

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 70-820/80-19

Docket No. 70-820

License No. SNM-777 Priority 1 Category UR

Licensee: United Nuclear Corporation

UNC Recovery Systems

Wood River Junction, Rhode Island 02894

Facility Name: Fuel Recovery Operation

Inspection at: Wood River Junction, Rhode Island

Inspection conducted: October 6-October 24, 1980

Inspectors: W. W. Kinney, Project Inspector

1/21/81
date signed

H. W. Crocker, Chief, Fuel Facility Projects Section

1/21/81
date signed

Approved by: H. W. Crocker, Chief, Fuel Facility Projects Section

date signed
1/21/81
date signed

Inspection Summary:

Inspection on October 6-24, 1980 (Report No. 70-820/80-19)

Area Inspected: Special announced inspection by region-based inspectors of circumstances surrounding the packaging of six shipments of radioactive lagoon waste which were shipped from the licensee to the Nuclear Engineering Company (NECO) burial site in Beatty, Nevada, and were subsequently returned to the licensee as ordered by the State of Nevada. The inspection involved 107 inspector-hours onsite by two NRC region-based inspectors.

Results: Three apparent items of noncompliance were identified. A. Failure to follow DOT regulations in three instances. (1) Failure to package LSA radioactive material in strong, tight packages so that no leakage would occur during transport - 10 packages leaked. (Section V, Findings, page 23); (2) Failure to correctly identify the physical form of radioactive material on shipping paper - material was identified as solid and liquids were present. (Section V, Findings, page 23); (3) Failure to mark a container "Radioactive - LSA". (Section V, Findings,

Region I Form 12
(Rev. April 77)

8106090608

page 23). B. Licensee transferred liquid material to NECO and State of Nevada license does not allow the receipt and burial of liquid radioactive waste. (Section V, Findings, Page 22). C. Failure to provide operating, quality assurance, and quality test procedures to assure: that no separation of liquid from solids would occur prior to receipt of material by the burial ground operator; that no liquid waste was placed in the shipping containers; and that shipping containers would not leak during transport as a result of packaging raw lagoon sludge for shipment and burial. Also, failure to provide operating and quality assurance procedures for the lagoon sludge filtration and packaging operations during the period from August 10 through October 18, 1980. (Section V, Findings, page 24).

TABLE OF CONTENTS

	Page
I. Scope of Inspection	4
II. Summary	4
III. Facts	9
IV. Analysis	20
A. Incident 1	20
B. Incident 2	21
C. Incident 3	21
V. Findings	22
VI. Exit Interview	24
VII. Exhibits	24
1. Region V Inspection Report	26
2. Photographs	41
3. Sample Results	60
4. Concentration of Radionuclides in Sludge	61
Figure	
1. Lagoon Area as of late 1977	12

I. Scope of Inspection

This inspection concerned the circumstances surrounding the packaging of six shipments of radioactive lagoon waste which were shipped from UNC Recovery Systems in Wood River Junction, Rhode Island, to the Nuclear Engineering Company burial site in Beatty, Nevada, and were subsequently returned to UNC Recovery Systems. The State of Nevada ordered that the shipments be returned because they found a drum leaking liquid in one shipment and a box leaking liquid in another shipment.

The following employees of UNC Recovery Systems were contacted:

- *C. E. Bower - President and General Manager
- *R. J. Gregg - Quality Assurance Manager
- P. Dessaulles - Operations Manager
- R. Weber - Lagoon Project and Maintenance Manager
- J. Murphy - Operations Supervisor
- A. DeCourcy - Operations Foreman

The inspectors also contacted operating personnel during the course of the inspection.

*Denotes those present at the exit interview.

II. Summary

In License Condition No. 26 imposed on January 15, 1979, the NRC required that UNC Recovery Systems process the residues in the existing lagoons and have these lagoons decontaminated to release limits by July 1, 1982. In April 1980 the licensee declared its decision to terminate operations and to decontaminate the Wood River Junction site for termination of their license. The licensee established April 1, 1981, as the scheduled date for completion of the decontamination.

The licensee initiated trial runs of their lagoon sludge filtration and drying operation on May 19, 1980. The licensee hired temporary employees, named three shift supervisors, trained the newly hired employees, and by mid June 1980 had attempted to operate the lagoon sludge filtering and drying process. The dryer could not be operated because the air from the dryer contained particles which plugged the HEPA exhaust filters. The licensee decided that the filtered sludge was dry enough to meet burial ground requirements, and the licensee then packaged the undried filtered lagoon sludge for shipment to burial. The licensee had the lagoon sludge filtration process operational in late June 1980.

The licensee filtered lagoon sludge during July and August, and sent the sludge packaged in 55 gallon drums to the Chem Nuclear burial site in Barnwell, South Carolina. Thousands of drums were shipped and buried with no problems being encountered during shipment and burial.

During late August and September the licensee made three pertinent changes in their lagoon sludge removal operations.

- In an attempt to meet their decommissioning schedule and because they were having problems pumping the sludge to the filtration process, the licensee decided to expedite the removal of the sludge by loading raw sludge from lagoon A directly into shipping containers without the benefit of the filtration process.
- The licensee finished the removal of sludge from lagoons C, D, E, and F using cranes. The contents of these lagoons were either placed in lagoon A or were placed in 55 gallon drums and wooden boxes.
- The licensee started to ship their waste to the Nuclear Engineering Company (NECO) burial site in Beatty, Nevada.

While in storage or in transit, liquid separated from the raw sludge. Both the South Carolina license for operation of the Barnwell burial site by Chem Nuclear and the Nevada license for operation of the Beatty burial site prohibit the burial of radioactive liquids. Therefore, the loading of raw sludge in the containers ultimately resulted in UNC Recovery Systems sending waste to the Nevada burial site which contained free liquid and did not meet the Nevada State license requirements. This was an item of noncompliance. The loading of the raw sludge into the containers is discussed further below.

On the basis that the water content of the sludge on the top of lagoon A was about the same as the water content of the filtered sludge, the licensee had a crane remove sludge from lagoon A and fill about 30 wooden boxes on August 25, 1980. The boxes were not structurally strong enough to keep their shape, when loaded with the raw sludge. Also, about five of the boxes appeared to have leaked liquid while standing. The licensee felt that wet wood was used in the construction of the boxes, and the weight of the sludge squeezed the water from the wet wood. Instead of using boxes, the licensee decided to use 55 gallon drums to hold the unfiltered sludge.

