



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

APR 01 1980

MEMORANDUM FOR: WMUR Staff

FROM: Gregory G. Eadie  
Uranium Recovery Licensing Branch

SUBJECT: TRAINING SESSION ON RADON & RADON PROGENY SAMPLING

On Friday, April 4, 1980, at 11:00 a.m., a training session will be held to discuss radon and radon progeny sampling techniques. The meeting will be held in Room 623 of the Willste Building, and should last about one hour. All interested parties are invited to attend.

A handwritten signature in cursive script, appearing to read "Greg", is positioned above the typed name.

Gregory G. Eadie  
Uranium Recovery Licensing Branch  
Division of Waste Management

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

MAR 31 1980

MEMORANDUM FOR: Leo Higginbotham, Assistant Director  
Division of Fuel Facilities and Materials Safety Inspection  
Office of Inspection and Enforcement

FROM: Ross A. Scarano, Chief  
Uranium Recovery Licensing Branch  
Division of Waste Management, NMSS

SUBJECT: REQUEST FOR INSPECTIONS--ENERGY FUELS NUCLEAR, INC.,  
WHITE MESA PROJECT, DOCKET NO. 40-8681

The Uranium Recovery Licensing Branch requests that I&E conduct a construction inspection (scheduled by license condition) of the White Mesa tailings impoundment. This inspection should be performed by April 18, 1980. Specifically, final cell excavation and liner construction will be in progress at the time of the inspection. The construction of the White Mesa tailings retention system was authorized by License Amendment No. 1 dated October 12, 1979 (copy attached).

Since the technical review and previous construction inspections were performed by Dr. John Nelson of Colorado State University, we suggest that he accompany the Region IV inspector on this visit. The previous construction inspections by Colorado State were performed on October 18, November 9, and December 21, 1979 (reports enclosed).

As we have done for other site inspection requests, we have developed a list of those specific items we feel should be reviewed during your inspection (copy enclosed).

In addition, the general preoperational inspection of the overall facility should be scheduled at this time. Currently, Energy Fuels Nuclear plans to begin operation of the White Mesa mill on May 1, 1980. Therefore, an inspection by I&E personnel and a member of my staff (Project Manager) should be scheduled for the end of April 1980.

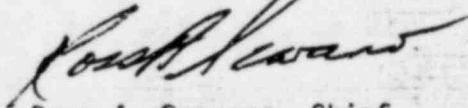
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Leo Higginbotham

- 2 -

We request that you contact us within two weeks as to acceptable dates for these inspections so that we may make arrangements with other personnel involved.

Should you have any questions concerning this request or if we can be of any assistance in this matter, please contact Mr. John Linehan of my staff at Ext. 74103.



Ross A. Scarano, Chief  
Uranium Recovery Licensing Branch  
Division of Waste Management, NMSS

Enclosures:

1. License Amendment No. 1 dated 10/12/79
2. Inspection Reports by Colorado State
3. List of items to be reviewed during inspection

OCT 12 1979

WMUR:EAT  
Docket No. 40-8681  
SUA-1358, Amendment No. 1

Energy Fuels Nuclear, Inc.  
ATTN: Mr. R. W. Adams  
Chairman of the Board  
Three Park Central, Suite 900  
1515 Arapahoe  
Denver, Colorado 80202

Gentlemen:

## Distribution:

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BFisher  
RTWoolsey  
EATrager  
LHOMiller

RAScarano  
REBrowning  
JBMartin

Pursuant to Title 10, Code of Federal Regulations, Part 40, Source Material License SUA-1358 is hereby amended to authorize the first stage of construction of the embankments and liner system of the tailings retention system by revising Conditions 25 and 26 as follows:

