pounds per square inch). Through use of recently-perfected underwater photographic techniques it should be possible actually to "see" how the container withstands the increase in pressure as it sinks through the water.

Types of containers to be tested at sea include 116 55-gallon drums with the wastes imbedded in concrete inside the container; nine 55-gallon drums encased in concrete; 25 concrete shapes of various sizes. Most of these will be actual containers used by Commission licensees and contractors. The containers have been selected from various areas of the United States and are being shipped to Port Hueneme. Some of the larger concrete packages will be fabricated on the West Coast to save shipping costs.

Containers will be lowered by means of a shipboard winch and cable to depths of 1,000 fathoms. Some of the containers will be raised from the depths for direct visual observation and for correlation with the underwater pictures which will be taken as each container is being lowered.

In a parallel phase of the tests of sea disposal containers, the Commission has contracted with Southwest Research Institute at San Antonio, Texas, to perform laboratory tests of containers. Pressure testing and impact testing will be performed on containers of the types now being used, and on experimental containers. Tests also will be performed of the various pressure equalizing devices. The purpose of these laboratory tests is to determine the effects of high pressure on different packaging methods under controlled laboratory conditions. A total of 54 models of containers will be tested by the Institute.

Data from the laboratory phase of the project will be correlated with information gained during the sea tests.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

JAN 4 1961

Dr. H. H. Hess, Chairman
Committee on Waste Disposal, Division of Earth Sciences
National Academy of Sciences - National Research Council
2101 Constitution Avenue, N. W.
Washington 25, D. C.

Dear Doctor Hess:

The Chairman of the Atomic Energy Commission has asked me to reply to your letter of June [illegible], 1960, transmitting your Committee's views on disposal of radioactive wastes.

First, we would like to acknowledge with thanks the past services of your group.

It has been clear that with regard to the highly radioactive wastes evolving from the chemical processing of irradiated fuel, disposal of the liquids into the environment is not indicated. These wastes have been, and will continue to be, stored in underground tanks until better systems can be developed and proven out. The experience accumulated during the storage of radioactive wastes in tanks at AEC installations has proven that such storage is safe and entirely satisfactory for the interim until a desirable method of ultimate disposal is developed, and meanwhile their activity is steadily decreasing. As you know, it will be necessary to store highly radioactive waste for a length of time prior to preparation of the aged waste for ultimate disposal. It is our opinion that safe, practical long-term solutions to highly radioactive waste problems at existing AEC installations will be obtained from development efforts being carried out by various groups in AEC facilities under AEC sponsorship. We, therefore, see no necessity for going to the enormous expense of relocating existing fuel element processing facilities as implied in your letter.

As you know, the recommendations of your group contained in its April 1957 report, and those made at other meetings of the Committee, contributed to the basis for establishing development projects on the geologic approaches to ultimate disposal of these high activity liquid wastes. Included are the projects on disposal in salt formations and the investigation of the basement rock at Savannah River for disposal purposes. In addition, projects directed toward conversion of these wastes to solid form, which have achieved some quite promising results,

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are an important part of the over-all program. We believe your Committee is generally familiar with these programs, and the organizations involved, through reports, visits and discussions as indicated in minutes of Committee meetings. We had thought until we received your recent letter that the earth science aspects of our program on waste disposal development had met with your general approval.

The application of the Committee's criterion for safe disposal -- "no system of waste disposal can be considered _safe_ in which the wastes are not completely isolated from all living things for the period during which they are dangerous" -- to the highly radioactive reprocessing wastes is understood, as indicated above. However, we assume that you do not mean that _zero_ radioactivity should be allowed to reach man's environment. This would raise fundamental questions including those of a biological and medical nature that are very broad in scope. The creation of the Federal Radiation Council by Executive Order and by statute, the recent hearings before the Joint Congressional Committee on Atomic Energy on the subject of radiation protection criteria and standards and the recent deliberations, conclusions and reports of the National Academy of Sciences-National Research Council Committee on Biologic Effects of Atomic Radiation attest to the complexity and wide scope of consideration associated with these questions.