During early September 1980 the licensee had the crane fill about 1500 drums with raw lagoon sludge. In spite of the troubles encountered with the raw sludge in the wooden boxes: the licensee performed no quality assurance tests on the raw sludge to determine the effects of standing and vibration on the raw sludge; and the licensee did not require the loading of the sludge into the drums be performed using any formal operating or quality assurance procedures for process control. The failure to have formal operating, quality assurance, and quality test procedures for the packaging of raw sludge for shipment and burial constitutes the first part of an item of noncompliance.

After the crane filled the drums from lagoon A, this crane and a larger crane were used to dig up lagoons F, D, and C. Lagoon E had been dug up

previously. Lagoon G was left to handle currently generated liquid wastes. (See Exhibit 2, photographs 1-5.) The material removed was placed either in lagoon A or was loaded into 55 gallon drums or wooden boxes. The 55-gallon drums were marked with red X's and segregated from other drums because the material was not suitable for shipment. Wooden boxes were used to hold larger pieces of lagoon liner. The licensee did not mark the boxes or segregate the boxes containing wet lagoon liners from other boxes of waste. The licensee did not have any formal operating or quality assurance procedures for properly preparing the lagoon liners for packaging for shipment and burial. This constitutes the second part of the item of noncompliance concerned with the licensee's failure to meet requirements for procedural controls.

The licensee made its initial shipment of waste to Beatty, Nevada, on September 10, 1980, with shipment No. 93N. This shipment consisted of filtered sludge in drums and boxes. The licensee started shipping drums of raw sludge to Beatty, Nevada, on September 19 in shipment no. 96. This shipment contained 60 drums. Another shipment, shipment no. 102, made on September 22 also consisted of 60 drums of raw sludge. Shipments made to Beatty also included 17 boxes with weights which indicated they were not filled with filtered lagoon sludge. These boxes probably contained lagoon liners. Shipment no. 103 which consisted of 60 drums of raw sludge was made on September 23, 1980. This shipment contained the drum which NECO found to be leaking liquid on September 29, 1980. This prompted the State of Nevada to ban the receipt of waste from UNC Recovery Systems at the Beatty burial site. Shipment no. 106 which consisted of 14 boxes and 5 drums was found to contain a leaking box at the Beatty site. It was also noted that a box on shipment no. 106 was not labelled "Radioactive-LSA." This was an item of noncompliance. The State of Nevada ordered that all shipments of waste be returned to UNC Recovery Systems. The following table gives information on the shipments which had been shipped to Beatty including and after shipment no. 103.

<u>Shipment No.</u>	<u>Shipment Date</u>	<u>Drums</u>	<u>Boxes</u>	<u>Point Stopped</u>
103	9/23/80	60	1	Beatty, Nevada
104	Went to Barnwell, South Carolina			
105	9/24/80	5	10	Beatty, Nevada
106	9/25/80	5	14	Beatty, Nevada
'	9/26/80	5	12	Beatty, Nevada
108	9/28/80	5	10	Morris, Illinois
109	9/30/80	5	11	Connecticut

NECO did not find significant radioactivity above background on the floor coverings installed in the trailers for shipment nos. 103 and 106. NECO overpacked the leaking containers. UNC Recovery Systems arranged for the return of the shipments to their facility.

On October 1, 1980, Region I sent an Immediate Action Letter to UNC Recovery Systems which confirmed commitments made by UNC Recovery Systems concerning the upgrading of the waste packaging operations, especially the lagoon waste packaging operations, so that in the future packages and their contents would meet burial ground license requirements and DOT-NRC regulations.

On October 2, 1980, the State of Nevada sent a letter to UNC Recovery Systems which suspended the licensee's burial ground use permit. This letter also set forth conditions which had to be met before UNC Recovery Systems waste would again be received at the Beatty burial site.

On October 4, 1980, the Governor of Rhode Island sent a letter to the Chairman of the NRC requesting the NRC to conduct an inquiry of the circumstances which resulted in the burial ground bar against waste disposal by UNC Recovery Systems.

On October 6-8, an NRC inspector inspected shipment Nos. 108 and 109 returned from Illinois and Connecticut. The inspector also inspected the ongoing lagoon sludge filtration operation. (Exhibit 2, photograph 9 shows the filter in operation.) During this latter inspection, the inspector found that the licensee did not have current operating and quality assurance procedures for the operation of the lagoon sludge filtration and sludge packaging operations. This constituted the third and final part of the item of noncompliance concerned with the licensee's failure to meet requirements for procedural controls.

In addition to the inspection of shipment Nos. 108 and 109, NRC inspectors inspected all of the shipments as they were unloaded at the UNC Recovery System facility at Wood River Junction. This inspection was done on October 14-17 and October 20-24. The results of the inspection of October 6-8, 14-17, and 20-24 are summarized below.

Shipment No.	Drums		Boxes		Drums	Boxes	Leakers	
	Shipped	Opened	Shipped	Opened	With Liquid	With Liquid	Drums	Boxes
103	60	60	1	1	15	0	7	0
105	5	3	10	4	0	0	0	0
106	5	3	14	14	0	2	0	2
107	5	5	12	12	0	1	0	1
108	5	5	10	5	0	0	0	0
109	5	5	11	11	0	1	0	0
	<u>85</u>	<u>81</u>	<u>58</u>	<u>47</u>	<u>15</u>	<u>4</u>	<u>7</u>	<u>3</u>

Shipment No. 109 contained box 79. Box 79 was the only container in the shipment which did not contain filtered lagoon sludge. It contained lagoon liner material. The box contained free liquid but it did not leak during transport. (See Exhibit 2, photograph 6-8.)

Shipment no. 108 had 5 drums and 10 wooden boxes filled with filtered sludge. There were no problems associated with this shipment.

Shipment no. 106 was the first shipment returned from Beatty, Nevada, which was inspected. This shipment contained the box discovered to be leaking at Beatty. This box, box no. 54, was overpacked and returned. (See Exhibit 2, photographs 10-13.) The shipment contained 5 drums and 14 boxes. The 5 drums and 10 of the 14 boxes contained lagoon sludge, and there were no problems with these containers. One of the boxes contained insulation material, and there were no problems with this box. The final 3 boxes contained lagoon liners, and another box, box 52, besides box 54 leaked during transport. (See Exhibit 2, photographs 14-16.)

