REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8112280476 DOC.DATE: 81/12/23 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
AUTH.NAME AUTHOR AFFILIATION
UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards "Evaluation of Potential Migration from Contaminated Soil." Retaining contaminated soil on-site requested.W/Class I & II fee.

DISTRIBUTION CODE: A001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 9+20
TITLE: General Distribution for after Issuance of Operating License

NOTES: w/check $4,400

	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME		COPIES LTTR	COPIES ENCL
ACTION:	ORB #1 BC	01	13	13				
INTERNAL:	ELD		1	0	IE	06	2	2
	NRR/DHFS DEPY	08	1	1	NRR/DL DIR		1	1
	~~NRR/DL/GRAB~~		1	0	NRR/DSI/RAB		1	1
	REG FILE	04	1	1				
EXTERNAL:	ACRS	09	10	10	LPDR	03	1	1
	NRC PDR	02	1	1	NSIC	05	1	1
	NTIS		1	1				

DEC 30 1981

cB

TOTAL NUMBER OF COPIES REQUIRED: LTTR 35 ENCL 33

P.O. BOX 529100 MIAMI, FL 33152

FLORIDA POWER & LIGHT COMPANY

December 23, 1981
L-81-536

Office of Nuclear Reactor Regulation
Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

Re: Turkey Point Units 3 & 4
Docket No. 50-250 & 50-251
Evaluation of Potential Migration
From Contaminated Soil

An application concerning the captioned matter is hereby submitted for approval. This matter has been discussed with members of your staff, and an enclosed evaluation as well as a Class I and II fee, is forwarded.

Very truly yours,

Robert E. Uhrig

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/JEM/cab

cc: Mr. J. P. O'Reilly, Region II
Harold F. Reis, Esquire

A001 S1/1 w/check $4,400

EVALUATION OF POTENTIAL MIGRATION

FROM CONTAMINATED SOIL

An area of contaminated earth located in the southeast corner of the Radiation Controlled Area (RCA) has been evaluated for possible retention at this location. The source of this contamination has been addressed in previous reports submitted to the NRC. This study consisted of the following evaluations:

(1) Core samples were taken in the immediate vicinity of the effected area to establish the boundary of contaminated earth and the total and isotopic radionuclide activities present.

(2) Pertinent literature was reviewed in order to characterize the hydrology of the surrounding area.

(3) An independent contractor recently performed a study to specifically characterize the hydrology in the immediate locale of the contaminated earth and the potential environmental impact of retaining this earth in-situ (see attached report).