25. The licensee shall construct, operate, and maintain the embankments and liner system for the Initial Construction Phase illustrated on Sheet 4 of 16 of the "Engineers Report, Tailings Management System, White Mesa Project, Blanding, Utah," (Evaporation Cell 1 - Initial, Tailings Cell 2, and the Cell 2 "Safety Dike") in accordance with the following documents, including all consultant recommendations, submitted in connection with the tailings retention system proposal:
- June 19, 1979 letter forwarding "Engineers Report, Tailings Management System, White Mesa Project, Blanding, Utah" (prepared by D'Appolonia Consulting Engineers, Inc.).
  - September 11, 1979 letter forwarding "Guideline Specifications for Earthwork, Liner Material, Liner Installation, Inspection and Maintenance, Tailings Management System, White Mesa Project, Blanding, Utah."
  - September 14, 1979 letter forwarding "Addendum to Guideline Specifications, Initial Phase Construction, Tailings Management System, White Mesa Project, Blanding, Utah" (addendum to "Engineers Report, Tailings Management System, White Mesa Project, Blanding, Utah").
  - September 28, 1979 letter forwarding "Response to Dam Safety Questions, NRC Consultants Review, White Mesa Project, Blanding, Utah."

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- e. October 10, 1979 letter forwarding "Addendum 2 to Guideline Specifications, Initial Phase Construction, Tailings Management System, White Mesa Project, Blanding, Utah."

Gravel material that is used in the lining underdrain system shall consist of clean gravel free of organic material containing less than 2 percent which passes a #100 sieve. After placement the gravel material shall have a permeability greater than 1000 times the permeability of the underlying material. Filter criteria shall be met between all materials in adjacent zones of the liner underdrain system.

In addition, the licensee shall not make any changes in the Initial Construction Phase portion of the tailings retention system without specific prior approval of the NRC obtained through application for amendment to this license. Also, construction of any of the embankments and/or the liner system for portions of the tailings retention system other than the Initial Construction Phase shall not begin until the system design has been reviewed and approved by the NRC, and NRC approval has been incorporated into this license by amendment.

Note: When requirements apply to cell embankments, it is intended that the requirements apply to all of the embankments in the Initial Construction Phase illustrated on Sheet 4 of 16 of the "Engineers Report, Tailings Management System, White Mesa Project, Blanding, Utah," i.e., embankments on the downstream sides of Cell 1 - Initial and Cell 2 and the Cell 2 "Safety Dike" (the Cell 2 "Safety Dike" will become the embankment on the downstream side of Cell 3 during a future phase of construction). Requirements concerning the liner system apply to cells lined during Initial Construction Phase, i.e., Cell 1 - Initial and Cell 2. Only Cell 1 - Initial and Cell 2 must be completely constructed prior to generation of tailings.

26. The licensee shall comply with the following regarding construction, operation, and maintenance of the tailings retention system:

Note: See Condition 25 "Note" for applicability of requirements concerning cell embankments and cell liners.

- a. Notify Region IV, USNRC, Office of Inspection and Enforcement, Arlington, Texas and the Uranium Recovery Licensing Branch, USNRC, Washington, D. C., at least three weeks prior to the following construction features to provide adequate time for on-site inspections by the NRC:

- i. When foundation excavation is near completion and prior to placement of embankment fill, except for Initial Construction Phase embankment foundations for which an on-site inspection by the NRC has already been conducted.

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ii. During embankment fill placement at approximately 10 percent and 70 percent stages of completion.



- iii. When cell excavation is near completion and prior to placement of the liner system.
  - iv. At intermediate stages during the liner construction to allow time for inspection of the compacted bed material underneath the liner, construction of joints in the liner and placement of cover over the liner.
- b. Submit to the Uranium Recovery Licensing Branch, USNRC, Washington, D.C., within six months after completion of each substage of construction, as-built drawings showing construction details of the foundations of embankments and liner system and subsoil profile (including topography and a mapping of soil types) prior to embankment construction and liner installation and a construction report summarizing the following:
    - i. Compaction control test results.
    - ii. Classification of all soils used in the embankment.
    - iii. Construction equipment and procedures.
    - iv. Unexpected conditions and problems encountered in construction, and methods employed to resolve these problems.
  - c. Maintain a minimum freeboard of 5 feet in the Tailings Cell 2 and a minimum freeboard of 6 feet in Evaporation Cell 1 - Initial.
  - d. Conduct and document a daily inspection of the embankments and the exposed protective soil cover over the liner and make repairs if any erosion occurs.
  - e. Insure that programs for inspection and monitoring of dam safety and water quality are conducted and evaluated by an experienced professional engineer. The responsible engineer should insure that all field inspectors are able to recognize signs of possible distress or abnormalities. A summary report of the results of the regular scheduled surveillance and inspections shall be submitted annually to the Uranium Recovery Licensing Branch, USNRC, Washington, D.C., in a report bearing the seal of the professional engineer.