Shipment no. 107 had 5 drums and 9 boxes of filtered sludge. There were no problems with these containers. There were two boxes filled with process equipment, and there were no problems with these boxes. There was one box which was supposed to contain filtered sludge. Instead it contained cement covered lagoon liner material. This box leaked during transit. (See Exhibit 2, photographs 17-21.)

Shipment no. 105 was made up of 5 drums and 10 boxes. These containers all contained filtered lagoon sludge, and there were no problems encountered with these containers.

Shipment no. 103, the shipment of 60 drums of raw sludge was the last shipment received back from Beatty. The leaking drum which was discovered at Beatty was overpacked in another drum. The leaking drum, drum A-1, was still leaking as received at the UNC Recovery Systems facility. (See Exhibit 2, photographs 22 and 23.) Inspection of the drums and the floor of the trailer showed that 6 other drums - A-4, A-12, A-14, A-40, A-42, and A-45 - had leaked during transit. (See Exhibit 2, photographs 24-33.) Inspection inside the drums showed 8 other drums with liquid standing on the top. (See Exhibit 2, photographs 34-37.) None of the leaking drums had liquid standing on the top. Therefore, a total of at least 15 drums had liquid in them.

As was indicated previously, the shipment of containers holding liquid is an item of noncompliance with the State of Nevada license for the burial ground. In addition to this, the licensee stated on the shipping papers that the waste material was of solid physical form and the waste actually contained liquid. This too is an item of noncompliance.

The use of container which ultimately leaked is an item of noncompliance with the DOT requirement that containers holding LSA material must be strong and tight and not leak.

III. Facts

Condition No. 26 to License No. SNM-777 was imposed on the licensee in Amendment No. 6 to the license dated January 15, 1979. This condition required that the licensee process the residues in the existing lagoons and have these lagoons decontaminated to release limits. Total decontamination to release limits was required to be completed by July 1, 1982.

In a letter dated April 29, 1980, to the Division of Fuel Cycle and Material Safety, the licensee declared its decision to terminate recovery of highly enriched uranium and to decontaminate the site for termination of their license. The licensee planned to process the lagoon waste concurrently with the decontamination of the recovery facilities. The licensee established April 1, 1981, as the scheduled date for completion of the decontamination.

The process for removing the solids from the lagoon originally was comprised of the following operations: pumping the lagoon sludge from the lagoons to a process building; treating the sludge with a flocculating agent; filtering the sludge; drying the sludge in a dryer; and packaging the dried sludge in 55 gallon drums for shipment to burial. The licensee initiated trial runs of the lagoon sludge filtration and drying equipment on May 19, 1980.

The licensee prepared Engineering Change Notice (ECN) No. 1432 entitled Lagoon Disposal Process, and issued the ECN on June 10, 1980. The ECN was valid for 2 months. The ECN outlined the procedures for lagoon sludge flocculation; filtration of the flocculated sludge; drying of the sludge; and loading of the dried solids into 55 gallon drums.

The licensee hired fifteen new temporary employees; named three shift supervisors for three shift a day operation; trained the newly hired employees; and by June 25, 1980, had attempted to operate the lagoon sludge process.

The licensee found that he could not maintain the air balance around the dryer. The HEPA filters for filtering the gases from the dryer were plugging after only a short operation time. The licensee determined that another filter such as a bag filter was needed as a prefilter to the HEPA filters. Since this would require time and money to obtain, the licensee elected to omit the drying step if the filtered sludge was satisfactory for burial. The licensee decided that the filtered sludge was dry enough

to meet the South Carolina license conditions for burial of the waste at the Barnwell burial site, and the licensee curtailed the use of the dryer.

During Inspection No. 80-09 on June 25-26, 1980, the inspector noted the conditions mentioned above. The inspector noted that the licensee was placing cement in the bottom of the plastic bag used to line the 55 gallon drums prior to filling the drums with the filtered sludge, and he was placing cement on top of the sludge. The inspector also noted that the licensee had not changed the procedure to reflect the discontinuation of the of the dryer operating and the initiation of the use of cement at the time of the inspection. The inspector observed that the filter press appeared to be producing a "dry" filter cake, which contained about 50 weight percent water, according to the licensee. The inspector also observed that there was no evidence of free liquid in any of the drums filled while the inspector observed the operations.

The licensee processed lagoon sludge during the months of July and August. The sludge was sent to the Barnwell burial site in South Carolina. No problems were noted with the thousands of drums of sludge sent to this burial ground.

The licensee considered removing lagoon sludge directly from the lagoons and placing it into wooden boxes for shipment to the burial ground. According to the licensee, on the basis that the water content of the sludge on top of lagoon A was about the same as that from the filter press, the licensee decided to proceed with that operation. On August 25, 1980, the licensee had a crane remove sludge from lagoon A and filled about 30 boxes with the sludge. The 4 x 4 x 4 foot boxes were not structurally strong enough to hold the sludge. The sides and bottoms of the boxes bowed. Also, about five of the boxes appeared to have leaked. The licensee thought that the water from the boxes came from wet wood being used in their construction of the boxes. On the basis that the boxes were not strong enough to hold the raw sludge and some appeared to leak, the licensee decided not to use the boxes for holding the raw sludge. The decision was made to load the sludge into 55 gallon drums.

According to the Quality Assurance Manager, he told the Lagoon Project Manager that the sludge in the boxes was not to be shipped. This decision was based on the fact that he noted that the sludge was removed at a depth greater than a 2-3 feet depth. Subsequently, according to the Lagoon Project Manager, upon removing the sludge from the boxes, it was found that the sludge had not leaked from the boxes. The Lagoon Project Manager had the sludge placed in 55 gallon drums for shipment to the burial ground.

After the decision to load the material from the lagoon into 55 gallon drums was made, the licensee had the crane move to the northeast corner of lagoon A. The crane then removed sludge from the upper part of the

lagoon. The crane was only able to be positioned at the ends of the lagoon because of the presence of other lagoons or buildings on the sides of the lagoon. According to the licensee, about 1500 55-gallon drums were filled with the sludge from lagoon A. The crane used had a 40 foot boom. If only a quarter circle of area was removed from the lagoon, a hole about six feet deep would have resulted from filling 1500 drums. The licensee indicated that the crane was able to move along one side of the lagoon for a short distance. Therefore, more than a quarter circle with a 40 foot radius was removed.

