Consumers Power Company

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May 3, 1982

Harold R Denton, Director
Office of Nuclear Reactor Regulation
Division of Licensing
US Nuclear Regulatory Commission
Washington, DC 20555

MIDLAND PROJECT
MIDLAND DOCKET NO 50-329, 50-330
UNDERGROUND PIPING INFORMATION REQUESTED DURING APRIL 16, 1982 MEETING
FILE: 0485.16 SERIAL: 16881
REFERENCES: (1) J W COOK LETTER TO H R DENTON, SERIAL 16269, DATED MARCH 16, 1982
(2) J W COOK LETTER TO H R DENTON, SERIAL 16638, DATED APRIL 15, 1982
ENCLOSURES: (1) TABLE 1.0 MONITORING STATION OVALITY AND CORRESPONDING STATION
(2) BURIED CATEGORY 1 LINES AND TANKS
(3) ADDITIONAL GEOTECHNICAL INFORMATION

The purpose of this letter is to provide confirmatory information regarding several issues discussed during a meeting between the NkC Staff and Consumers Power Company. The meeting was held in Bethesda on April 16, 1982.

Enclosure 1 is an expansion of the table previously submitted by our letter, Serial 16638, dated April 15, 1982. Additional information is provided specifying the future aliowable strain based on an acceptance criteria and technical specification limit of 0.48% strain. The number of strain gages has also been specified in the table. The number of gages were determined by reviewing the pipe elevation profiles for abrupt inflection points and critical buckling zones. The strain gages are to be mounted one pipe diameter apart at a given monitoring station.

At the April 16 meeting a concern arose about the accuracy of the vibrating wire strain gages. In a telephone conference with the Irad Gage Company, they indicated the instrument is accurate to 10 (4inch/inch) as a worst case condition for any type of vibrating wire gage. This includes accounting for inaccuracies in installation and calibrations. This accuracy is an order of magnitude greater than the accuracy required for the strain measurements to be taken (.0001 in/in vs .00001 in/in).

Aperture Card Dist

B001 S 1/24 one shelf

Limited Distribution

oc0482-0084a100

A clarification on the technical specification limits and requirements proposed in the pipe monitoring program submitted March 16, 1982 is necessary. Our intention is to use the 4% ovality (equivalent .0048 inch/inch strain) which includes appropriate safety factors as the technical specification unless we can justify a higher value at a later date. If the specified limit is reached we would immediately notify the NRC Staff and increase the monitoring frequency to one month intervals. In parallel with the Staff notification an engineering evaluation of the situation would be performed. This evaluation would consider the remedial action necessary to restore the safety function and reliability of the service water system to overall plant operations. The actions necessary may very well include excavation of the piping in the affected zone for visual examination and possible replacement or sleeving.

The NRC Staff asked Consumers Power Company to verify that no other buried Category 1 pipes remain unidentified. Enclosure 2 is a current table of all the buried seismic Category 1 lines and tanks. The pressurization lines and tanks have been added to the list of buried Category 1 piping. The control room pressurization lines and tanks were installed during the summer 1981, and therefore not subjected to the soils settlement problems. The penetration pressurization lines and tanks have not been installed; however appropriate procedures for soil settlement will be followed. The list does not include the 48-inch diameter (48-OHBC-2) discussed in Enclosure 3 of our letter, Serial 16638, dated April 15, 1982.

The NRC Staff expressed a concern regarding the margins for future settlement at the wall penetration of pipeline 26-OHBC-15. Our investigations indicate that there is a 90° elbow fitting in this line immediately upon exiting the building. Any bending moment developed due to soils settlement will be transformed to an equal torque value. This load transformation causes the vertical deflection due to settlement to change to an angle of twist on the pipe at the penetration. This angle of twist has no effect on the annulus clearance of the wall penetration and therefore the only real clearance we need to assure is the seismic rattlespace (0.3693 inch). The margin we presently have is 0.6307 inches which is a factor of 1.7 times the conservative estimate of seismic rattlespace.

The NRC Geotechinical Branch requested information concerning soils and its relation to buried utilities. Enclosure 3 addresses the concerns expressed about the prediction of maximum future settlement for plant life (3.0 inches) and the isolated sand pocket near the diesel fuel tanks. A concern was also expressed about the soil properties used in estimating the soil forces required to deform condensate line (20-1HCD-169) into its present configuration. We have responded by seperately providing the Structural Mechanics Assoiciates calculations estimating the soil capacity at Midland.