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All other conditions of this license shall remain the same.

→ In addition, at the time of submittal of the construction report for the final substage of construction of the Initial Construction Phase, please provide specific plans for meeting the guidelines of Regulatory Guide 3.11.1 entitled "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings."

The above conditions were discussed and agreed to in a October 10, 1979 telephone conversation between your Mr. M. Vincelette and Mr. E. Trager of my staff.

FOR THE NUCLEAR REGULATORY COMMISSION

Original Signed by

Ross A. Scarano, Chief  
Uranium Recovery Licensing Branch  
Division of Waste Management

FOR PREVIOUS CONCURRENCES SEE ATTACHED SHEET

Bin #20 & #21

OFFICE →	WMUR	WMUR	WMUR <i>RA</i>		
SURNAME →	EATrager	HJMiller	RAScarano		
DATE →	10/ /79	10/ /79	10/ /79		

NRC FORM 318 (9-76) NRCM 0248

★ U.S. GOVERNMENT PRINTING OFFICE: 1978 - 285 - 759

OFFICE →	WMUR <i>SMV</i>	WMUR <i>Y</i>	WMUR		
SURNAME →	EATrager:t1	HJMiller	RAScarano		
DATE →	10/11/79	10/11/79	10/ /79		



Geotechnical Engineering Program  
Civil Engineering Department

Colorado State University  
Fort Collins, Colorado  
80523

M E M O

October 22, 1979

TO: J. D. NELSON

FROM: S. R. ABT

SUBJECT: Inspection of the White Mesa Project, Energy Fuels Nuclear

REMARKS:

On 18 October 79, I inspected dike 1 and dike 2 of the White Mesa Project, Energy Fuels Nuclear (EFN) at Blanding, Utah. The inspection was concentrated in two primary areas:

- a) The clearing of the highly calcareous areas along the dike centerline.
- b) Inspection of the areas in which the embankments were already under construction.

Comments are as follows:

a) Highly calcareous areas:

During the Nelson-Abt inspection of the project site of 9 Oct 79, it was noted that each dike had a seam of highly calcareous material. It was recommended that these areas be well cleaned to bedrock before construction of the embankment commence. To comply with these recommendations, EFN thoroughly graded the highly calcareous areas, swept the bedrock with a nylon sweeper and shoveled the site clean with a front end loader and hand tools. Dike 1 and dike 2 were considered well cleaned and properly prepared to commence embankment construction. In accordance with the recommendations of 4 Oct 79, the bedrock should be well soaked with water before the initial lift of fill is placed and rolled with a rubber tire roller. EFN provided a first rate effort in complying with inspection recommendations of 9 Oct 79.

b) Inspection of construction areas:

An inspection of dike 1 and dike 2 was performed where construction of the embankment had initiated (east end of both dikes). Both areas are primarily fill embankments. From the 9 Oct 79 inspection, it was noted that a road embankment coincided with the dike 1 location. Since that inspection, the road had been removed as requested.

Fill material comprising the embankments of dike 1 and dike 2 is presently being obtained from the area between the two dikes. The material is notably dry. Therefore, water distributors are pre-wetting the fill materials. Graders



then work the material by sidecasting to distribute the moisture. Water is again added, where necessary, before being placed on the dikes. Scrapers then move and place the material along the dikes in approximately 3 inch lifts followed by a sheep's foot roller for compaction. If needed, supplemental water was distributed on the dike and compaction was completed.

Examination of the consultant's field records showed that after the initial lifts had been placed, tested and properly compacted, field operations were adjusted to where field densities of the compacted materials were meeting or exceeding 90 percent of the optimum dry density along the embankments. Field density testing is being performed on site with a nuclear density gage under the supervision of the consultant's Professional Engineer. Presently, density readings are being taken at a rate of one per 1000 cubic yards of placed material.

Further examination of the records revealed that approximately 4000 cubic yards of material are being placed on a daily basis. It is anticipated that when the operation reaches full production, 8000 cubic yards of material can be moved in a 20 hour day.

