Engineering Report

For

Disposal of Preoperational Metal Cleaning Waste

Tennessee Valley Authority

Bellefonte Nuclear Plant

Jackson County, Alabama

Tennessee Valley Authority

March 1981

8104070438

1. General Information

a. Company Facility

TVA Bellefonte Nuclear Plant

Jackson County, Alabama

b. Company Name:

Tennessee Valley Authority

c. Company's Authorized Agent

Mohamed T. El-Ashry
Director of Environmental Quality
Natural Resources Building
Norris, TN 37828

d. Product to be manufactured

Electric power

e. Water Supply

Potable: Hollywood Utility District, Hollywood, Alabama

Raw: Tennessee River

2. Location Map

The attached topographic map (Location Map 1) and aerial photograph (Location Map 2) indicate the surrounding area, elevations, and location of the site.

3. Summary

A preoperational metal cleaning process is presently scheduled to begin in May 1981 and will continue over a period of about two years. The purpose of the cleaning process is to remove dirt, oil and grease films, and small amounts of rust from plant unit and piping systems. The principal cleaning chemical will be tri-sodium phosphate. Small amounts of other chemicals will also be used. A strong acid cleaning process is not planned.

To treat the wastewater, the use of a percolation/evaporation method is proposed. This method has been successfully used at the Watts Bar Nuclear Plant Facility in Tennessee. At Bellefonte, the spent cleaning solutions would be discharged to two ponds having a total area of about 10 acres. There would be no treatment prior to discharging the solutions to the ponds. Percolation/evaporation would be relied upon for liquid removal; and filtration and chemical action within the soil mass would tie up the majority of the sodium, phosphate, and small concentrations of suspended solids, oil and grease, and iron.

4. Water Volumes and Chemicals

The expected water volumes and chemicals to be used during the preoperational metal cleaning process are listed in Table 1.

5. *Ground Water Assessment

a. Physical Properties

Ground water occurs at the Bellefonte site under water table, i.e., unconfined, conditions. Results of core drilling at the site indicate that below a depth of 30 feet there are few openings of significant size. The Chickamauga limestone, which underlies the site, has a limited ability to transmit water, as reflected by the low water acceptance rates during pressure tests in foundation exploration holes. Generally only the lower half of the overburden, which averages about 10 feet thick, is saturated.

Town Creek embayment forms a hydraulic boundary to the site ground water system. All ground water from the proposed treatment site flows to Town Creek embayment.

*Excerpt from "Environmental Report - Bellefonte Nuclear Plant Units 1 and 2"

b. Hydrologic Properties

Recharge to the ground water system originates from local precipitation and occurs over the entire surface area. In a year of normal rainfall, averaging 56 inches, greatest recharge occurs during January through March and least recharge occurs in September to mid-November. Water levels change seasonally, reflecting the change in volume of water stored, and are highest during the period of greatest recharge and lowest during the period of least recharge.

Regionally, public and industrial ground water supplies, such as those at Hollywood, Stevenson, Bridgeport, and Avondale Mills, are obtained from limestone of Mississippian age.

In and near the plant area, the principal water-bearing formations are the Knox Dolomite of Cambrian and Ordovician age and the Fort Payne Chert of Mississippian age. An outcrop belt of the Knox Dolomite is located about 3200 feet northwest of the plant site. The Knox dips to the southeast and at the plant site is at a depth of about 1000 feet below land surface. The northwestern edge of an outcrop belt of Fort Payne Chert is located about 3000 feet southeast of the plant site. The Fort Payne dips away from the plant site; the outcrop area of the formation in this area is mostly below the level of Guntersville Lake.

Water level measurements in 12 core holes at the site and in 21 private wells nearby, made in January 1971, show that the water table conforms closely to surface topography and that the hydraulic gradient slopes with land surface from the plant site towards Town Creek embayment. A part of precipitation on the site infiltrates the surficial weathered material and moves to the water table, where lateral movement occurs toward the discharge area along Town Creek embayment.