During the operation using the crane, the licensee used a hopper to direct the material from the crane bucket into the drums. A drum lined with a plastic bag with cement in the bottom was placed under the hopper; the material was dumped from the crane bucket through the hopper into the drum; cement was added to the top of the material; the lids were placed on the drums and fixed in place with the bolt ring. Most of the time the plastic bags were pulled into the drum by the rush of sludge into the drum.

In mid September, the removal of sludge from lagoon A was stopped, and the small 40-foot boom crane and a larger crane were used to remove the other lagoons. (See the figure 1 of the lagoons.) Old liners from lagoon F were moved to the south bank of lagoon D. The sludge in lagoon F was moved to lagoon A. About three fourths of lagoon D was moved to lagoon C. The remaining southern fourth of lagoon D was placed into 55 gallon drums. The liners on the bank of lagoon D, previously described, and the lagoon D liner were placed into boxes. The smaller pieces of liner were placed in 55 gallon drums. Lagoon C was dug up and placed into lagoon A. (See Exhibit 2, photographs 1 through 5 show the lagoons in October 1980).

The material taken from lagoon D and put into drums was not considered suitable for shipment to burial and the drums were marked with red X's and kept segregated from the other drums filled with lagoon A waste. The boxes filled with liners were not marked with red X's and were not segregated.

The licensee starting shipping drums containing the raw lagoon sludge in shipment no. 91 to Barnwell, South Carolina, on September 8, 1980, according to licensee records.

The licensee started shipping waste to the Nuclear Engineering Company (NECO) site at Beatty, Nevada, on September 10, 1980, with shipment no. 93N. According to licensee records, shipment 96 made on September 19, and shipment no. 102 made on September 22, 1980, contained sludge taken directly from the lagoon and placed into drums. Each shipment contained 60 drums of the raw sludge. The shipments to Beatty made during September 1980 also included about 17 boxes with weights which indicated they were not filled with lagoon sludge processed through the filter press.

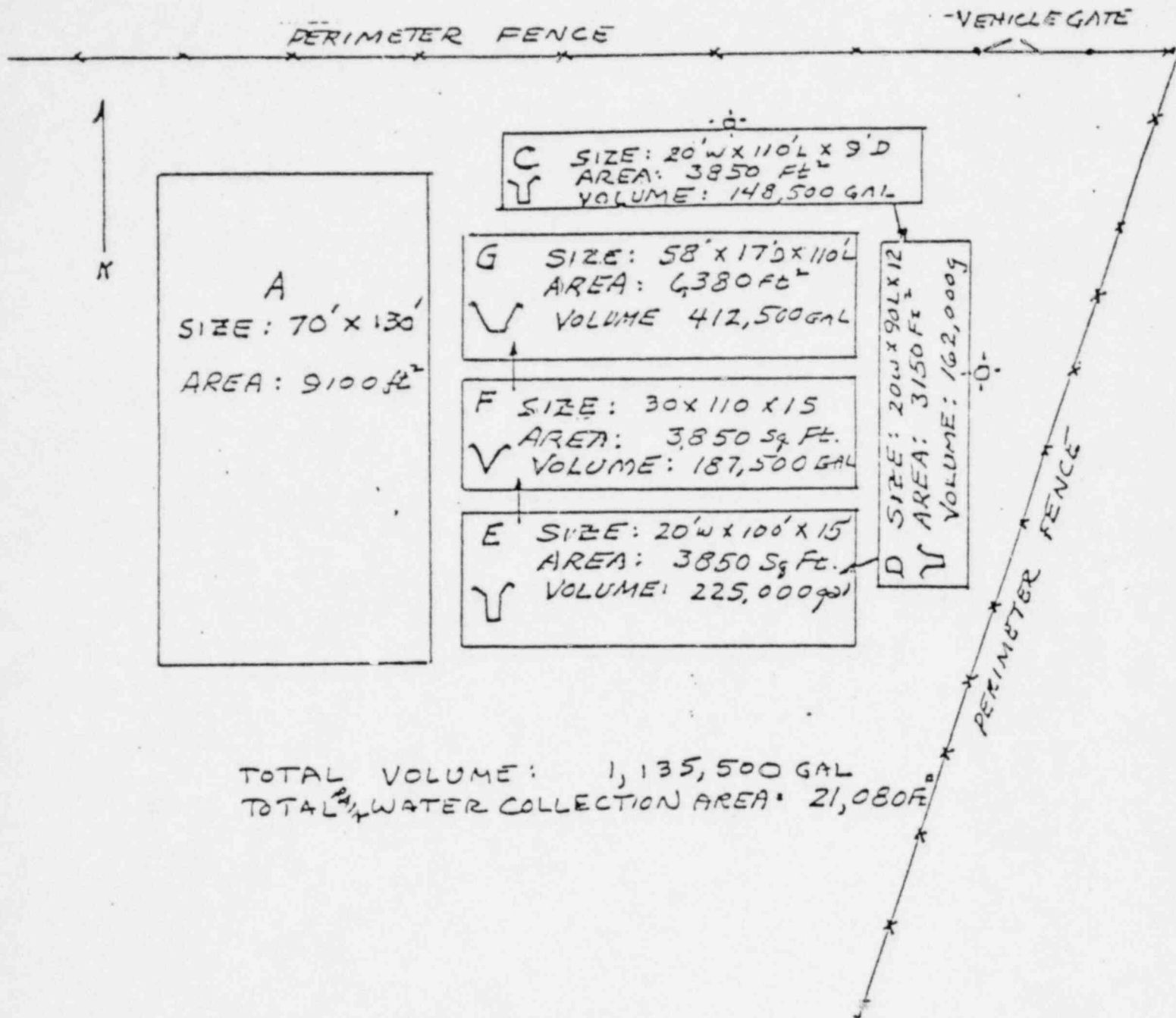


Figure 1. Lagoon Area as of late 1977

The following table gives information on the shipments the licensee made to Beatty which the State of Nevada refused to allow NECO to receive at the Beatty burial site.