Comments:

a) Personnel in attendance during the inspection:

M. D. Vinncette  
D. K. Sparling  
C. E. Baker  
H. R. Roberts  
C. E. Oldweiler  
L. Laws  
R. Greenwood  
S. R. Abt

Recommendations:

It is recommended that the White Mesa construction site be allowed to construct dike 1 and dike 2 effective 19 October 79.

It is also recommended that the site and field records be periodically monitored to ensure minimum density requirements are met throughout the construction phase.



Geotechnical Engineering Program  
Civil Engineering Department

Colorado State University  
Fort Collins, Colorado  
80523

November 12, 1979

Gene Trager  
Nuclear Regulatory Commission  
Mail Stop 483SS  
7915 Eastern Avenue  
Silver Spring, Maryland 20555

Subject: Energy Fuels Nuclear, White Mesa Project  
Our reference E4.05

Dear Gene:

On November 9, 1979 I visited the White Mesa site for purposes of inspecting the construction of the embankments on Cells 1, 2 and 3. Fill placement on Cell or Embankments 1 and 2 was approximately 50% completed at that time. Very little work has been done on Embankment 3.

The day preceding my site visit a large rain storm had occurred and the site was generally quite wet. Wet areas had been scraped and removed prior to placement of additional material on them. The fill is being placed in relatively thin lifts and compacted by a sheep's foot roller. Construction procedures appear to be adequate.

I checked the daily records of density and water content tests. In a few points in the initial lifts the engineer had approved several density tests which were below specifications. I told the engineer for D'Appolonia and Associates that I did not consider that good procedure and that no compaction tests below specifications should be approved. Those low densities appeared to have occurred only early in the project and recent density tests indicated all densities were above specified values.

In general, construction is proceeding at a good pace and procedures at the present time are adequate.

Also enclosed herewith is a copy of a memo from Steve Abt documenting the 18 October 1979 site visit. Another site visit should be conducted in a week or two. That can be coordinated between Ed Baker and us if you wish.

If you should have any questions concerning this, please call me.

Very truly yours,

*John D. Nelson*  
John D. Nelson

dup of 7912310169

JDN/rv  
Encl:

Geotechnical Engineering Program  
Civil Engineering Department

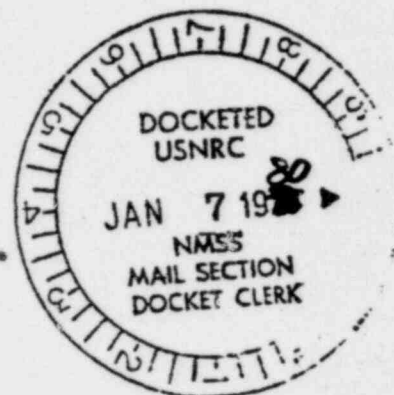


440-8681  
Colorado State University  
Fort Collins, Colorado  
80523

December 26, 1979

Eugene Trager  
Nuclear Regulatory Commission  
Mail Stop 483SS  
7915 Eastern Avenue  
Silver Spring, Maryland 20910

Subject: Energy Fuels Nuclear Inc.  
White Mesa Project, Blanding, Utah



Dear Gene:

On December 21, 1979 I visited the White Mesasite for purposes of conducting the 70% inspection. Present at the inspection were Harold Roberts and Lynn Laws of Energy Fuels. Don Sparling was also on site.

At the present time Cell 1 initial embankment has been completed to final elevation over the entire length. The north face of the embankment remains to be trimmed to the final grade and for that reason appears to be steeper than the design slope. When the embankment surface has been trimmed in the spring the slope is expected to meet the specifications.

Embankment no. 2 is almost constructed to final elevation. In an area towards the east end of the embankment approximately 4 feet of fill remains to be placed. The west end of the embankment is within about one foot of final grade.

Embankment 3 is approximately 10% completed.

At the present time all placement of fill on the embankments has been stopped until the spring because of freezing conditions. I discussed with Harold Roberts and Lynn Laws the need to remove all frozen and overly wet material from the embankments prior to resumption of fill placement in the spring.