In arriving at conclusions and operating decisions regarding health and safety, the AEC has been guided to a considerable extent by the recommendations of such groups as the International Commission on Radiological Protection and the National Committee on Radiation Protection. Your Committee is also generally aware of how the AEC presently carries out certain of its ground disposal operations within the framework of such recommendations. We hope the visits of June 27 - July 1 by the Committee to Hanford and Idaho have added to your information in this area and are pleased to note the conclusion in your report on these visits that neither the Hanford Plant nor the Idaho Falls Plant is now creating a hazard. We also wish to assure you that careful consideration is being given to the Committee's previously noted reservations relative to certain specific operations involving ground disposal of intermediate level liquid wastes at the Oak Ridge National Laboratory.

With regard to the Committee's present recommendations, you are familiar with present programs being carried out to investigate and delineate geologic sites suitable for ultimate disposal of highly radioactive liquid wastes. Oak Ridge National Laboratory, Hanford, University of Texas, U. S. Geological Survey, Bureau of Mines, and the American Association of Petroleum Geologists are among the organizations working in this area. The engineering and establishment of such systems involve complex questions which you have helped to frame and answers to which involve research, development and testing in a number of related fields in addition to those of the earth sciences.

We, of course, concur in the requirement that adequate provisions for the management of radioactive wastes be a prerequisite to the location, design, construction and operation of nuclear facilities, and plans for safe handling and disposal of radioactive wastes are an integral part of all proposals for nuclear installations. A careful review of waste management systems for proposed reactors by AEC staff and the AEC's Advisory Committee on Reactor Safeguards is an example of the degree of importance attached to this function even though most reactors do not produce high level liquid wastes. However, we agree that all chemical reprocessing activities should be and are, subjected to comprehensive AEC review and the problems of waste management are importantly involved.

Your assistance and contributions to the AEC waste disposal development program are appreciated.

Sincerely yours,

SIGNED, A. R. LUEDECKE

General Manager

GM
ADPRID
Secretary
RD rdg
Pittman rdg
WF reading
DSR rdg

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : W. B. McCool, Secretary

DATE: DEC 27 1960

FROM : Frank K. Pittman, Director E. V. McGarry
Division of Reactor Development

SUBJECT: MEMORANDUM TO COMMISSIONER GRAHAM REGARDING NAS-NRC EARTH SCIENCES ADVISORY GROUP

RD:NT:ESE:JAL

The attached report, prepared at the request of Commissioner Graham, is transmitted to you for circulation to the Commissioners for their information.

Attachment
Memo for Commissioner Graham
w/Report - Background Information

File; commissioners got carbon copies so no reproduction necessary.
HDA
12/30/60

12-27-60

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

MEMORANDUM FOR COMMISSIONER GRAHAM

THROUGH GENERAL MANAGER

SUBJECT: ROLE OF NAS-NRC EARTH SCIENCES DIVISION ADVISORY COMMITTEE ON GEOLOGIC AND GEOPHYSICAL ASPECTS OF WASTE DISPOSAL

The following is submitted in accordance with your request to explore the requirement for a continuing subject advisory group.

After consideration of the various factors involved in establishing the group, its activities to date and the relative advantages and disadvantages of maintaining the group on a continuing basis versus the use of consultants or advisors on an "ad hoc" basis, it is concluded that, on balance, it would be desirable to continue the group in its present form. This conclusion is based primarily on three factors:

1. The continuing and comparatively long range nature of current and future research and development in the ultimate disposal of highly radioactive waste materials makes it advantageous to have assistance and advice in over-all review and appraisal by a group with some continuity in its function.

2. Having such a group operate under the aegis of the NAS-NRC assures a highly authoritative, independent review in a field that has potentially highly sensitive public relations implications. While the problems associated with advisory committees and groups is recognized, it is believed in this situation the use of such a group is warranted.