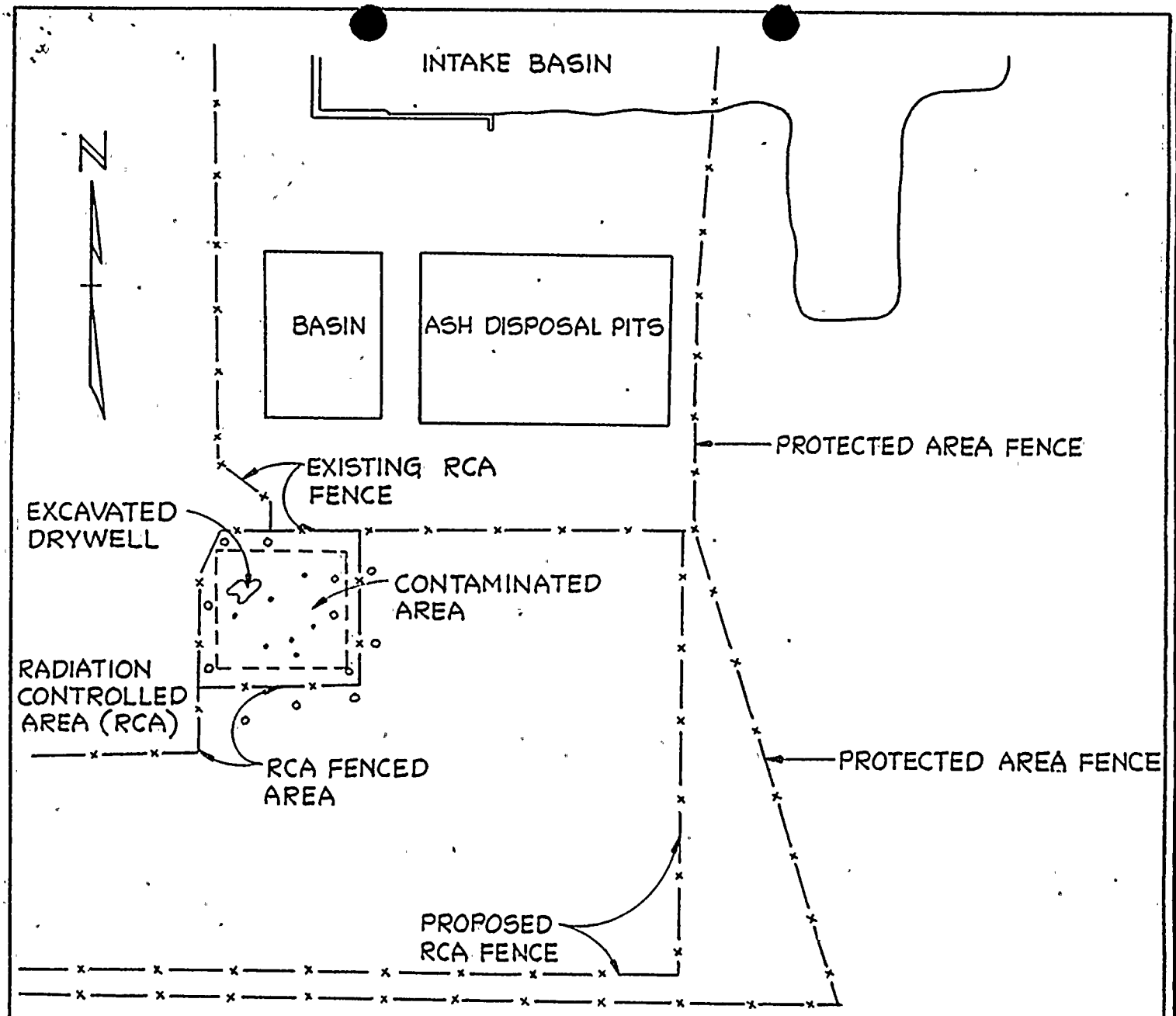
(4) Alternatives to retaining this earth in-situ were evaluated.

Based on the results of this evaluation and the commitments made here-in, Florida Power and Light Company hereby requests authority under 10 CFR 20.302 to retain this earth at its present location. It is felt there will be no discernable impact on either the environment or occupational and public health.

DISCUSSION

Figure 1 describes the boundary of radioactive material transported underground by water from the excavated drywell at the southeast corner of the Radiation Controlled Area (RCA). This area is represented by the dotted lines enclosed within the fenced-in-protected and radiation controlled areas. The outer dotted line represents the future extension of the existing RCA for additional space.

Figure 1 also shows the excavated drywell as well as core sampling locations. Fourteen samples were taken throughout the entire contaminated area with background levels noted. The cores were excavated using heavy equipment passing through the organic muck/water layer, down to the bedrock layer (approximately 11 feet below the surface). Therefore, characterization of the thickness of the contamination layer and also its perimeter boundary was obtained. Radiation surveys inside the cores along with soil sample collection and analyses (17 in all) indicated that the contaminated layer remained predominantly in the organic muck/water region (refer to figure 2). Samples of bedrock and topsoil (above the water line) revealed minimal contamination. Radiation levels taken at contact with the ground surface and at waist level indicated background levels in the general area.



LEGENDS:

- • Core Sampling Locations with Detectable Activity
- o Core Sampling Locations with Non-detectable Activity