We believe the information supplied satisfies the concerns the NRC Staff expressed during the recent April meeting.

J A Mooney
Executive Manager
Midland Project Office

For J W Cook

JWC/WJC/mkh

CC Atomic Safety and Licensing Appeal Board, w/o
CBechhoefer, ASLB, w/o
PChen, ETEC, w/a
FCherney, NRC, w/a
MMCherry, Esq, w/o
FPCowan, ASLB, w/o
RJCook, Midland Resident Inspector, w/o
RSDecker, ASLB, w/o
SGadler, w/o
JHarbour, ASLB, w/o
DSHood, NRC, w/a (2)
JDKane, NRC, w/a
FJKelley, Esq, w/o
RBLandsman, NRC Region III, w/a
WHMarshall, w/o
WDPaton, Esq, w/o
BStamiris, w/o

TABLE 1.0

Monitoring Station Ovality and Corresponding Strain

Station*	Measured Ovality (%)	Meridional Strain (%)	Future Allowable Strain (%)	No of Strain Gages
Line: 26-OHBC 15 Reference: Figure 1			Allowable Strain = .48%	
1	2.34	0.35	0.13	2
2	1.88	0.32	0.16	3
3	2.34	0.35	0.13	2
4	2.34	0.35	0.13	2
5	1.24	0.25	0.23	2
Line: 26-OHBC 16 Reference: Figure 2				
1	2.18	0.34	0.14	3
2	2.18	0.34	0.14	2
3	2.34	0.35	0.13	3
4	2.18	0.34	0.14	2
5	1.12	0.23	0.25	2
Line: 26-OHBC 53 Reference: Figure 3				
1	1.40	0.27	0.21	2
2	2.96	0.40	0.08	2
3	2.18	0.34	0.14	3
4	2.18	0.34	0.14	2
Line: 26-OHBC 54 Reference: Figure 4				
1	2.50	0.36	0.12	2
2	2.50	0.36	0.12	3
3	2.18	0.34	0.14	2
4	2.03	0.32	0.16	2
5	2.50	0.36	0.12	3
6	2.03	0.32	0.16	2
Line: 26-OHBC 55 Reference: Figure 5				
1	2.03	0.32	0.16	2
2	1.47	0.27	0.21	2
3	1.56	0.28	0.20	2
4	1.56	0.28	0.20	2

Station*	Measured Ovality (%)	Meridional Strain (%)	Future Allowable Strain (%)	No of Strain Gages
Line: 26-OHBC 56				
Reference: Figure 5				
1	1.09	0.22	0.26	2
2	1.87	0.31	0.17	2
3	0.90	0.21	0.27	2
4	2.49	0.36	0.12	2
Line: 26-OHBC 19				
Reference: Figure 6				
1	1.87	0.31	0.17	2
2	1.87	0.31	0.17	3
3	1.87	0.31	0.17	2
4	0.89	0.21	0.27	2
Line: 26-OHBC 20				
Reference: Figure 6				
1	1.87	0.31	0.17	2
2	1.87	0.31	0.17	2
3	1.87	0.31	0.17	3
4	1.79	0.30	0.18	2

*The station numbers are numbered from left to right from the given reference figures transmitted March 16, 1982.

BURIED SEISMIC CATEGORY I LINES AND TANKS

A. Service Water Lines

8"-1HBC-310
8"-2HBC-81
8"-1HBC-81
8"-2HBC-310
8"-1HBC-311
8"-2HBC-82
8"-1HBC-82
8"-2HBC-311
10"-0HBC-27
10"-0HBC-28
26"-0HBC-53
26"-0HBC-54
26"-0HBC-55
26"-0HBC-56
26"-0HBC-15
26"-0HBC-16
26"-0HBC-19
26"-0HBC-20
36"-0HBC-15
36"-0HBC-16
36"-0HBC-19
36"-0HBC-20

B. Diesel Fuel Oil Lines and Tanks

1-1/2"-1HBC-3
1-1/2"-1HBC-4
1-1/2"-2HBC-3
1-1/2"-2HBC-4
2"-1HBC-497
2"-1HBC-498
2"-2HBC-497
2"-2HBC-498
1T-77A
1T-77B
2T-77A
2T-77B