3. Our belief that the group is one that is highly competent and representative of the earth science disciplines that relate most directly to the subject of waste disposal in specific geologic environments.

While it may be that the use of "ad hoc" advisors is perhaps somewhat less restrictive, such an approach in connection with the over-all earth sciences interests seems to have the same - or more - problems as a continuing group without the several advantages accruing to a continuing group under the NAS-NRC. There have been, of course, specific situations in the R&D program in this area where "ad hoc" groups have been used and proven valuable. An example is the working group established at our request by the American Petroleum Institute to consider the engineering problems associated with possible deep well disposal. It is expected that such "ad hoc" groups would be used in the future in connection with specific questions arising in the program. However, as noted previously, we believe the desirability of continuing over-all review and assistance, including appraisal of R&D work and evaluation of R&D proposals, still exists.

It may be useful to apprise the General Advisory Committee of activities in this field. However, it is not known whether the GAC could or would undertake the kind of review and assistance noted above. Because of the specialized character of the scientific disciplines involved in the geologic, hydrologic and geophysical aspects of the problem of ultimate disposal of highly radioactive wastes it would seem that if an advisory group is to be used, it might best originate from a group or organization directly active in and cognizant of these disciplines.

While, as stated previously, it is believed that the continuing utilization of such a group is desirable from a number of standpoints, it is not essential to the actual conduct of the waste disposal development program.

Background information relating to the NAS-NRC advisory group is attached.

Frank K. Pittman, Director
Division of Reactor Development

BACKGROUND INFORMATION

NAS-NRC DIVISION OF EARTH SCIENCES COMMITTEE ON DISPOSAL
OF RADIOACTIVE WASTES

Origin of Committee

The Committee was established in February 1955 through a contract between NAS-NRC and AEC. This action was taken following earlier extensive discussions with various earth science experts in universities, other government agencies, and industry, primarily on the problem of ultimate disposal of highly radioactive liquid wastes in the earth environment. The consensus of these discussions was that a useful way of focusing the best competencies of the earth sciences profession in the U. S. on this problem would be through a steering or advisory group set up through the NAS-NRC.

Objectives and Charter of Committee

The primary purpose or objective of the committee was and is to assist and advise the AEC (DRD) with regard to the geologic, hydrologic and geophysical aspects of the conception, evaluation of feasibility, and associated R&D work related to the development of systems for the final or ultimate disposal of highly radioactive liquid waste into the geologic environment.

Although a specific, detailed charter or terms of reference within which the committee would pursue the above objective was not spelled out in a contractual document, concrete operating plans were developed through discussions with the group in early 1955.

In summary, these plans consisted of sponsoring and conducting a working conference or series of such conferences to first, generate ideas and suggestions for ultimate disposal techniques, and second, to review and evaluate the ideas and suggestions developed. This would lead to recommendations concerning needed or desired R&D work. This would constitute the first phase of the group's activities and is represented, to a certain extent, by their April 1957 report. (This report covers the working conference held under the sponsorship of the group in September 1955. It contains the initial recommendations of the group with regard to the possibility of using salt formations or deep permeable basins for ultimate disposal of highly radioactive waste materials).

Following this, the group would operate on a periodic but continuing basis to advise the AEC with regard to review and evaluation of the related R&D program. This function has been carried out and continues to the present time.

In 1958, in extending the contract with the NAS-NRC the scope of work was indicated to include the following: (all related to disposal of high-level radioactive wastes into the ground)

a. Periodic review of results obtained from R&D carried out by the AEC to obtain an independent evaluation of the R&D program.

b. Recommendation of areas of investigation or specific projects deemed necessary or desirable for an adequate attack on the problem.

c. Evaluation and recommendations regarding proposals received from responsible organizations for work directly related to this field.

d. Periodic review of operational experience to provide an independent assessment of operations.

e. Assistance in integration of available earth science knowledge pertaining to the over-all problem.