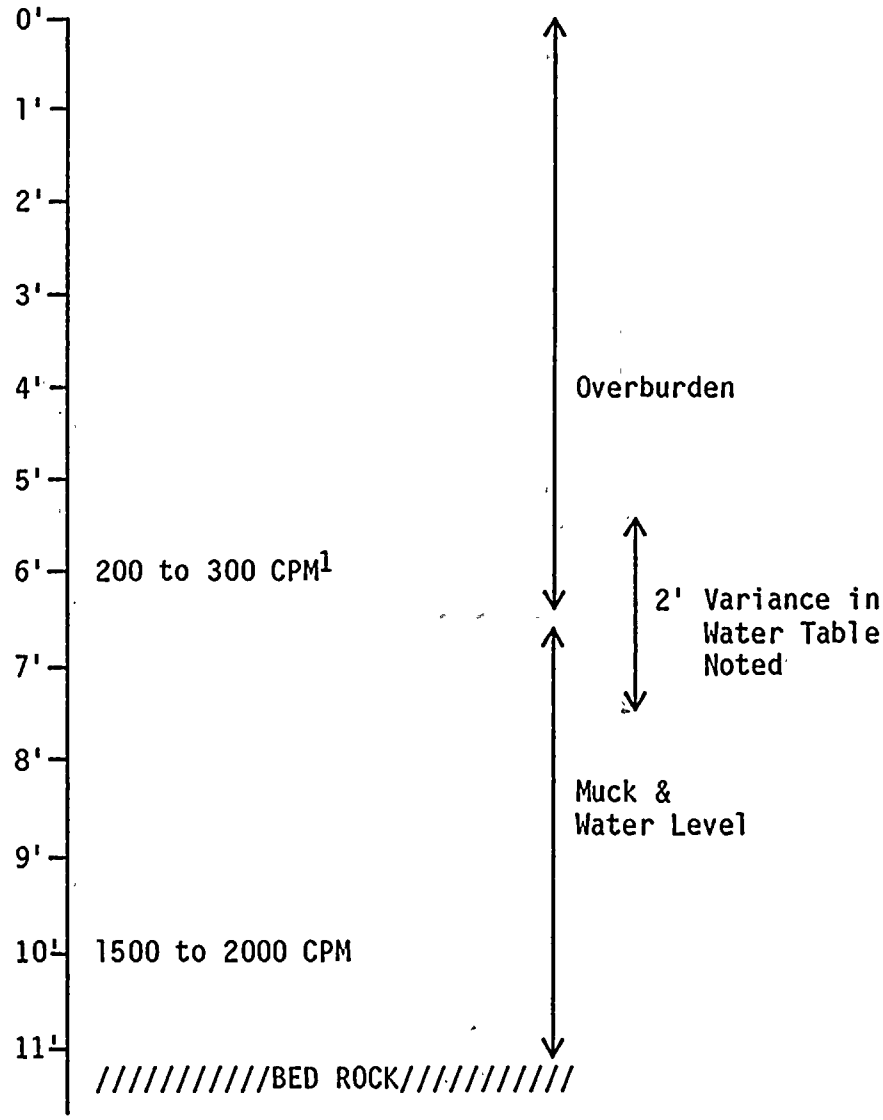
SOUTHEAST CORNER OF EXISTING RADIATION CONTROLLED AREA (RCA) AND SURROUNDING AREA

FIGURE 1

DRAWN BY	E. Crespo
CHECKED	
CORRECT	

NO.	DATE	REVISION	BY	CH	CORR	APP

Figure 2: Distribution Of Radioactivity In Soil With Respect to Depth



Comment: As noted zero feet represents topsoil surface level prior to elevating the area to the 17'6" elevation. This is approximately 6'6" above Mean Low Water.[2]

[1]All readings are net (background subtracted) using an RM-14 with HP-210 probe.
[2]Mean Low Water - mean low water plus 0.7 feet equals mean sea level.

Of special interest is the migration of the contamination. Of all core samples surrounding the excavated drywell, contamination was detected only in the eastern and southern directions. This was partially attributed to the flowpath of water from the (rerouted) storm drain discharging into the excavated drywell (during the periods from 7/78 to 7/80). The contamination boundary migrated out to approximately 85 feet from the excavated drywell.

Also of interest is the effect of dilution, dispersion and sorption from the drywell to the contamination boundary. The average radioactivity concentration at the excavated drywell was 1.8 n Ci per gm while the average concentration at the boundary is 0.1 n Ci per gm[1]. This resulted in an average reduction factor of greater than 16-fold.

Several water samples (5 in all) were collected at the muck/water interface and analyzed revealing low-level contamination, but in all cases these concentrations were within established limits for unrestricted areas.[2]. The radionuclides detected were cobalt-60 and cesiums'-134 and -137.

Based on a total of 136 soil samples collected throughout this area (and analyzed by gamma isotopic techniques)[3] the total estimated activity present is 0.23 Ci. The total volume of earth contaminated is approximately 41,800 cubic feet. Based on a density of 4.99×10^4 gm per $ft.^3$, the average concentration of contaminated soil is 0.1n Ci per gm. Cobalt-60 is the predominant isotope present comprising approximately 77% of the total activity while cesiums'-134 and -137 comprise approximately 9% and 14% (respectively) of the remaining activity.