<u>Shipment No.</u>	<u>Shipment Date</u>	<u>Drums</u>	<u>Boxes</u>	<u>Point Stopped</u>
103	9/23/80	60	1	Beatty, Nevada
104	Went to Barnwell, South Carolina			
105	9/24/80	5	10	Beatty, Nevada
106	9/25/80	5	14	Beatty, Nevada
107	9/26/80	5	12	Beatty, Nevada
108	9/28/80	5	10	Morris, Illinois
109	9/30/80	5	11	Connecticut

On September 29, 1980, NECO received three shipments of waste from UNC Recovery Systems. On the same day under the inspection by a Region V inspector, NECO started to unload Tri-State Transit Trailers 440132 and 440654. Trailer no. 440132 held shipment no. 103, and trailer no. 440654 held shipment no. 106. During unloading of trailer no. 440132, a leaking drum was found immediately. This prompted the State of Nevada to ban the receipt of waste from UNC Recovery Systems at the Beatty burial site. A second trailer, trailer no. 440654, was also opened and a leaking box, box no. 54, was found. It was also noted that a box did not have an LSA label. (See Exhibit 1, Region V Inspection No. 80-62.)

On September 30, 1980, another shipment arrived at the Beatty site. Because of the ban imposed by the State of Nevada, none of the four trailers could be unloaded. Therefore, inspection of individual packages by the NRC inspector was not possible. The surveys of the leaking drum and leaking box showed no significant radioactive contamination above background.

Mr. R. J. Gregg, Quality Assurance Manager, and Mr. P. Dessaulles, Operations Manager, went to the Beatty site, observed the condition of the shipments, discussed the situation with burial site personnel, and arranged for the return of the four shipments to the UNC Recovery Systems facility.

NECO wrapped the bottom half of the drum with plastic and placed the drum in an overpack drum. Absorbent media was placed in the annulus between the two drums. NECO placed plastic on the floor of the trailer and placed the overpacked drum on the plastic. NECO wrapped the sides and bottom of the box with plastic with absorbent media between the sides of the box

and the plastic. An overpack box was built around the box. Absorbent media was placed between the sides of the boxes. The box was placed directly back in the trailer with no other floor covering put in place. The original floor covering was not removed. NECO did not find significant radioactivity above background on the floor covering installed in the trailer by UNC Recovery Systems.

Meanwhile, UNC Recovery Systems stopped the two tractor-trailers which were enroute to the Beatty burial site, and they arranged for these two shipments to be returned to the UNC facility.

On October 1, 1980, Region I sent an Immediate Action Letter to UNC Recovery Systems which confirmed commitments the licensee made to the NRC. These commitments concerned the upgrading of the waste packaging operations, especially the lagoon waste packaging operations, so that in the future packages and their contents would meet the Nevada State and South Carolina State requirements for burial and the DOT-NRC requirements for preparation of packages for shipment. The licensee was to:

- Assure that no radioactive material shipments will be made from your facility until management actions have been taken to prevent the presence of free standing liquids in packages for shipment and burial.
- Assure that the integrity of packages of waste for burial will not be lost during shipment.
- Assure that shipments will not be resumed until authorized by the burial sites, the origin and destination states, and the NRC, Region I.

On October 2, 1980, the Division of Health of the State of Nevada issued a letter to UNC Recovery Systems which stated that "UNC's permit number 114 for use of the Nevada State site to dispose of radioactive waste has been suspended indefinitely." This letter set forth the following conditions to be met prior to receipt of waste at the Beatty site.

- No radioactive waste currently packaged by and in the possession of UNC can be received at the Beatty site until:
 - Each package has been opened and visually inspected to determine that the contents are dry solid material.
 - Each opened package has been turned upside down so that any liquid that may be in the package will run out.
 - Each package has been found to be free of any liquid and has been sealed properly and labeled according to DOT regulations.

- No other radioactive waste packaged in the future by UNC can be received at the Beatty site until:
 - UNC has developed an acceptable quality assurance program which should include inspections by well trained middle-management personnel.
 - The accepted quality assurance program has been made a part of the company's NRC licensed procedures.
 - An NRC inspector has inspected packaging operations conducted under the new quality assurance program.
- No radioactive waste from UNC can be received at the Beatty site until:
 - Certification that packaged waste now in UNC's possession has been re-processed as above must be furnished to this office either by an outside company used to perform this operation, or inspectors of Agreement States or NRC inspectors who have inspected the operation.
 - This office has been informed by NRC that the UNC's accepted quality assurance program has been made a part of their NRC license.
 - This office has been informed by NRC inspectors that the accepted quality assurance program has been observed to be effective in preventing the presence of liquids in the solid waste during packaging operation.

On October 4, 1980, the Governor of Rhode Island sent a letter to the Chairman of the NRC requesting that the NRC conduct an inquiry of the circumstances which resulted in the burial ban against waste disposal by UNC. The Governor requested that:

- "NRC assign an inspector to the UNC site to oversee the unloading of the trucks which return to Wood River Junction from Beatty, Nevada and inspect the drums when open."
- "NRC assign an inspector to the UNC site in cooperation with state inspectors in monitoring UNC's waste processing and packing operations with a view toward insuring the integrity of the processes in achieving compliance with State of Nevada regulations. My sole aim is to expedite the recertification process through which UNC must go before regaining permission to dump at Beatty."

-- "Continue to provide close cooperation, assistance and advice to me and my office as I coordinate the implementation of a program to insure that this does not happen again and the UNC gets recertified as soon as possible."

On October 6 through October 8, 1980, the inspector observed the unloading of the trailers which were returned from Connecticut and Illinois. The first trailer unloaded contained shipment no. 109 and was returned Connecticut. The trailer contained 5 drums and 11 boxes. There was no evidence of any leakage from any of the containers. It was noted that box no. 79 had material on the side that appeared to be dried sludge. This box also had a weight which was different from the other 10 boxes. It weighed 1466 pounds, and the other boxes weighed between 1800 and 2200 pounds. The uranium value assigned by the licensee was 1, while the uranium value for the other boxes ranged from 24 to 29 grams. This indicated that the licensee did not consider the material in the box to be filtered lagoon sludge, when the shipping papers were filled out.

Box no. 79 was opened. The box contained lagoon liner material. It was discovered later that the word "liner" was spray painted on one side of the box. Also later in the inspection a hole was drilled in the bottom of the box. About one half gallon of water was collected from the hole. The liquid collected was analyzed for radionuclides, which were found present. (See Exhibit 3.) (See Exhibit 2, photographs 6-8 and of box 79 in shipment 109.)

One of the other boxes of shipment no. 109 which weighed between 1800 and 2200 pounds was opened at the request of the inspector. This box contained filtered lagoon waste.

