TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

August 17, 1981

YCRD-50-566/81-03

Mr. James P. O'Reilly, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 3100
101 Marietta Street
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

YELLOW CREEK NUCLEAR PLANT UNIT 1 - LAMINATION OF SOIL IN ERCW SPRAY POND - YCRD-50-566/81-03 - REVISED FINAL REPORT

The subject deficiency was initially reported to NRC-OIE Inspector R. W. Wright on February 4, 1981, in accordance with 10 CFR 50.55(e) as NCR YC-144. This was followed by our first interim report dated March 5, 1981 and our final report dated August 11, 1981. As discussed with Don Quick by telephone on August 13, 1981, enclosed is our revised final report. The reason for the revision is to submit the table referenced in the final report.

If you have any questions concerning this matter, please get in touch with D. L. Lambert at FTS 857-2581.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosures
cc: Mr. Victor Stello, Jr., Director (Enclosures)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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ENCLOSURE

YELLOW CREEK NUCLEAR PLANT UNIT 1
LAMINATION OF SOIL IN ERCW SPRAY POND
YCRD-50-566/81-03
REVISED FINAL REPORT

DESCRIPTION OF DEFICIENCY

As part of TVA's construction control testing, earthfill block (undisturbed) samples are required to be taken from Category I earthfill placement. Laminations have been observed in several block samples taken from the earthfill liner in the unit 1 ERCW spray pond. Most of the laminations occurred at a depth of 1 to 3 inches from the top of the block samples. This deficiency was deemed reportable since the presence of laminations could adversely affect the seepage or structural integrity of the spray pond.

Laminations in the earthfill liner were possibly caused by overcompaction, excessive speed of hauling equipment, or failing to scarify the top surface of any previously placed layer of fill.

SAFETY IMPLICATIONS

The spray pond liners are designed taking into account permeability and shear strength of earthfill among other factors. Laminations may have some effect on the seepage and the shear strength of the liner. If the laminations are significant and remain uncorrected, this could cause an increase in permeability and could reduce the shear strength. This would result in additional seepage losses and reduced safety factors for the spray pond slope stability.

CORRECTIVE ACTION

TVA has conducted an evaluation to determine if the laminations would significantly affect seepage or the structural integrity of the spray pond. Five additional block samples have been taken in the vicinity of the earlier block samples which indicated laminations. The samples and the walls of the trenches excavated to obtain the samples were inspected for laminations. In general, no significant laminations, shear planes, cracks, or weak zones were observed in the samples or the trenches. Sample 5, which was taken from the bottom liner, contained a few minor and localized zones of laminations near the top surface of the block. In addition to the unconsolidated-undrained (Q) and consolidated-undrained (R) triaxial shear test, this sample was selected to conduct a vertical permeability test to simulate vertical seepage through the bottom liner of the pond. Sample 8, which was taken in the slope of the pond liner contained two minor localized laminations: one at the top and the other near the bottom of the block. In addition to the normal Q and R shear strength testing, this sample was selected to conduct a horizontal permeability test to simulate lateral seepage through the slope liner. The test results of the additional block samples are shown on the attached table. The horizontal and vertical permeabilities of block samples are lower than the design value indicating that there would be less seepage or at least no adverse impact on seepage losses through the liner.

The apparent shear strength values for R tests are higher than the design value and therefore should not have an adverse impact on the slope stability of the pond.

The effective friction angle values for both block samples are relatively higher than the design value. Sample 5 indicated slightly lower cohesion than the design value, but this should not have a significant effect on the long-term slope stability.

The Q-test friction angles are higher than the design value. Although the Q-test cohesion values are relatively lower, no significant impact on the stability is anticipated since there is an ample safety factor (= 7.45) for during construction and end of construction cases. Moreover, the liner construction is almost complete, and there is no sign of sliding or stability problems to date.

Based upon the field observations and the laboratory test results, it is concluded that there is no significant lamination to cause any adverse impact on the seepage or the structural integrity of the unit 1 spray pond liner. Therefore, no corrective action is required on the inplace earthfill. To lessen the probability of laminations occurring in the future, TVA has included a table with recommended compaction guidelines for earthfill in TVA construction specification N8C-882. This table lists the rollers which have been tested, the corresponding loose-lift thickness, and the number of roller passes which should be used in compacting the earthfill to meet the required compaction criteria.

If the surface of any previously placed layer of earthfill is too smooth, TVA also requires the surface to be scarified to create a rough contact before placing subsequent earthfill layers. This has been incorporated into TVA construction specification N8C-882.

This problem has not been found at other TVA nuclear plants.

TABLE

YELLOW CREEK NUCLEAR PLANT

EARTHFILL FOR ERCW SPRAY PONDS

BLOCK SAMPLES

Block No.	Coordinates		Elevation	Soil Symbol	Moisture Content %	Dry Density pcf	Particle Size Analysis				Atterberg Limits		Triaxial Q		Triaxial R				Coefficient of Permeability	
							Gravel %	Sand %	Silt %	Clay %	Liquid Limit %	Plasticity Index %	ϕ deg	c tsf	ϕ deg	c tsf	$\bar{\phi}$ deg	$\bar{c}$ tsf	Kh cm/sec	Kv cm/sec
2	E0+15.9	S4+92	50[illegible].1	SC	15.4	114.1	1	57	11	31	39	17	--	--	--	--	--	--	--	--
5	E0+51.2	S7+99.2	498.0	SC	18.4	105.6	1	65	12	22	34	19	18.9	0.62	11.9	1.29	32.6	0.06	--	6.4×10^{-8}
8	W1+52	S9+50	513.5	SC	16.7	104.9	2	65	10	23	31	11	17.7	0.51	22.2	0.46	30.3	0.21	7.4×10^{-6}	--
9	W0+56	S4+41	506.6	SC	18.0	106.8	1	58	11	30	36	14	--	--	--	--	--	--	--	--
10	W3+43.5	S5+61	516.4	SC	20.0	101.7	4	57	10	29	41	18	--	--	--	--	--	--	--	--

ADOPTED DESIGN VALUES

Triaxial Q		Triaxial R				Coefficient of Permeability
ϕ deg	C tsf	ϕ deg	C tsf	$\bar{\phi}$ deg	$\bar{C}$ tsf	K cm/sec
13	0.8	14	0.2	30	0.1	50×10^{-6}