D'Appolonia personnel were not present at the site. Field records of density tests were not available. Copies of On-Site Construction Inspection Reports were supplied to me by Harold Roberts, and are appended hereto. It is implied in those reports that satisfactory remedial action was taken for the density tests that did not meet specification with C. Oldweiler of D'Appolonia he not meet density or moisture requirement of material was carried out to achieve a

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No. of pages: 13

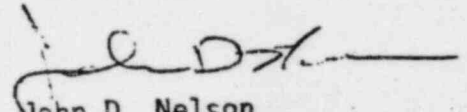
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Eugene Trager, December 26, 1979  
Page 2

Excavation of the cells is proceeding. I observed ripping operations of the sandstone. The ripped material is being loaded into trucks for transport to stockpiles.

In general, the operations appear to be progressing in a satisfactory manner. It is recommended that an additional inspection be made when embankment construction is resumed in the spring.

Very truly yours,



John D. Nelson  
Professor

JDN:dn



October 22, 1979

Harold R. Roberts  
Energy Fuels Nuclear, Inc.  
P.O. Box 787  
Blanding, Utah 84511

On-site Construction Inspection  
Report 1  
October 1-20, 1979

Dear Harold:

As per contract agreement the following report contains the bi-monthly progress of dike construction for the Tailings Management System, Blanding, Utah.

D'Appolonia personnel on site conducting on-site inspection during the report period were C. E. Oldwielder and R. J. Greenwood.

Prior to dike construction Mr. Oldwielder conducted on-site inspection with test pits at various locations throughout the site. Samples were taken to verify soil properties and laboratory proctor density tests were performed to develop fill density requirements.

Observation of dike construction began on October 4. Dike construction from October 4 through October 9 consisted of excavation of highly calcareous soils from the west portions of Dike 1 and Dike 2.

On October 9 an on-site inspection of the excavated foundations and site area was conducted by John Nelson and Steve Abt, from Colorado State University, Mike Taylor and Cory Oldwielder, from D'Appolonia, and Harold Roberts, Don Sparling, Ed Baker, Muril Vincelotte and Lynn Laws, from Energy Fuels. Additional clean-up of excavated foundations in the west portion of Dikes 1 and 2, removal of calcareous material located near test pit no. 10, removal of additional topsoil from Dike 3 and excavation of road fill from the east end of Dike 1 was required before approval would be given to begin placing fill in the above mentioned areas.

Final clean-up of excavated foundations were completed on October 17. On site re-inspection was conducted by Steve Abt on October 18 and approval to begin placing fill in excavated areas was given by the NRC on October 19



On October 10 placement of fill began between station 4+00 and 8+00 of Dike 2 and continued until October 15 with a total fill volume of 13,000 cubic yards.

Placement of fill and removal of old road fill began between station 0+00 and 8+00 and continued through the 20th with a total fill volume of 9,382 cubic yards.

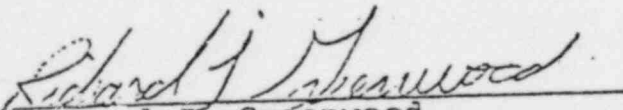
On October 16 it was observed that the initial survey did not allow for benched areas within dike construction. A meeting was held by C. E. Oldwielder, R. J. Greenwood, H. R. Roberts, Don Sparling, Lynn Laws and Surveyor to discuss error in survey.

The outcome was that the dikes would be re-surveyed and built according to design drawings.

A summary of fill placement with associated fill volumes are contained in Table 1.

If you have any questions please contact me.

Sincerely,

  
Richard J. Greenwood,  
Geotechnical Engineer

RJG/gp

cc: M. J. Taylor  
C. E. Oldwielder

TABLE 1  
SUMMARY OF FILL PLACEMENT

DATE	FILL LOCATION			EST. FILL PLACED		NO. OF DENSITY TESTS	AVE. YDS. PER TEST	TOTAL FILL PLACED		
	DIKE	STATIONS	APPROXIMATE ELEVATION	DAILY	CUMMULATIVE			DIKE 1	DIKE 2	DIKE 3
10/11/79	2	5+50-6+50	5,595	1,100	1,100	3	367		1,100	
10/12/79	2	5+00-7+00	5,598	4,320	5,420	5	864		5,420	
10/13/79	2	4+50-7+50	5,601	4,040	9,460	4	1,010		9,460	
10/14/79				No Fill Placed						
10/15/79	2	4+00-8+00	5,604	3,540	13,000	6	590		13,000	
10/16/79				No Fill Placed						
10/17/79	1	6+00-8+00	5,603	1,360	14,360	7	194	1,360		
10/18/79	1	6+00-8+00	5,609	5,817	20,177	9	646	7,177		
10/19/79	1	1+00-3+00	5,608	2,205	22,382	3	735	9,382		
10/20/79				No Fill Placed						