The second trailer unloaded contained shipment no. 108 and was returned from Illinois. This trailer contained 10 boxes and 5 drums of filtered lagoon sludge material. There was no evidence of leakage from any of the containers. During subsequent inspection 5 boxes and all 5 drums were opened. These containers all contained filtered sludge. The weights and listed uranium contents also indicated the containers held filtered sludge.

During the inspection of October 6-8, the inspector inspected the operation of the lagoon sludge filtration operation. (See Exhibit 2, photograph 9 shows the filter press in operation.) The inspector requested copies of the current operating procedures for the filtration operation. After some searching in a desk, the supervisor located a copy of Engineering Change Notice (ECN) No. 1432, Lagoon Disposal Process, effective dates from June 10, 1980 to August 10, 1980. This ECN was that prepared for the startup of the lagoon disposal process. The operation had been changed substantially and the operating procedures had not been changed. For instance, the operation was changed so that the dryer was not used, and the operating procedure called for operation of the dryer.

As a result of the above observations by the inspector and their own review of the situation, on October 8, 1980, Mr. C. E. Bowers, President, UNC Recovery Systems, directed that all lagoon sludge processing operations be terminated, effective immediately. The operations were not to be restarted until: a) existing procedures were revised to accurately reflect current practice, or new procedures were generated, whichever was applicable, and b) lagoon processing personnel were fully trained in the application of the modified or new procedures. The licensee sent a letter to the NRC on October 8, outlining the above actions.

On October 9 and 10, 1980, the four trailers at Beatty, Nevada, were sent back to UNC Recovery Systems at Wood River Junction, Rhode Island. On October 14, 1980, UNC shipment no. 106 was returned to the UNC Recovery Systems facility, and on October 15, 1980, the trailer was unloaded under the inspection of the inspector. This shipment contained 14 boxes and 5 drums of waste. The box which was discovered leaking at Beatty, Nevada, was on this shipment. This box was packaged in an overpack box before being shipped back.

The overpack was removed from around box 54. The bottom of the overpack box, the plastic under box 54, and the absorbent around box 54 were either wet or damp showing that the box had continued to leak on the return trip. No liquid appeared to have escaped from the overpack box. The lid of box 54 was removed. The box contained lagoon liner which was covered with wet sludge. The inside of the box was lined with a plastic liner. In one corner of the box, the box liner was pulled down so that the sludge covered lagoon liner was not inside the box liner. This corner of the box was the location of the main leakage from the box. The contents of the box was obviously wet; however, there was no evidence of free liquid at the top of the box. The contents were such that one would not be surprised to find liquid in the bottom of the box. Subsequently, a hole was drilled in the bottom of the box, and about one half gallon of additional water was collected from box no. 54. The liquid collected was analyzed for radionuclides, which were found to be present. (See Exhibit 3.) (Exhibit 2, photographs 10-13 show various aspects of box 54.)

Close examination of the other boxes in shipment no. 106 disclosed that box no. 52 was wet at the bottom seam. When box no. 52 was opened, it was found to contain lagoon liner material also. This liner material appeared to not have much sludge on it. The material also appeared to be dry. The appearance of the top of the material in the box was dry and one would not expect liquid to be present in the bottom of the box. When a hole was drilled in the bottom of this box, water drained from the hole. About two-thirds of a gallon was collected. The liquid collected was analyzed for radionuclides, which were found to be present. (See Exhibit 3.) (Exhibit 2, photographs 14-16 show various aspects of box 52.)

Examination of the weights of the boxes in shipment 106 show that boxes 49, 52, 53, and 54 probably did not contain filtered lagoon sludge, since the weights of the boxes were outside the 1800 to 2200 pound range. The

uranium values assigned by the licensee to each of these boxes was 1 gram of U-235. The uranium values assigned to the filtered sludge boxes ranged from 22.7 to 27.1 grams, depending on the weight of the sludge in the boxes. When the boxes were opened, it was found that box 49 contained insulation material and boxes 52, 53, and 54 contained lagoon liners.

The weights and uranium contents listed for the 5 drums of waste on shipment 106, discussed above, indicated that the drums contained filtered sludge. This fact was confirmed by opening three of the drums and finding filtered sludge in the packages.

On October 16, 1980, shipments 105 and 107, which were returned from Beatty, Nevada, were unloaded by the licensee.

Shipment no. 105 was made up of 10 boxes and 5 drums. The weights, listed uranium contents, and appearance of the outside surfaces of the boxes and drums indicated that the boxes and drums contained filtered lagoon sludge. The bottom surface of the trailer showed no evidence of any leakage from any package. Four of the boxes and three of the drums were opened. All of these containers contained filtered sludge with no liquid problems.

Shipment no. 107 had a box which was leaking. The cloth and paper floor covering in the trailer were wet under a box identified as box 58. This shipment was made up of 12 boxes and 5 drums. Ten of the boxes were supposed to contain filtered lagoon sludge and two of the boxes were supposed to contain process equipment removed from the inside of the process facility during the decommissioning activities. The five drums were supposed to contain filtered lagoon sludge.

The box which leaked was one of the ten boxes which was supposed to contain filtered lagoon sludge. The weight of the box was 2500 pounds, which is outside the 1800 to 2200 pounds that boxes with filtered sludge usually weigh. The licensee had considered the material in the box to be filtered sludge when they assigned a uranium content to the package. The box was supposed to contain 34.8 grams of uranium-235 rather than 1 gram of uranium-235.

All of the boxes and drums from shipment no. 107 were opened. All of the drums and boxes contained what they were supposed to contain except for box 58. Box 58 contained lagoon liner, a piece of fence, and wipe cloths. The box also had cement on the top of the liner material. This was the only box with lagoon liner which had cement on the top of the material in the box. The Radioactive LSA sticker on the side of the box had "L-Liner" written on it. No water flowed from holes drilled in the box. However, water continued to leak from the box as evidenced by water collecting on a plastic sheet under the box. (Exhibit 2, photographs 17-21 show various aspects of box 58.)

On Friday October 17, 1980, late in the day, shipment no. 103, the shipment containing 60 drums and the leaking drum discovered at Beatty, Nevada, arrived at the UNC Recovery Systems facility. Unloading of the drums and inspection of the drums, drum contents, and the trailer was accomplished on October 17 and 21.