C. Borated Water Lines

18"-1HCB-1
18"-1HCB-2
18"-2HCB-1
18"-2HCB-2

D. Control Room Pressurization Lines and Tanks

4"-0DBC-1
1"-0CCC-1
0VT 68A
0VT 68B

E. Penetration Pressurization Lines and Tanks

1"-1CCB-45
1"-2CCB-45
1T-114
2T-114

4/26/82

SEE APERTURE CARDS

AVAILIBILITY ____ (PDR) ____ CF ____ HOLD ____

NUMBERS OF PAGES. 1

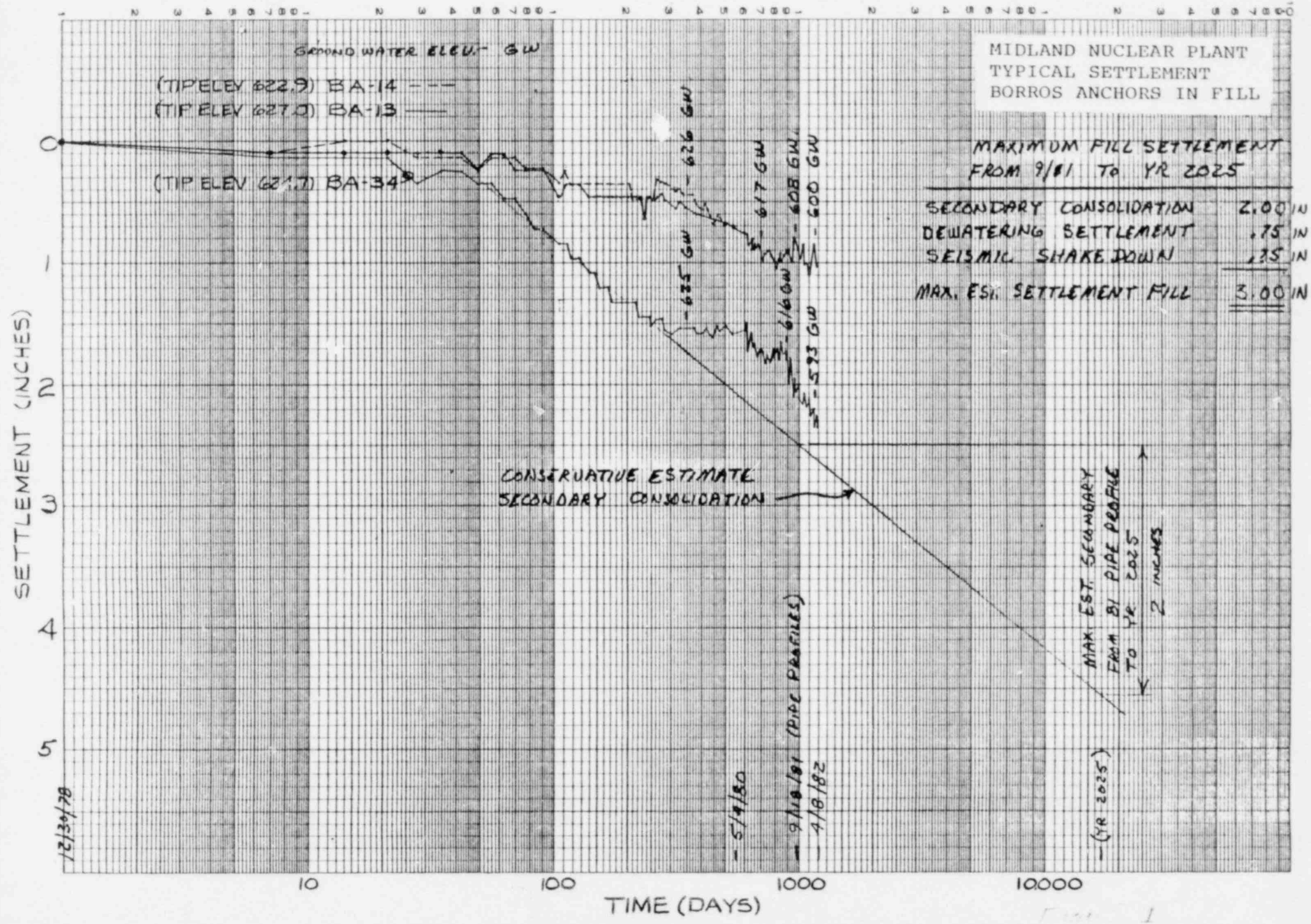
ENCLOSURE 3.0

ADDITIONAL GEOTECHNICAL INFORMATION

Prediction of Maximum Future Settlement For Buried Utilities

To predict the maximum future settlement for buried utilities, settlement monitoring within the fill has been utilized in our analysis. There are nine (9) locations in the vicinity of buried utilities where Borros anchors have been installed and have not been influenced by surcharge loadings. Settlement readings for anchors that have been established at a depth of 7 feet to 12 feet below the surface were used in the analysis, since these depths are representative of the depth of most buried utilities. Soils conditions at the locations of the Borros anchors is also representative of the variable soil conditions encountered throughout the fill.