It was not and is not contemplated that the group would directly sponsor or engage in R&D work.

Committee Membership

The membership of the committee presently consists of the following:

Dr. Harry H. Hess, Chairman, Head of Department of Geology, Princeton University

Dr. W. E. Benson, Division of Earth Sciences, National Science Foundation

Dr. John N. Adkins, Chief, Geophysics Branch, Office of Naval Research

Dr. John C. Frye, Director, Illinois State Geological Survey

Dr. W. B. Heroy, Sr., President, Geotechnical Corporation, Dallas, Texas

Dr. M. King Hubbert, Staff Consulting Geologist, Shell Oil Company, Houston, Texas

Dr. Richard J. Russell, Dean, Graduate School, Louisiana State University

Dr. C. V. Theis, Staff Scientist, U. S. Geological Survey, Albuquerque, New Mexico

Dr. William R. Thurston, Secretary, Assistant to the Director, U. S. Geological Survey

From the standpoint of experience in various aspects of the earth sciences, it is believed that the group is one of outstanding capabilities and is vigorous.

luation of those aspects of geology and hydrology that directly pertain to the problem of ultimate disposal of highly radioactive wastes.

Assessment of Committee Activities

In pursuit of the primary objective, namely advice and assistance to AEC in the earth science aspects of development of safe, practical ultimate disposal systems for highly radioactive wastes, it is believed the group has been effective and useful. They have played a significant part in establishing the current AEC R&D projects in disposal in salt formations, disposal in deep, permeable formations and in possible applications of hydraulic fracturing to underground disposal. The continuation of this activity, i.e., the periodic review and evaluation of these and related R&D projects would appear to be the primary justification of the continuation and authority of the committee.

In the course of orienting and briefing the committee on the scope of work it has been necessary to describe the nature and origin of the waste materials involved, how these were being managed at present, and related operations. Included were existing ground disposal operations for lower activity wastes such as are carried out at Hanford, ORNL and NRTS. It appears to be these latter operations (particularly those at ORNL), more than anything else, coupled with the "philosophical" reservations on the part of certain committee members against any man-made radioactivity being introduced into the environment that have precipitated the group's apparent criticisms contained in their letter to the Commission.

All in all, however, it is concluded that the committee's contributions have been on the positive side, insofar as the waste disposal R&D program is concerned and even with respect to certain AEC waste disposal operational activities (e.g., ORNL waste disposal pits).

Future Committee Activities

As stated previously it is believed the most useful function of the group in the future would be that of review and evaluation of the R&D program related to ultimate disposal, and continuation of the group for this purpose is believed to be desirable.

Secondarily, it would seem worthwhile from several viewpoints (independent check, public relations considerations, etc.) to have the group available to review and evaluate current AEC ground disposal operations from time to time. In this latter connection the requirement for factoring in basic radiation protection guides and standards - by other experts - must be recognized.

Activities of Other Related Committees

There are other groups (both continuing and ad-hoc) whose activities have been related to the work of the NAS-NRC Earth Sciences group and which should be noted.

The most important of these from a public relations standpoint is the NAS-NRC Committee on Disposal and Dispersal of Radioactive Wastes, one of six committees[1] under the general chairmanship of Dr. Detlev W. Bronk, President of the National Academy of Sciences. This particular committee is under the direct chairmanship of Dr. Abel Wolman, Professor Emeritus of Sanitary Engineering of The Johns Hopkins University and included in its membership are the Chairman of the Earth Sciences group, Dr. H. H. Hess, and another member of the group, Dr. C. V. Theis. Along with the other five committees, it prepared a report which was published by the NAS-NRC this past spring (May 1956) and which covered the over-all subject of waste management in a comprehensive way. This whole group is one of the most authoritative extra-AEC organizations concerning itself with radiation problems and it is significant to note that its published report on waste disposal is not considered to contain conclusions that are adverse to the AEC.