The leaking drum, which was in the steel drum overpack, was inspected and opened first. The top of the overpack drum and the top of the leaking drum were removed first. The material visible at the top of the leaking drum was cement which had been poured on top of unfiltered lagoon sludge. There was no liner bag visible above the top of the material in the drum. There was no standing liquid visible in the drum. The drum was removed from the overpack drum, and the plastic and absorbent material was removed from outside the drum. The area under the bung about 2-3 inches from the bottom of the drum was slightly damp but the absorbent material didn't appear to have been significantly wetted. The bung was removed. No water flowed from the open bunghole. Plastic liner material with sludge inside the liner was pressed tight against the side of the drum and was taunt across the bunghole.

The remaining 59 drums were removed from the trailer. As each drum was removed it was inspected and the trailer floor under the drum was inspected. Each drum was numbered by the licensee with green spray paint as it was removed. Photographs were taken of drums and the floor under the drums which appeared to be leaking. This close examination revealed six drums which were leaking as they were received at the UNC Recovery facility. These drums were number A-4, A-12, A-40, A-42, and A-45 as they were unloaded from the trailer. Drums A-4, A-12, A-14, A-40 and A-45 were leaking from the bung on the bottom side just as A-1, the leaker discovered at Nevada, leaked. Drum A-42 was leaking from the bottom seam of the drum. There were wetness and stains on the cloth and paper floor coverings under these drums showing that the drums also leaked during transit. Photographs were taken of each of these drums and the trailer floor under the drums. These photographs show the liquid leaking from the drums and the marks on the trailer floor covering. (Exhibit 2, photographs 22-33 show the leaking drums.)

All of the 59 drums which were removed from the trailer were opened. All of the drums contained unfiltered lagoon sludge. Eight of the drums - A-3, A-7, A-54, A-55, A-56, A-57, A-58 and A-60 - contained free liquid on the top of the contents in the drums. (Exhibit 2, photographs 34 through 37 show typical drums with liquid on top.) None of the leaking drums discussed previously had free liquid on the top. The material visible at the top of the leaking drums was of the same general appearance as the leaking drum found at Nevada. The sludge had cement on the top. A drum liner was visible in some cases. None of the 59 containers contained sludge material that appeared to be as dry as the filtered sludge.

A hole was drilled in drum A-56, and liquid was collected (Exhibit 2, photographs 36 and 37 show the liquid from the drum.). The liquid collected was analyzed for radionuclides, which were found to be present. (See Exhibit 3.)

The concentrations of radionuclides in the sludge loaded into the shipping containers were above the 0.002 microcuries per gram limit for "radioactive material" given in 49 CFR 173.389(e) and 10 CFR 71.7(a). Samples of raw lagoon sludge from lagoon A, lagoon C, lagoon D, and lagoon F and a sample of filtered sludge from the filtration of lagoon A sludge taken on August 1, 1980, all had radionuclide concentrations above 0.002 microcurie per gram of moist solids. Uranium 234 was the major contributor to the specific activity of the sludge. (see Exhibit 4)

Examination of the shipping papers showed that the licensee stated that the physical form of the material in all the containers was solid, when indeed at least 19 containers contained liquids and solids. (See Attachments A and B of Exhibit 1.)

IV. Analysis

There are three incidents involved in the facts concerning the shipment of liquids to the Beatty, Nevada, burial site and the leakage of the liquid from the containers during shipment.

1. The licensee shipped unfiltered raw sludge in 55 gallon drums to the Beatty, Nevada, burial ground. The sludge placed in the drums either initially contained too much liquid or the liquid separated from the solids after the sludge was placed in the drums.
2. The licensee shipped black plastic lagoon liners covered with wet sludge or water in wooden boxes. The water leaked from some of the boxes.
3. The licensee used 55 gallon drums and boxes which were not strong and tight enough to contain liquid. The use of these packages permitted the discovery of the liquid in the waste material.

These incidents and some of the causal factors are discussed below.

A. Incident 1

UNC Recovery Systems management established April 1, 1981, as the completion date for the decontamination and decommissioning of their site. In order to attempt to meet this completion date, UNC management decided to expedite the disposal of the lagoon solids by loading some of the solids from lagoon A directly into shipping containers for shipment and burial. Using a crane, the licensee first had about 30

wooden boxes filled with the raw sludge. At this point, the licensee was confronted with evidence that problems with separation of liquid from the raw sludge could occur. About five of the boxes had water come from the bottom of the boxes. Some members of licensee management felt that wet wood had used in the construction of the boxes, and the sludge was heavy enough to squeeze water from this wet wood. Other members of license management felt the water came from the sludge. Therefore, in spite of the possibility that liquid could be separating from the sludge and leaking from the boxes, the licensee decided to continue the loading of solid directly into shipping containers. However, instead of using wooden boxes, the licensee used 55 gallon drums.

UNC Recovery Systems Quality Assurance did not assure that the operations were controlled so that only proper material was shipped from the UNC facility. The Manager of Quality Assurance told the Lagoon Project Manager that the sludge in the boxes was not to be shipped. Subsequently, the material in the boxes was placed into 55 gallon drums for shipment without the knowledge and concurrence of Quality Assurance. Quality Assurance did not require nor did they provide control over the loading of raw sludge into the 55-gallon drums, even after the problems were encountered during the attempts to package the material in wooden boxes.

The licensee based the decision to load lagoon sludge directly into shipping containers on the premise that the water content of the sludge on the upper surface of the lagoon was about the same as the water content of the filtered sludge and the materials had the same water retention properties. This premise may have been faulty because the water retention properties of the raw sludge during conditions of storage and transport could have been quite different from the filtered sludge. The filtration process used a flocculating agent to make filtration of the sludge possible. This flocculating agent might well provide the stabilization needed to keep the liquid from separating from the sludge during storage and transportation. There was no evidence of any free liquid in the packages of filtered sludge.

B. Incident 2

During the complete removal of lagoons C, D, E, and F, the licensee had to remove and dispose of the liners. The licensee placed much of the liner material covered with wet sludge into 55-gallon drums which were subsequently marked with red X's and kept segregated from the drums containing filtered sludge and raw sludge removed from the top of lagoon A. However, the licensee placed large pieces of lagoon liner into wooden boxes identical to the boxes used to contain filtered lagoon sludge; and the licensee neither marked these boxes with X's or segregated these boxes from other boxes of waste which were to be sent to burial.