November 7, 1979

Harold R. Roberts  
6425 S. Hwy. 163  
Blanding, Utah 84511

On-site Construction Inspection  
Report 2  
October 21 through November 3, 1979  
D'Appolonia Consulting Engineers  
White Mesa Uranium Project

D'Appolonia personnel on-site during this period were R. J. Greenwood 10/22 to 11/2/79; B. Buck 10/26 to 11/3/79; and C. E. Oldweiler 11/2-3/79. B. Buck worked the night shift, and R. J. Greenwood and C. E. Oldweiler worked the day shift. Fill was placed on 10/22 (night shift only) and 10/23 to 10/26 and 10/29 to 11/3/79 (both day and night shift).

Areas on the western end of both dikes which were over-excavated to remove highly calcareous material received approval for fill placement. Placement in these areas was begun on 10/22 according to the procedure specified in Addendum 2 to the Guideline Specifications, dated October 10, 1979. The second compactor arrived on-site on 10/23/79.

An estimated total of 35,448 yds<sup>3</sup> of fill was placed in Dike 1 - Initial during this period and 43 compaction tests (824 yd<sup>3</sup>/test) were taken with the nuclear gauge. Fourteen tests failed either the density or moisture requirement and required additional work in the test area. The average of the 29 passing tests was 91.6% of optimum density and an average of 11.6 % moisture content. The attached table indicates the fill placed daily and number of tests.

An estimated total of 67,809 yds<sup>3</sup> of fill were placed in Dike 2 during this period and 54 compaction tests (1,256 yds<sup>3</sup> per test) were taken with the nuclear gauge. Eleven tests failed to meet either the density or moisture requirement and required additional work in the test area. The average of the 43 passing tests was 91.5% of optimum density and an average of 13.1% moisture content. The attached table indicates the fill placed daily and number of tests.

Five compaction tests were taken with a Washington Densometer, rubber balloon-type device, as an independent check on the nuclear gauge. The nuclear gauge results ranged from +2.6 to

-1.63 (+2.8 to -1.8 pounds per cubic foot) of the Washington Densometer results. The moisture contents were 1.8 to 0.2% higher than the Washington Densometer results. These check tests indicate a good agreement between test methods and will be continued on a regular basis.

Submitted by:



Corwin E. Oldweiler,  
Assistant Project Engineer

cc: L. Laws  
R. J. Greenwood  
M. J. Taylor  
Files

Table 1

## SUMMARY OF FILL PLACEMENT

October 21 through November 3, 1979

DATE	FILL LOCATION			EST. FILL PLACED		NO. OF DENSITY TESTS	AVE. YDS. <sup>3</sup> PER TEST	TOTAL FILL PLACED		
	DIKE	STATIONS	APPROXIMATE ELEVATION	DAILY	CUMMULATIVE			DIKE 1-I	DIKE 2	DIKE 3
Through 10/20/79	---	---	---	---	22,382	---	---	9,382	13,000	
10/21/79	---	---	---	---	No Fill Placed	---	---	---	---	---
10/22/79	1	10+00-21+00	---	4,662	27,044	1 (1)	4,662	14,044		
10/23/79	1	0+00-3+00	5,611	5,817	---	10	582	19,861		
	2	13+00-16+00	5,590	1,806	34,667	0 (1)	---		14,806	
10/24/79	1	0+00-15+00	5,610	6,783	41,450	7	969	26,644		
10/25/79	1	10+00-13+00	5,605	2,646		7	378	29,290		
	2	23+00-28+00	5,593	3,948	48,044	0 (1)	---		18,754	
10/26/79	1	10+00-13+00	5,605	273		0 (1)	---	29,563		
	2	13+00-16+00	5,594	9,345	57,662	6	1,557		28,099	
10/27/79	---	---	---	---	No Fill Placed	---	---	---	---	---
10/29/79	1	10+00-12+00	5,506	1,071		2	536	30,634		
	2	13+00-18+00	5,593	8,253	66,986	9	917		36,352	
10/30/79	1	10+00-12+00	5,507	1,155		2	578	31,789		
	2	13+00-23+00	5,595	8,232	76,373	7	1,176		44,584	
10/31/79	1	10+00-19+00	5,610	3,801		6	634	35,590		
	2	16+00-19+00	5,598	5,628	85,802	4	1,407		50,212	
11/1/79	1	14+00-19+00	5,615	2,457		3	819	38,047		
	2	22+00-27+00	5,600	9,345	97,604	6	1,558		59,557	
11/2/79	1	14+00-19+00	5,615	3,192		2	1,596	41,239		
	2	20+00-28+00	5,602	10,248	111,044	10	1,025		69,805	
11/3/79	1	10+00-16+00	5,611	3,591		3	1,197	44,830		
	2	12+00-23+00	5,600	11,004	125,639	12	917		80,809	