Borros anchors BA-13, BA-14, and BA-34 were installed in December 1978 and have over three years of data. Settlement plots for these anchors are shown on Figure 1.0. Borros anchors BA-100 through BA-106 were installed in September 1979 and have over two years of data. Settlement data from anchors BA-100 through BA-106 project less future settlement then shown for BA-34. The log of time versus settlement plots projected for most of these anchors predict on the order a maximum total 2.0 to 2.5 inches of additional settlement to occur over the next 40 years of buried utility life. Settlement projections for BA-34 are considered to provide a conservative estimate of the future maximum settlement expected beneath any buried utilities in the site fill. A total maximum future settlement during plant life has been estimated not to exceed 3 inches and includes settlement due to dewatering and seismic shakedown.



MIDLAND NUCLEAR PLANT
TYPICAL SETTLEMENT
BORROS ANCHORS IN FILL

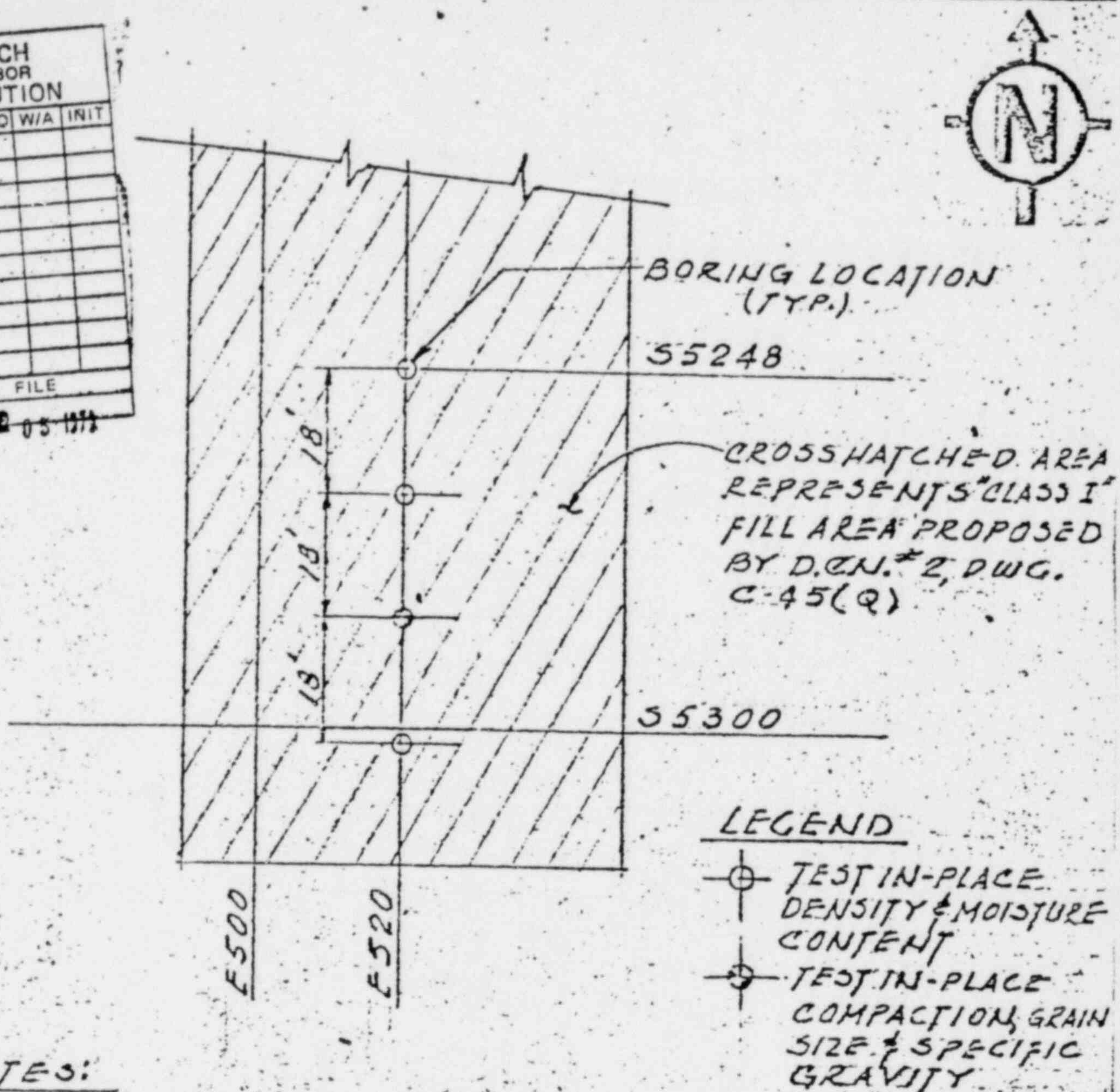
MAXIMUM FILL SETTLEMENT
FROM 9/81 TO YR 2025