After the discovery that water leaked from a box during the transport of the box from the licensee's facility, the licensee stated that it was an "error" or a "mistake" to ship the lagoon liner material in the box for disposal. However, the licensee had done nothing to prevent this error or mistake from happening. The lack of control of materials packaged in boxes and sent to burial was quite evident in this situation.

C. Incident 3

Six of the seven leaking drums had leaks at the bungs on the sides of the container. The seventh leaking drum leaked from the bottom seam. There were sixty drums on the shipment; therefore about one-tenth leaked. The quality control by the drum manufacturer or remanufacturer was unsatisfactory for this to occur. The licensee's quality assurance program for assuring that strong tight drums were used for packaging waste was ineffective.

The licensee demonstrated in the loading of raw lagoon sludge into plywood boxes that the boxes could not be depended upon to hold liquid.

The leaking of the containers permitted the detection of the presence of liquid in the waste.

V. Findings

UNC Recovery Systems had been removing sludge from the lagoons and preparing it for shipment and burial using a filtration process. The filtered sludge was such that it could be stored and transported without the separation of liquid occurring. Thousands of 55 gallon drums were shipped to burial at the Barnwell, South Carolina, burial site without problems.

In an effort to expedite the removal of the sludge from the lagoons, the licensee placed raw unfiltered sludge directly into 55-gallon drums for shipment and disposal at the Barnwell, South Carolina, and Beatty, Nevada, burial grounds. The change from shipping only filtered sludge to burial was the underlying cause for the problems encountered in the removal and disposal of the lagoons by burial.

UNC Recovery Systems packaged raw sludge in 55-gallon steel drums and lagoon liners in plywood boxes for shipment and burial at Beatty, Nevada. There was free liquid in some of these packages as received at Beatty, Nevada. The State of Nevada license issued to NECO for the burial of low level radioactive waste at Beatty, Nevada, states that all liquid waste shall be solidified prior to burial and no special nuclear material will be received in liquid form. The shipment of wastes containing the liquid for disposal at Beatty, Nevada, is an item of noncompliance with 10 CFR 70.42(b) and (c) which require that licensees transfer special nuclear materials only to persons licensed to receive such material. There were four shipments which had packages containing liquid.

<u>Shipment No.</u>	<u>Shipment Date</u>	<u>Drums With Liquid</u>	<u>Boxes With Liquid</u>
103	9/23/80	15	-
106	9/25/80	-	2
107	9/26/80	-	1
109	9/30/80	-	1

Some of the drums and boxes containing free liquid leaked liquid during transport. Packaging of LSA radioactive material in packages which leaked demonstrated noncompliance with 49 CFR 173.392(c)(1) which requires that materials must be packaged in strong, tight packages so that there will be no leakage of radioactive material under conditions normally incident to transportation. The four shipments which had packages containing liquid had the following number of leaking packages.

<u>Shipment No.</u>	<u>Shipment Date</u>	<u>Leaking Drums</u>	<u>Leaking Boxes</u>
103	9/23/80	7	-
106	9/25/80	-	2
107	9/26/80	-	1
109	9/30/80	-	-

The fact that the licensee used containers which leaked liquid allowed the detection of the liquid in the containers. The quality of the packages, especially the packages with leaking bungs, demonstrates that the quality assurance programs employed by the drum vendors was ineffective.

The licensee stated on the shipping papers that the physical form of the radioactive material was solid, and the material in the container during at least part of the transportation was liquid. Incorrect statement of the physical form of the material is an item of noncompliance with 49 CFR 172.203(d)(1)(ii).

The licensee failed to mark one box "Radioactive-LSA", and this is an item of noncompliance with 49 CFR 173.392(c)(8).

The free standing liquid in the drums of raw sludge apparently separated from the sludge during either storage or transport. There was evidence that separation during storage could occur when the licensee loaded raw sludge into boxes and liquid appeared to leak from the boxes. It is possible that wet sludge was placed in the drums and liquid separated from the sludge while standing in storage. It is also very possible that if

the separation did not occur during storage that it did occur while the sludge was bounced and vibrated during transport. The licensee had no formal operating or quality assurance procedures in effect to prevent the loading of wet sludge into the 55-gallon drums. Also, the licensee had performed no quality test procedures to determine the effects of vibration or other conditions normal to transport on the sludge material.

The free liquid in the boxes containing lagoon liners had to come from the liners being too wet with lagoon liquids, when the lagoon liners were placed in the boxes. Again, the licensee had no formal operating or quality assurance procedures in effect to either prevent the loading of wet liners in the boxes or to control such boxes so that they would not be shipped to burial.

In addition to not having formal operating, quality assurance, and quality test procedures for: the loading of raw sludge into 55 gallon drums; the loading of lagoon liners into boxes; and the control of containers holding nonconforming material, such as wet lagoon liners, the licensee did not have current operating and quality assurance procedures for the operation of the lagoon sludge filtration process. This lack of process control by means of operating, quality assurance, and quality test procedures is an item of noncompliance.

As indicated in the Facts section of this report, the licensee must define and take many corrective actions before they will be permitted to send waste from the lagoons to the burial sites for disposal.

VI. Exit Interview

The inspectors meet with the licensee representatives denoted in Section I at the end of the onsite inspection on October 24, 1980. During this interview the item of noncompliance concerning the shipment of liquid to the Beatty burial ground while the Nevada license does not allow the receipt and burial of liquid radioactive waste and the item of noncompliance with DOT requirements that packages of LSA radioactive material must be strong and tight and not leak were discussed.

The inspectors met with the licensee representatives on January 15, 1981, and discussed all the items of noncompliance associated with this inspection.

VII. Exhibits

Exhibit 1 is the Region V Inspection Report 80-62 for the inspection of Nuclear Engineering Company activities at Beatty, Nevada, in which the problems with the UNC Recovery Systems shipments were first observed. This report had shipping papers as Attachment A and B. It can be seen on these

attachments that the licensee stated the physical form of all the materials in the shipments no. 103 and 106 was solid while some drums and boxes did contain liquid. Attachment C shows photographs of the leaking box and drum.

Exhibit 2 is comprised of photographs of the lagoons, lagoon sludge filtration, and the containers presenting problems in the six shipments returned to UNC Recovery Systems as a result of the State of Nevada ban on the receipt of UNC Recovery Systems waste at Beatty, Nevada.

Exhibit 3 provides the concentration of radionuclides in the liquid material drained from three boxes and one drum.

Exhibit 4 provides the concentration of radionuclides in lagoon sludge.