Another committee (ad hoc) that assisted in more detailed consideration of the possibility of disposal in deep wells was established in 1958 at our request (and with the concurrence of the NAS-NRC Earth Sciences group) by the American Petroleum Institute under the chairmanship of T. V. Moore of Esso, New Jersey. This group was comprised of experts from a number of oil companies and prepared a report indicating the general engineering feasibility of such systems. This group carried out the job without remuneration, including testimony before the JCAE by its chairman.

Growing out of the work of the API group was a request to the American Association of Petroleum Geologists to assist in the analysis and evaluation of sites where a deep well field experiment might be carried out. A group has been set up under the chairmanship of John F. Galley of the Shell Oil Company and is currently considering (working in cooperation with the U. S. Geological Survey) proposed sites for such work. There is also no AEC remuneration of this group.

Working with such groups has resulted in substantial benefit to AEC in two major ways, 1) it has brought to bear the competencies of outstanding experts, which would not otherwise be available, on specific AEC problems, and 2) it has served to emphasize that the AEC is proceeding in a deliberate, and not unilateral or arbitrary manner, in an area of particular potential public relations sensitivity.

1/ The work of these six committees is carried out under the aegis of the NAS with the financial support of the Rockefeller Foundation. The six committees are:

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Pathology
Meteorology
Oceanography & Fisheries
Agriculture & Food Supplies
Disposal and Dispersal of Radioactive Wastes

and collectively are known as the NAS Committees on Biologic Effects of Atomic Radiation (BEAR Committees)

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DEC 16 1960

MEMORANDUM FOR COMMISSIONER GRAHAM

THROUGH GENERAL MANAGER SIGNED, A. R. LUEDECKE

SUBJECT: ROLE OF NAS-NRC EARTH SCIENCES DIVISION ADVISORY COMMITTEE ON GEOLOGIC AND GEOPHYSICAL ASPECTS OF WASTE DISPOSAL

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Original Signed By
A. J. Vander Weyden

Frank K. Pittman, Director
Division of Reactor Development

CC:
Chairman McCone
Commissioner Wilson
Commissioner Olson

cc:
RD rdg
Pittman rdg
WT rdg
SSB rdg

Secretariat
Tammaro
GM

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Disposal and Dispersal of Radioactive Wastes

and collectively are known as the NAS Committees on Biologic Effects of Atomic Radiation (BEAR Committees)

Meeting 12

A. R. Luedecke, General Manager
THRU: A. Tammaro, AGMRID

DEC 1 1960

Frank K. Pittman, Director
Division of Reactor Development

Original signed by
Frank K. Pittman

REPLY TO DR. H. H. HESS, DIVISION OF EARTH SCIENCES, NAS-NRC

RD:NT:ESE:JAL

Attached for your signature is the subject reply as approved by the Commission at its meeting on Wednesday, November 23, 1960. This contains the modification which the Commission desired in the second sentence of paragraph 5.

Also attached is a letter of transmittal from you to the Executive Director of the Joint Committee on Atomic Energy to forward this exchange of correspondence if it is decided that this should be done. At the November 23 Commission meeting it was noted that this decision was to be left up to the Chairman.

Attachments
Ltr to Dr. Hess*
Ltr to Mr. Ramey w/attach.

AGMRID
GM
Secretary
Pittman rdg
RD rdg
NT rdg
ESE rdg

*filed in date order 1-4-61

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RD:NT:ESE	RD:NT	RD:DIR:OFS
JALieberman/ edb	GMKavanagh	FKPittman
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12-1-60

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT ~~OFFICIAL USE ONLY~~

Ref Sec

Memorandum

TO : Frank K. Pittman, Director
Division of Reactor Development

DATE: November 25, 1960

FROM : W. B. McCool, Secretary

SUBJECT: EARTH SCIENCES ADVISORY COMMITTEE

SYMBOL: SECY:AHE

1. We informed your office on November 25, 1960, that at Meeting 1675 on November 23 during discussion of AEC 180/13 - Letter to Committee on Waste Disposal, NAS-NRC, Regarding Land Disposal of Radioactive Wastes, Mr. Graham requested a report on the requirement for a standing advisory committee to the Commission in the dicipline of the Earth Sciences. Mr. Graham suggested this function might be more appropriately delegated to the General Advisory Committee or to Ad Hoc groups responsive to particular needs.