Currently, no cones of influence resulting from ground water withdrawal exist in the Bellefonte area. The nearest public ground water supply is that of Hollywood, 2.4 miles northwest of the plant site, which uses an average of only 47,500 gallons per day. If the ground water withdrawals at Hollywood were greatly increased, the cone of influence would not extend to the plant site because of the hydraulic barrier formed by Town Creek embayment between Hollywood and the plant site.

Maximum bedrock permeability was estimated on the basis of maximum water acceptance rate in bore hole packer tests made during the exploratory drilling program, which indicated a permeability of 7.2 feet per day. The mean ground water velocity under conditions of maximum permeability is estimated to be 21.6 feet per day. The resulting average ground water time of travel from the plant to the nearest point of discharge on Town Creek embayment, is about 111 days.

6. Test Bore Hole Data

Test bore hole data for the proposed areas for percolation/evaporation ponds are listed in Table 2. Test hole locations are shown in Location Map 1.

7. Description of Waste Treatment Ponds

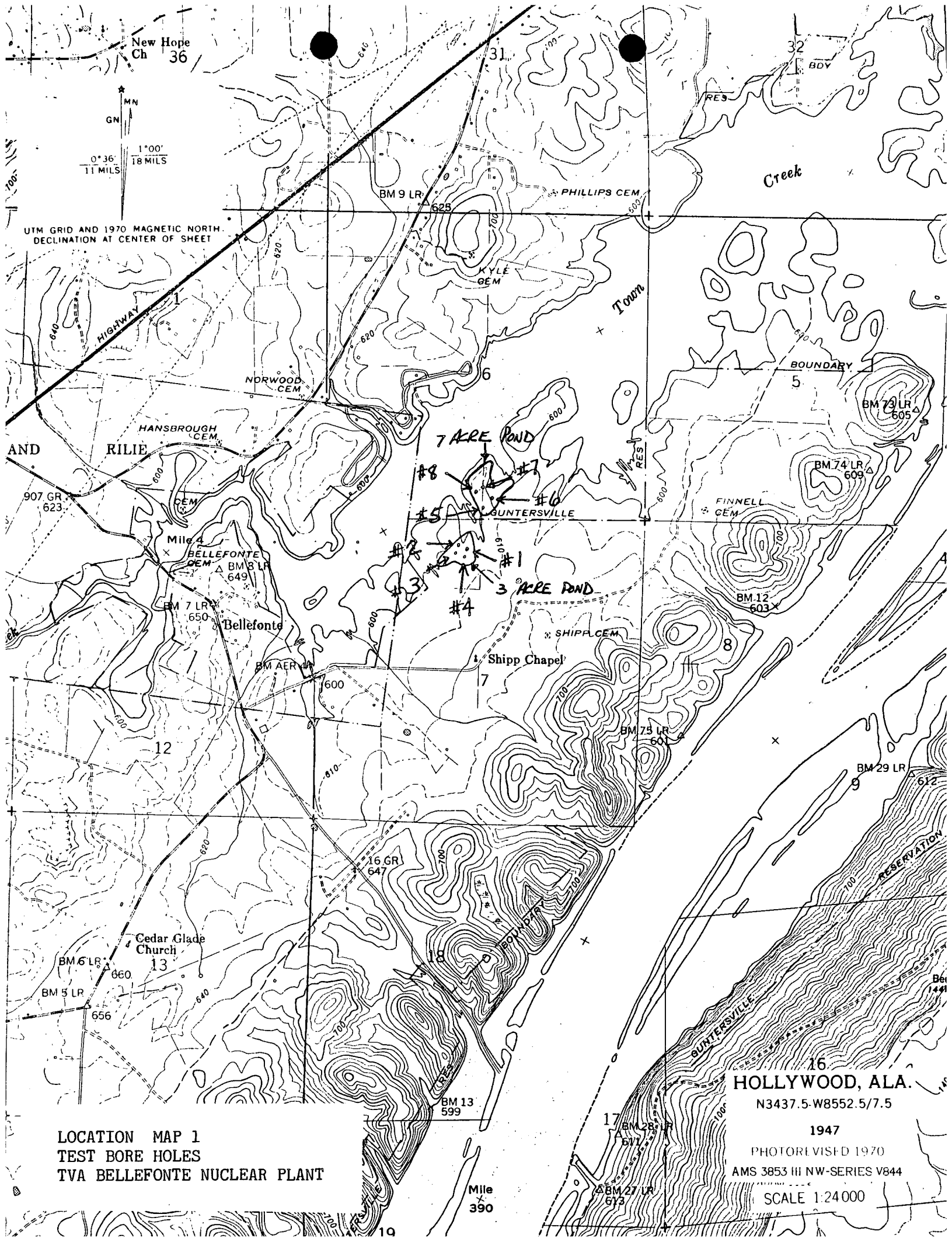
Two percolation/evaporation ponds, 7 acres and 3 acres, will be used. Locations of the ponds are shown on Location Map 1 and 2. The ponds will be ground level, but the floor of each will be graded to nearly level so that uniform percolation across the entire area is provided. An impermeable dike will be constructed around each pond to prevent rainfall runoff from entering the pond. The pond depth will be four feet. The elevations of the floors and the tops of the dikes of the ponds are shown on Location Map 2. Percolation/evaporation will provide liquid removal, and filtration and chemical action within the soil mass should tie up the majority of the sodium,