(1) - Fill Placed wet and wheel rolled on rock foundations - no tests.



November 17, 1979

Harold R. Roberts  
6425 South Highway 163  
Blanding, Utah 84511

On Site Construction Inspection  
Report 3

November 4 through November 17, 1979  
D'Appolonia Consulting Engineers  
White Mesa Uranium Project

D'Appolonia personnel on-site during this period were C. E. Oldweiler 11/5 to 11/9/79; B. Buck 11/4 to 11/17/79; and R. J. Greenwood 11/12 to 11/17/79. B. Buck worked night shift and C. E. Oldweiler and R. J. Greenwood worked the day shift. Fill was placed on 11/5 to 11/9/79; and 11/12 to 11/17/79 (both day and night shift).

An estimated total of 25,178 yards<sup>3</sup> of fill was placed in Dike 1 - Initial during this period and 37 compaction tests (680 yds<sup>3</sup>/test) were taken with the nuclear gauge. 4 tests failed in moisture requirement and required additional work in the test area. The average of the 33 passing tests was 92.7% of optimum density and an average of 11.3% moisture content. The attached table indicates the fill placed daily and number of tests.


An estimated total of 68,629 yds<sup>3</sup> of fill was placed in Dike 2 during this period and 89 compaction tests (771 yds<sup>3</sup> per test) were taken with the nuclear gauge. Nine tests failed to meet either the density or moisture requirement and required additional work in test area. The average of the 80 passing tests was 92.5% of optimum density and an average of 12.1% moisture content. The attached table indicates the fill placed daily and number of tests.

Fill placement in Dike 3 began on 11/15/79 and continued through 11/17/79 with an estimated total of 15,160 yds<sup>3</sup> of fill placed. During this period 18 tests (842 yds<sup>3</sup> per test) were taken with the nuclear gauge. No tests failed in either density or moisture requirement. The average of the 18 tests was 92.9% of optimum density and an average of 11.1% moisture content. The attached table indicates the fill placed daily and number of tests.

Five compaction tests were taken with a Washington Densometer, rubber balloon-type device, as an independent check on the nuclear gauge. The nuclear gauge results ranged from +2.1 to -1.4% (+2.4 to -1.7 pounds per cubic foot) of the Washington Densometer results. These check tests indicate a good agreement between test methods.

An on-site inspection was made by the N.R.C. representative, Mr. John Nelson, on 11/9/79. Both the construction site and the actual construction were observed by Mr. Nelson. Also present were: Don Sparling, Ed Baker, Harold Roberts and Lynn Laws of Energy Fuels; and C. E. Oldweiler of D'Appolinia. General construction and field testing procedures were discussed. Mr. Nelson felt that the fill placement and inspection operations were satisfactory.