2. The General Manager has directed you to prepare the report requested above. We will be happy to assist in circulating the report for the information of the Commission.

cc: Mr. Graham
General Manager
Deputy General Manager
Asst. General Manager
Asst. General Mgr. for R&ID
General Counsel

Copies filed:
O&M-7 Contr. & ~~Bonds~~
O&M-7 GAC Comm.

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09-5R-1

OPTIONAL FORM NO. 10
5010-104
UNITED STATES GOVERNMENT ~~OFFICIAL USE ONLY~~

Reference Sec

Memorandum

TO : Frank K. Pittman, Director
Division of Reactor Development

DATE: November 25, 1960

FROM : W. B. McCool, Secretary

SUBJECT: AEC 180/13 - LETTER TO COMMITTEE ON WASTE DISPOSAL, NAS-NRC, REGARDING LAND DISPOSAL OF RADIOACTIVE WASTES

SYMBOL: SECY:AHE

1. We informed your office on November 25, 1960, that at Meeting 1675 on November 23 the Commission:

a. Approved transmittal of the letter attached as Appendix "C", as revised, to AEC 180/13, to the NAS-NRC Earth Sciences Division Committee on Waste Disposal;

b. Noted the summary description of present AEC waste storage and ground disposal operations, attached as Appendix "D" to AEC 180/13;

c. Noted the status of research and development programs on high level radioactive waste handling as described in Appendix "E" to AEC 180/13;

d. Noted that no news release on the exchange of correspondence will be made

e. Noted that, subject to the Chairman's approval, a copy of the letter attached as Appendix "C", as revised, to AEC 180/13 will be transmitted to the JCAE; and

f. Noted that AEC 180/13 is unclassified.

2. You will recall the Commission requested the second sentence of paragraph 5 of the letter to Dr. Hess be revised to read:

"However, we assume you do not mean that zero radioactivity should be allowed to reach man's environment. This would raise fundamental questions including those of a biological and medical nature that are very broad. The creation of the..."

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9-5-11

3. The General Manager has directed you to take the action required by the above decision. It is our understanding that your office will prepare the necessary correspondence. Copies of these letters together with other pertinent correspondence should be provided the Office of the Secretary.

cc: General Manager
Deputy General Manager
Asst. General Manager
Asst. Gen. Mgr. for R&D
General Counsel
Congressional Relations

FORM AEC-304 (3-57)

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: Materials 12

TO:

FROM:

SUMMARY: AEC-R 8/10 - AMENDMENT TO 10 CFR 20, STANDARDS FOR PROTECTION AGAINST RADIATION
To considet the issuance of an effective amendment to 10 CFR Part 20 dealing with the disposal bf byproduct, source and special nuclear material waste by land burial.

FILED: PRC 1-1 Reg. Radiation Prdtection Reg.

INDEXER: date of paper: 11-28-60

REMARKS:

CONFIRMED TO BE UNCLASSIFIED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: [illegible] DOB/NN-523

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1

ale - 12. Waste Disposal

1675 AEC Meeting 11-23-60 906

3. AEC 180/13 - Letter to Committee on Waste Disposal, NAS-NRC, Regarding Land Disposal of Radioactive Wastes

Mr. Hollingsworth presented for Commission consideration a proposed reply to a letter from the Committee on Waste Disposal of the Earth Sciences Division, National Academy of Sciences-National Research Council, on the subject of disposal of radioactive wastes.