phosphate, and small concentrations of suspended solids, oil and grease, and iron. After preoperational cleaning is completed, the pond sites will be recovered with topsoil and revegetated to prevent possible runoff/erosion of the contaminants contained in the soil of the ponds.

Prepared by _____
Jimmy Powell

Reviewed by _____
Douglas S. Walsh

_____
Gerald R. Steiner



LOCATION MAP 1
TEST BORE HOLES
TVA BELLEFONTE NUCLEAR PLANT

TABLE 1

EXPECTED WATER VOLUMES AND CHEMICALS
TO BE USED DURING PREOPERATIONAL METAL CLEANING
TVA BELLEFONTE NUCLEAR PLANT

Plant System	Water Volume, MG	Chemical
Condensers	2.0	Na_3PO_4-$12H_2O$ (5000 mg/l PO_4)
		16 pounds KOH, or 12.5 pounds NaOH
	5.0	demineralized rinse water
Component cooling system	0.035	*QS-30 (0.05% solution) *Triton X-100 (0.05% solution)
	0.315	demineralized rinse water
Main steam hydro	1.5	Hydrazine, N_2H_4 (100 mg/l)
Piping system layup	0.35	Hydrazine (100 mg/l)

* Wetting agents

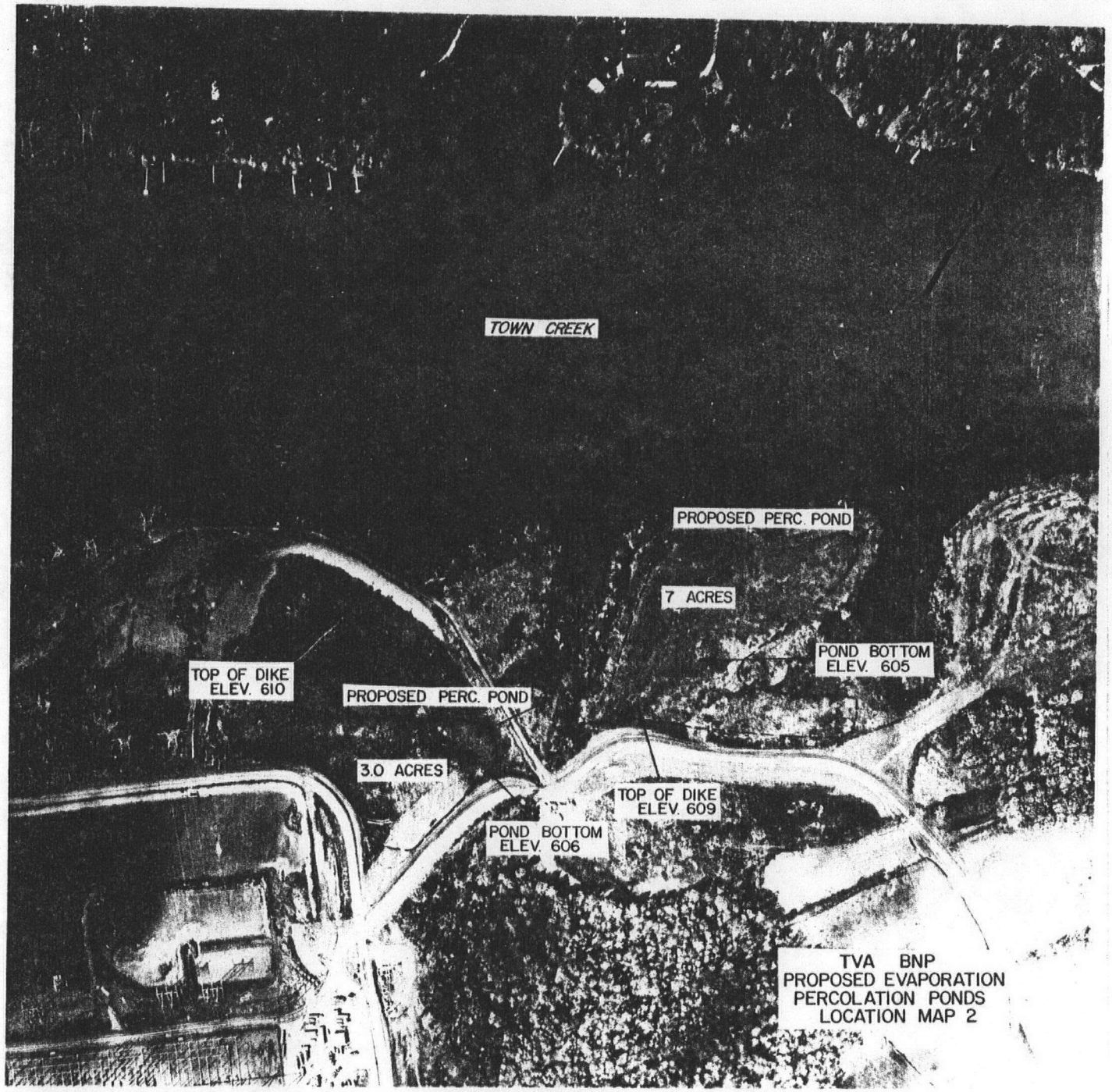

TOWN CREEK
PROPOSED PERC. POND
7 ACRES
POND BOTTOM
ELEV. 605
TOP OF DIKE
ELEV. 610
PROPOSED PERC. POND
3.0 ACRES
TOP OF DIKE
ELEV. 609
POND BOTTOM
ELEV. 606
TVA BNP
PROPOSED EVAPORATION
PERCOLATION PONDS
LOCATION MAP 2

TABLE 4

TEST BORE HOLE DATA

BELLEFONTE NUCLEAR PLANT