1. Only core samples with detectable activity were used in this tabulation.
2. Based on 10 CFR Part 20, Appendix B.
3. Method of analysis is presented in "Comprehensive Radiological Survey of the Turkey Point Plant Site" report dated 2/27/81 from FPL to the NRC.

HEALTH AND ENVIRONMENTAL IMPACT OF RETAINING CONTAMINATED SOIL ON-SITE*

Turkey Point site is located in an area of shallow, extremely permeable, limestone bedrock, with the water table located near the top of the aquifer. A substantial portion of the land within the 0 to 5 mile radius is vacant. Water sufficiently fresh for irrigation purposes is available from wells located west and northwest of the site. The nearest of these wells is about 3.5 miles from the site. Potable water for Homestead, Florida City, and Turkey Point Plant is derived from well fields in the vicinity of Homestead and Florida City (more than 8 miles from the plant site).

The contaminated area is located on the south edge of the Turkey Point station site inside the RCA between the cooling canals of Loch Rosetta, intake cooling waters, and Lake Warren. At present a military activity (east side of Loch Rosetta) is located at a distance approximately 1000 feet from this area.

The 2 major ground water units underlying the site, the Biscayne aquifer and the Florida aquifer, are both highly saline in the site area and flow in the direction of the ground water gradient, which is generally away from the land (southeast direction). Any reversal of the ground water gradient, resulting for example from overpumping or drought will cause additional salt water intrusion in the Biscayne aquifer. This intrusion makes the water unfit for human consumption. It has been estimated that the minimum ground water travel time from the vicinity of the contaminated area to the canal system would be several years. Dye studies to evaluate the rate, direction, and depth of ground water at the site indicate that the lateral movement of ground water at the site is very slow. In addition, most of the radionuclides would move more slowly than this through the ground water because of the process of sorption. That which reached the canal system would be significantly reduced by this process (sorption through the earth) and would contribute minimally to the concentration of natural occurring radioactivity and permissible plant releases already present. The canal water is saline and unsuitable for human consumption.

A study by Dames & Moore was recently performed to characterize the hydrology specifically in the locale of the contaminated area. Core samples were taken by Dames and Moore immediately surrounding this effected area. All samples were surveyed for potential contamination resulting in nondetectable activity. This report, attached as a supplement, confirms the above mentioned statements. The results of the study show that the rate of movement of the contamination averages approximately 7.4×10^{-3} feet per day and moves in the direction of the intake basin.

Based on the characterization discussed above the potential for migration of the contaminants in the layer of earth presents a negligible impact to the environment, public and occupational health for the following reasons:

*References:

1. Florida Power and Light Co., Turkey Point Plant Units 3 & 4, Final Safety Analysis Report.
2. U.S. Nuclear Regulatory Commission, "Final Environmental Statements Related To Steam Generator Repairs at Turkey Point Plant Units 3 and 4", "Docket Nos. 50-250 and 50-251, US NRC Report NUREG-0743, March 1981.

1. The contaminated layer remains below the topsoil-to-water interface (approximately 5 $^1/_2$ feet below the existing surface). This topsoil is comprised of crushed, compacted limestone, therefore the permeability of this media is much less then preexisting soil. In the near future this surface level will be increased an additional 10 $^1/_2$ feet (also using crushed, compacted limestone) therefore the major portion of the contaminated layer will be at least 16 feet below the surface. In the worst case, this layer will be at least 10 feet below the surface for that portion of contaminated dirt which had already been excavated and is temporarily stored on the existing surface inside the RCA. This represents approximately 10% of the total 0.23 Ci present. Any migration upward through the ground water would require traversing this distance and is very unlikely to occur. Core sampling results in the area confirmed minimal migration upward into the noncontaminated top soil.

2. With the rerouting of the storm drain the fluid flow in the vicinity of the contaminated soil would return to normal hydraulics for the general area (effected by tide, seasons, intake water, etc.). The transport time and migration, particularly towards the intake basin, should thus be reduced significantly for reasons discussed above.