Mr. Wilson said he would like to point out that the Committee on Waste Disposal of the Earth Sciences Division of the NAS was competent to address itself only to geological aspects of waste disposal and is outside its field when commenting on matters of waste disposal in general.

Commissioner Olson drew attention to paragraph 5 of the proposed letter to Dr. H. H. Hess, Appendix "C" of AEC 180/13. Mr. Olson suggested that the second sentence of paragraph 5 be revised to state: "However, we assume you do not mean that zero radioactivity should be allowed to reach man's environment. This would raise fundamental questions including those of a biological and medical nature that are very broad." Mr. Hollingsworth called attention to a fact that the recommendations do not provide for a copy of the letter to be forwarded to the Joint Committee. Commissioner Graham pointed out that the Joint Committee is interested in the totality of the waste disposal problem. He said he favored transmitting a copy of the letter to the Joint Committee. Commissioner Wilson said he did not believe it was necessary and in some respects not advisable to forward this letter to the Joint Committee. He pointed out that it would be proper to include a copy of Mr. Hess' letter to the Chairman dated June 21, 1960, with AEC's reply and as the letter from the Committee on Earth Sciences contained inaccuracies he said it might cause unnecessary alarm. Mr. Hollingsworth suggested and the Commissioners agreed that subject to the Chairman's approval, a copy of the letter attached as Appendix "C" to AEC 180/13, as revised, will be transmitted to the Joint Committee.

After further discussion the Commission:

a. Approved transmittal of the letter attached as Appendix "C"

11-23-60

as revised, to AEC 180/13, to the NAS-NRC Earth Sciences Division Committee on Waste Disposal;

b. Noted the summary description of present AEC waste storage and ground disposal operations, attached as Appendix "D" to AEC 180/13;

c. Noted the status of research and development programs on high level radioactive waste handling as described in Appendix "E" to AEC 180/13;

d. Noted that no news release on the exchange of correspondence will be made;

e. Noted that subject to the Chairman's approval a copy of the letter attached as Appendix "C", as revised, to AEC 180/13, will be transmitted to the JCAE; and

f. Noted that AEC 180/13 is unclassified.

Later in the Meeting subsequent to Commissioner Wilson's departure, Mr. Graham inquired regarding the advisability of maintaining a standing advisory committee to the Commission in the Earth Sciences. Mr. Lieberman pointed out that the Committee on Earth Sciences of the National Academy of Sciences have served the Commission since 1955. They have addressed themselves to problems involving many Commission activities and have provided valuable advice in AEC's operations. At present he said, they are planning an examination of a basal drop that occurred recently in the subsurface below the Savannah River Plant. Mr. Graham said that it might be advisable to investigate the possibility of this function being delegated to the General Advisory Committee. He said it might be more appropriately and adequately dispensed by ad hoc committees whose members are responsive to individual problems. After additional discussion Mr. Graham requested a report on the requirement for a standing committee to advise the Commission in the earth sciences.

#12-

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Mtg. between McCone and Emelyanov 11-19-60

Waste Disposal - Mr. Hall recalled the letter from Professor Emelyanov dealing with proposed visits on waste disposal sometime between January and March. Professor Emelyanov repeated that that was the m[illegible] convenient time for his people and added at that time a new plant would be

[illegible]mpleted and [illegible] [illegible] disposal authorities. Mr. [illegible] asked what [illegible] Professor Emelyanov stated that it was a plant to distill and solidify waste so it could be packaged in smaller containers.

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW
1st REVIEW-DATE: [illegible]
AUTHORITY: [illegible]
NAME: [illegible]
2nd REVIEW-DATE: [illegible]
AUTHORITY: [illegible]
NAME: [illegible]
DETERMINATION (CIRCLE NUMBER(S))
1. CLASSIFICATION RETAINED
2. CLASSIFICATION CHANGED TO: ______
3. CONTAINS NO DOE CLASSIFIED INFO
4. COORDINATE WITH: ______
5. CLASSIFICATION CANCELED
6. CLASSIFIED INFO BRACKETED
7. OTHER (SPECIFY): ______

~~CONFIDENTIAL~~

CLASSIFICATION CANCELED
DOE NSI DECLASSIFICATION REVIEW E.O. 12958
BY: RAYMOND RUDELL DOE/NN-523 RR

Copy of complete memo of conversation filed under date of [illegible] CAE-1 2-5 61-NA 2-US-USSR Agree.