Boring No.	Sample No.	Coordinates	Depth ft	Symbol	Moist. Content %	Liq. Limit %	Plastic. Index %	Gravel %	Sand %	Silt %	Clay %
1	1-A	N8+72.52 W19+48.83	0-2	CH	24.2	62.0	43.8	1	17	28	54
1	1-B	"	2-4	CH	20.1	59.1	41.2	10	17	28	45
1	1-C	"	4-6	CL	22.4	44.7	27.9	7	23	33	37
1	1-D	"	6-8	CL	19.5	31.7	15.2	1	20	48	31
2	2A	N8+40.80 W20+57.45	0-2	CL	20.5	39.6	21.3	1	18	40	41
2	2B	"	2-4	CL	18.8	36.9	19.7	2	19	45	34
2	2C	"	4-6	CL	19.6	38.2	20.5	0	21	41	38
2	2D	"	6-8	CH	23.1	59.6	41.3	0	13	30	57
3	3A	N6+54.14 W20+12.54	0-2	CL	17.6	31.9	14.8	0	21	47	32
3	3B	"	2-4	CL	19.0	36.6	19.8	0	20	44	36
3	3C	"	4-6	CL	18.4	39.1	22.3	3	21	43	33
3	3D	"	6-8	CL	23.4	40.6	23.1	1	20	39	40
4	4A	N7+02.54 W18+91.14	0-2	CL	18.4	30.3	13.2	0	25	46	29
4	4B	"	2-4	CL	18.9	30.5	13.7	0	19	49	32
4	4C	"	4-6	CL	18.7	41.8	23.0	8	17	29	46
5	5A	N15+67.60 W21+23.14	0-2	CH	22.7	55.5	37.2	2	21	26	51
5	5B	"	2-4	CH	21.2	57.4	37.5	7	18	30	45
5	5C	"	4-6	CH	22.2	57.7	35.4	1	24	30	45
5	5D	"	6-8	CH	19.2	65.9	45.1	0	17	32	51
6	6A	N18+04.69 W21+38.11	0-2	CH	32.5	82.2	55.7	1	8	22	69
6	6B	"	2-4	CH	34.2	76.3	53.1	4	14	19	63
7	7A	N18+96.07 W23+70.64	0-2	CL	14.9	41.9	24.8	7	19	33	41
8	8A	N17+28.65 W24+10.48	0-2	CL	18.7	43.3	25.9	7	20	34	39
8	8B	"	2-4	CL	21.7	46.0	28.4	8	20	33	39
8	8C	"	4-6	CL	23.9	48.3	30.6	21	16	29	34
8	8D	"	6-8	CL	25.4	40.1	21.4	3	14	37	46