   The minimum distance from the contaminated soil to the cooling canal (by the intake basin) is approximately 380 feet. Using the rate of movement of 7.4×10^{-3} feet per day no contaminants would reach the intake basin in less than 140 years. Using the dilution, dispersion and sorption factors characterized above it can be estimated conservatively that a 70-fold reduction from the source can be used for potential migration to the intake basin. Therefore the average concentration reaching the basin should be less than .002 n Ci per gm. This does not take into account decay with time.

3. Of 136 soil samples analyzed only one disclosed concentrations slightly greater than exempt concentrations.* As mentioned above, all the contaminated soil is contained inside the RCA. All water samples revealed concentrations within limits for unrestricted areas.** These concentrations will continue to decrease in time due to radioactive decay, dispersion, dilution, ion exchange and sorption.

4. The general area radiation levels both at waist level and contact with the ground are background. In addition to the ongoing environmental program discussed in the Turkey Point Units 3 and 4 Final Safety Analysis Report, routine radiation surveys by plant personnel (on a quarterly basis) are taken of the general area, including outside the RCA. Any potential changes in the background radiation levels will be assessed on a timely basis.

5. The total activity present 30 years from now will be less than 0.02 Ci comprising of 83% cesium - 137 and 17% cobalt-60.

---

*Based on 10 CFR Part 30.
**Based on 10 CFR Part 20.

EXCAVATING, PACKAGING AND SHIPPING TO A FEDERALLY APPROVED DISPOSAL SITE

Estimated operational cost to excavate this area and package the contaminated muck for shipment is approximately $576,700. This includes manpower, use of heavy equipment and duration of operation (approximately 37 weeks and 12,000 man-hours). This estimate does not include lost time due to inclement weather such as rain, which is prevalent in Florida 6 months out of the year (May to October). Prior to packaging for shipment this contaminated muck must be dried in order to ensure water content does not exceed NRC and burial site criteria limits. Based on previous shipments of contaminated soil the estimated 41,800 cubic feet of soil would require approximately 5,580 55-gallon drums to be packaged for shipment. The average total activity per drum, based on a concentration of 0.1 n Ci per gm and a density of 4.99×10^4 gm per ft^3 would be about 37 µCi.* The average concentration of radioactive material in these containers is less than 50% of the concentration that would require regulations for transport under Department of Transportation (DOT) criteria set forth in 49 CFR 173.389 as defined "radioactive material", and is also exempt from the requirements of 10 CFR 71.7.

Based on the present method of shipment the total cost for containers, shipping, and burial to Barnwell, South Carolina (projected in 1982 dollars) would be approximately $1,100,000. This would result in inefficient use of the current limited available burial space at Barnwell, S.C. If shipped to Richland, Washington, transportation costs would be an additional 1.4 million dollars.

*This does not include dilution with noncontaminated soil which is prevalent when excavating using heavy equipment.

SUMMARY

The estimated total cost for excavating, packaging and transporting the contaminated soil to an approved disposal facility would be at least $1,676,700. This includes $576,700 for excavating and packaging. Other factors such as inclement weather and drying of the soil are not taken into account and would act to increase these cost estimates. The bulk of the packages would contain radioactive material much less than that necessary to be considered "radioactive material" as defined in Department of Transportation regulations and would result in inefficient use of limited available burial space.

Retaining the contaminated soil on-site with approximately 10 feet of noncontaminated overburden (inside the RCA), would result in no discernable impact on either the environment or occupational and public health. The potential for increased background radiation levels on the surface grounds would be minimal but routine surveys of the local grounds (quarterly basis at a minimum) would provide early detection of any potential for this occurrence. The total estimated activity present after 30 years would be less than 0.02 Ci.

Any potential migration of the contaminants would be in the direction of the intake basin and would not reach this basin in less than 140 years. This slow leakage would contribute minimally to the concentration of natural occurring radioactivity and permissable plant releases already present. As mentioned this water is saline and unsuitable for human consumption. Any potential for extreme movement of the contaminants in any other direction would also be isolated by the cooling canal system.

CONCLUSION

We request to retain the contaminated soil on-site for the above mentioned reasons. The impact on both the environment and occupational and public health would be negligible. The potential of recontaminating this region as previously done is negligible for the reasons stated in the corrective actions in Licensee Event Report 251-79-14 dated 9/11/79, and the "Comprehensive Radiological Survey of the Turkey Point Plant Site" report dated 2/27/81.