[illegible]

7 lts

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D. C.

November 9, 1960

MEMORANDUM FOR ALL HOLDERS OF AEC 180/13

1. Copy (ies) 40 of AEC 180/13 was (were) distributed to your office on September 21, 1960.

2. The Division of Reactor Development has requested that the attached pages 12-15 be substituted for pages 12-15 now in AEC 180/13. The revisions in the letter to the Committee on Waste Disposal resulted from discussions between Commissioner Wilson and DRD Staff, and occur primarily in paragraph 3 on page 12, paragraph 4 on page 13, and paragraph 8 on page 15.

Done

W. B. McCool
Secretary

Attachment
Revised pages 12-15

11-9-60

Materials 12 - Waste Disposal

~~OFFICIAL USE O~~

4. Recommendations Under Preparations

Agenda Planning
Session-11-7-60
OUO

The Commission reviewed with the General Manager various matters which are subject of forthcoming staff recommendations. General Luedecke said now under preparation are two staff papers regarding Domestic and Foreign Patent Policies. The Chairman suggested and the Commissioners agreed that these matters be reviewed by Commissioners Graham, Wilson and Olson prior to formal consideration.

The Commissioners discussed the Establishment of Criteria for Site Evaluation of Power and Test Reactors. The General Manager said the AEC staff is working with the Advisory Committee on Reactor Safeguards in developing criteria for site selection. The matter will be submitted to the next meeting at ACRS. He said the Committee has commented favorably on most of the AEC recommendations with the exception that the Committee believes the criteria should not be published as an effective AEC regulation but possibly published as an article in a scientific journal. Mr. Olson said it was his opinion these criteria should be published as effective AEC regulation or not published at all. Commissioner Wilson said he believed the publication of this information in a scientific journal would provide sufficient guidance at this time.

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Consideration of the November 1, 1960 Planning Estimates will be withheld until the budget level for the weapons program has been determined with the Bureau of the Budget.

In discussing forthcoming recommendations regarding AEC policy on exchange with the Soviet Bloc, Mr. Graham said that he understands the scientific community hopes to construct a very large particulate accelerator in cooperation with the Soviet Union. He said he would like to call this to the attention of the Commission for discussions in connection with the forthcoming staff paper.

JA 5 - Soviet Union

The Chairman said he considered the recommendations on centralization of Administration of Waste Disposal of the highest priority and recommended the matter be submitted for Commission consideration at the first opportunity.

Commissioner Olson reviewed for the Commissioners the contents of the study on AEC Regulatory Organization Procedures. He said he had reviewed the final draft in considerable detail and the study is a recital of fact regarding Organizational Procedures for the Commission's regulatory function. Recommendations pursuant to the study will be submitted for early Commission consideration.

Legal 2 - Reg. Procedures

October 27, 1960

MEMORANDUM FOR THE COMMISSIONERS

Subject: REPORT OF NAS-NRC - THE DISPOSAL OF RADIOACTIVE WASTE ON LAND

Attached for your information, as indicated in AEC 180/14, is the April 1957 report submitted by The NAS-NRC Division of Earth Sciences Committee on Waste Disposal.

HDa
for W. B. McCool
Secretary

Attachment:
As noted ~~above~~ filed in Bulky Package

OFFICE ▶	SECRETARIAT					
SURNAME ▶	ANAMOSA:rk					
DATE ▶	10/27/60					

Form AEC-318 (Rev. 9-53) U.S. GOVERNMENT PRINTING OFFICE 16—62761-3