	Sample Number	Coordinates	Depth	Remarks
1	1A	N8+72.52 W19+48.83	0'-2'	
1	1B	"	2'-4'	
1	1C	"	4'-6'	
1	1D	"	6'-8'	
2	2A	N8+40.80 W20+57.45	0'-2'	
2	2B	"	2'-4'	
2	2C	"	4'-6'	
2	2D	"	6'-8'	
3	3A	N6+54.14 W20+12.54	0'-2'	
3	3B	"	2'-4'	
3	3C	"	4'-6'	
3	3D	"	6'-8'	
4	4A	N7+02.54 W18+91.14	0'-2'	
4	4B	"	2'-4'	
4	4C	"	4'-6'	
				Unable to bore deeper, hit limestone rock
5	5A	N15+67.60 W21+23.14	0'-2'	
5	5B	"	2'-4'	
5	5C	"	4'-6'	
5	5D	"	6'-8'	
6	6A	N18+04.69 W21+38.11	0'-2'	Spoil area, significant amounts, limestone boulder
6	6B	"		" " " " " "
				Unable to bore deeper due to limestone boulders
				" " " " " " " "
7	7A	N18+96.07 W23+70.64	0'-2'	Spoil area, significant amounts, limestone boulder
				Unable to bore deeper due to limestone boulders
				" " " " " " " "
				" " " " " " " "
8	8A	N17+28.65 W24+10.48	0'-2'	)
8	8B	"	2'-4'	) Spoil area, significant amounts of large rock
8	8C	"	4'-6'	) ranging from 2" to 12" with some wood
8	8D	"	6'-8'	)

215 Natural Resources Building

MAR 1 3 1981

Mr. James P. Martin
Engineer, Technical Staff
Alabama Water Improvement Commission
Public Health Services Building
Montgomery, Alabama 36130

Dear Mr. Martin:

BELLEFONTE NUCLEAR PLANT - NPDES PERMIT NO. AL0024635

This refers to past correspondence and discussions between you and my staff related to our proposed method for treating preoperational metal cleaning wastes at the subject plant. Enclosed for your review and approval is an engineering report for the proposed treatment method. We have included the provisions requested by you in your August 11, 1980, letter to me. Please contact Gerald R. Steiner or Douglas S. Walsh in Chattanooga, Tennessee, at 615/755-3173, if you have any questions.

Sincerely,

Original Signed By
M. T. El-Ashry

Mohamed T. El-Ashry, Ph.D.
Director of Environmental Quality

GRS:DJC
Enclosure

TOWN CREEK
N
PROPOSED PERC. POND
7 ACRES
POND BOTTOM
ELEV. 605
TOP OF DIKE
ELEV. 610
PROPOSED PERC. POND
3.0 ACRES
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TVA BNP
PROPOSED EVAPORATION
PERCOLATION PONDS
LOCATION MAP 2