SECONDARY CONSOLIDATION	2.00 IN
DEWATERING SETTLEMENT	.75 IN
SEISMIC SHAKEDOWN	.25 IN
MAX. EST. SETTLEMENT FILL	3.00 IN

DIESEL FUEL TANK SEISMIC STABILITY
RELATED TO LIQUEFACTION OF ISOLATED SAND POCKET

Figure 2.5-22H is a cross-section through the DOFT showing fill and natural soil conditions. The section includes 4 borings (B-1 through B-4) drilled in July 1977 before the excavation was made in the original plant fill to construct the tanks. The location plot and logs of these borings are also attached. It is seen from available information that the loose sand pocket in boring DF5 near elevation 600 is limited in extent and therefore considered confined by clay fill.

An analysis was made of the diesel fuel oil tanks assuming liquefaction does occur in a postulated thin layer of sand below the entire area of the tanks. Since the tanks are anchored down and have adequate resistance to flotation, any movement of the tanks under these postulated conditions would be resisted by the passive resistance of the fill surrounding the tanks. The safety factor against sliding of these tanks under these conditions was calculated to be at least 1.7. This analysis indicates that the tanks will be stable even if liquefaction of the loose sand pocket does occur. Lateral movement estimated under these conditions is less than 1/2 inch. The 1-1/2 to 2 inch diameter diesel fuel piping lines and tank connections have sufficient flexibility to accomodate this differential movement.



NOTES:

1- BORINGS SHALL BE MADE IN LOCATIONS SHOWN.
2- MATERIALS FROM BORINGS SHALL BE TESTED IN ACCORDANCE WITH SPEC. 7220-C-208
3- TESTS SHALL BE ADMINISTERED IN ACCORDANCE WITH THE QUALITY ASSURANCE PROGRAM SPEC. 7220-G-22

SB 19092

No.	DATE	REVISIONS	BY	CHK'D	GROUP LEAD	GROUP SUPV.	PROJ. ENGR.	CHIEF ENGR.
A	5-20-77	ISSUED FOR INFORMATION	LRC.	[illegible]	Rao	[illegible]	RLC	

SCALE	DESIGNED	DRAWN
ORIGIN	MIDLAND PLANT - UNITS 1 & 2 CONSUMERS POWER CO. EMERGENCY DIESEL FUEL TANK AREA - TEST BORING ARRANGEMENT	JOB No. 7220 DRAWING No. SK-C-541 REV. A

SERVICE CONTRACTS DIVISION
TEST BORING DEPARTMENT

Date JULY - 21 - 1977

Job No.

Job Address A.T. & T. MIDLAND, MICH.

Fixed Datum used is

Ground Surface this boring is

DEPTH From	DEPTH To	CLASSIFICATION Be Careful and Accurate	Sample Type	Sample No.	Depth	No. of 30" blows on Spoon 1st 6"	2nd 6"	3rd 6"	Recovery in.	Lost Water or Remarks
Grd. Surface	0'9"	GRAVEL FILL								
0'9"	4'6"	DENSE BROWN FINE TO	S.S.	1	2'6"	13	13	18		
		MEDIUM SILTY SAND	S.S.	2	5'0"	8	13	10		
4'6"	8'6"	LOOSE BROWN FINE SAND	S.S.	3	7'6"	5	4	3		
8'6"	11'0"	VERY LOOSE GRAY FINE	S.S.	4	10'0"	1	1	1		
		SILTY SAND TRACE OF ORGANIC								
11'0"	13'0"	MEDIUM GRAY CLAYEY SAND	S.S.	5	12'6"	5	7	3		
13'0"	18'0"	MEDIUM GRAY SANDY CLAY	S.S.	6	15'0"	2	2	2		
			S.S.	7	17'6"	3	3	4		
18'0"	29'0"	STIFF GRAY SANDY CLAY	S.S.	8	20'0"	4	4	5		
		SOME SMALL GRAVEL	S.S.	9	25'0"	4	6	7		
29'0"		VERY STIFF GRAY SILTY CLAY	S.S.	10	30'0"	5	7	9		
		SOME SMALL GRAVEL	S.S.	11	35'0"	5	8	11		
			S.S.	12	40'0"	5	8	11		
			S.S.	13	45'0"	7	9	12		
			S.S.	14	50'0"	5	8	10		
		WATER ENC. AT. 9'0"								