Submitted by:

  
Richard J. Greenwood,  
Geotechnical Engineer

cc: L. Laws  
C. E. Oldweiler  
M. J. Taylor  
Files

TABLE I

SUMMARY OF FILL PLACEMENT

November 4 through November 17, 1979

DATE	FILL LOCATION			EST. FILL PLACED		NO. OF DENSITY TESTS	AVE. YDS. <sup>3</sup> PER TEST	TOTAL FILL PLACED		
	DIKE	STATIONS	APPROXIMATE ELEVATION	DAILY	CUMMULATIVE			DIKE 1-I	DIKE 2	DIKE 3
11/5/79	1	9-14+00	5,615	2,940	137,903	4	735	47,770	90,133	
	2	12-20+00	5,602	9,324		10	932			
11/6/79	1	6-12+00	5,615	3,381	151,490	4	845	51,151	100,339	
	2	12-21+00	5,603	10,206		11	928			
11/7/79	1	3-10+00	5,615	2,961	164,426	2	1,481	54,112	110,314	
	2	12-28+00	5,604	9,975		10	998			
11/8/79					No Fill Placed					
11/9/79	1	2+00-5+00	5,613	1,995	172,994	5	399	56,107	116,887	
	2	6+00-8+00	5,605	6,573		12	548			
11/10/79					No Fill Placed					
11/11/79					No Fill Placed					
11/12/79	1	1+00-8+00	5,615	2,163	185,447	3	721	58,270	127,177	
	2	12+00-27+00	5,607	10,290		12	858			
11/13/79	1	8+00-13+00	5,615	1,911	196,913	3	637	60,181	136,732	
	2	12+00-28+00	5,610	9,555		14	683			
11/14/79	1	1+00-17+00	5,617	4,347	206,426	6	725	64,528	141,898	
	2	3+00-28+00	5,612	5,166		8	646			
11/15/79	1	5+00-7+00	5,618	1,740	214,506	3	580	66,268	143,718	4,520
	2	7+00-11+00	5,610	1,820		3	607			
	3	5+00-8+00	5,585	4,520		5	904			
11/16/79	1	8+00-12+00	5,619	2,040	225,166	3	680	68,308	147,138	9,720
	2	12+00-18+00	5,613	3,420		4	855			
	3	4+00-9+00	5,586	5,200		6	867			
						4	425	70,008		
11/17/79	1	13+00-17+00	5,618	1,700	234,606	5	460	149,438		15,160
	2	20+00-27+00	5,614	2,300		5	460			
	3	4+00-9+00	5,586	5,440		7	777			

CHECKLIST - WHITE MESA EMBANKMENT CONSTRUCTION  
AND LINER INSTALLATION INSPECTION

I. Embankment Tour

A. Embankments

1. Check final grades - slopes 3H : 1V
2. During any fill placement, check lift thickness.
  - a. Granular - one foot loose thickness
  - b. Cohesive - six to eight inch loose thickness
3. During fill placement, visually check embankment materials for conformance with specifications.
4. Check for no frozen fill material or placement of fill on subgrade that is frozen, under water, muddy, or contains frost.

B. Liner Installation

1. Check subgrade
  - Free from loose earth, ruts, sharp breaks in slope, rubbish, roots, cobbles, and rock fragments.
2. Check liner (PVC)
  - a. No installation in cold weather or high winds
  - b. No field seaming during precipitation
  - c. Check for any damage to lining panels
  - d. Check field seaming procedures
  - e. Check anchor trenches
3. Check liner cover
  - a. No sharp fragments or material greater than three inches in size
  - b. Check time lag between liner placement and soil cover
  - c. Check thickness: 12 inches on bottom  
18 inches on sides

## II. Review of Construction Records

- A. Check as-built drawings and photographs and compare to the design drawings and specifications.
- B. Check the results of laboratory and field tests performed on the embankment materials and liner and verify that design material specifications have been met.

### 1. Field density

- a. Granular fill: 75% Relative Density
- b. Cohesive fill: 90% Modified Proctor

### 2. Moisture content

### 3. Lining tests for each 250,000 square feet of liner:

<u>Property</u>	<u>Units</u>	<u>Test Method</u>
Thickness (min. & max.)	inches	ASTM D-1593
Specific gravity	--	ASTM D-792-A
Tensile strength	pounds/inch	ASTM D-882, Method A
Maximum elongation	percent	ASTM D-882, Method A
Modulus at max. elongation	pounds/inch	ASTM D-882, Method A
Graves tear	pounds	ASTM D-1004
Elmendorf tear	grams	ASTM D-1922
Cold crack	of	ASTM D-1790
Dimensional stability	percent	ASTM D-1204
Water extraction	percent	ASTM D-1239
UV resistance	hours	--
Volatility	percent	ASTM D-1203