NOT BECHTEL

BECHTEL'S DONE 1st JUNE

Ground Surface to 8'6" ft. used 3 " casing.

Water level is 8'8" ft. below Ground surface 12 hrs. after completion.

Water level is ____ ft. below Ground surface ____ hrs. after completion.

Boring stopped by

Foreman HERSCHEL BOYD

Boring No. B-1

SB 13094

RAYMOND INTERNATIONAL INC.
SERVICE CONTRACTS DIVISION
TEST BORING DEPARTMENT

Date July - 22 - 1977 Job No. _____

Job Address 1 MIDLAND, MICH.

Fixed Datum used is _____

Ground Surface this boring is _____

DEPTH From	DEPTH To	CLASSIFICATION Be Careful and Accurate	Sample Type	Sample No.	Depth	No. of 30" blows on Spoon 1st 6"	2nd 6"	3rd 6"	Recovery in.	Lost Wa or Remar
Grd. Surface	0'9"	GRAVEL FILL								
0'9"	6'6"	MEDIUM BROWN FINE SILTY SAND	S.S.	1	2'6"	13	11	13		
			S.S.	2	5'6"	14	15	13		
6'6"	8'0"	LOOSE BROWN FINE TO MEDIUM SILTY SAND	S.S.	3	7'6"	4	4	4		
8'0"	11'6"	LOOSE BROWN & GRAY FINE SILTY SAND	S.S.	4	10'0"	1	1	5		
11'6"	16'0"	STIFF GRAY SANDY CLAY	S.S.	5	12'6"	5	5	5		
			S.S.	6	15'6"	4	6	12		
16'0"		VERY STIFF GRAY SILTY CLAY SOME SMALL GRAVEL	S.S.	7	17'6"	5	10	12		
			S.S.	8	20'0"	9	16	20		

GEOTECH
ANN ARBOR
DISTRIBUTION

DISC	CT	INFO	W/A	INIT
MGR				
ADMIN				
DRFT				
SOILS				
GEOL				
H&H				
ENVP				
Proj Mgr				
Proj Eng				

JOB FILE
REC'D AUG 05 1975

WATER ENC. AT 16'0"
4" AUGER

Ground Surface to _____ ft. used _____" casing.

Water level is 8'6" ft. below Ground surface 6 hrs. after completion. Foreman HOSEA BOYD

Water level is _____ ft. below Ground surface _____ hrs. after completion.

Boring stopped by _____ Boring No. B-2

SB 10095

SERVICE CONTRACTS DIVISION
TEST BORING DEPARTMENT

Date JULY - 22 - 1977 Job No. _____

Job Address MIDLAND, MICH.

Fixed Datum used is _____

Ground Surface this boring is _____

DEPTH From	DEPTH To	CLASSIFICATION Be Careful and Accurate	Sample Type	Sample No.	Depth	No. of 30" blows on Spoon 1st 6"	2nd 6"	3rd 6"	Recovery in.	Lost Water or Remark
Grd. Surface	2'0"	LOOSE BLACK SILTY SAND								
2'0"	6'0"	MEDIUM BROWN FINE TO	S.S.	1	2'6"	2	4	6		
		MEDIUM SILTY SAND	S.S.	2	5'0"	6	7	7		
6'0"	9'6"	LOOSE BROWN FINE SILTY SAND	S.S.	3	7'6"	2	2	1		
9'0"	12'0"	STIFF GRAY VERY SILTY CLAY	S.S.	4	10'0"	4	4	5		
		SOME SMALL GRAVEL	S.S.	5	12'6"	6	7	14		
12'0"		VERY STIFF GRAY VERY SILTY	S.S.	6	15'0"	8	15	22		
		SANDY CLAY SOME SMALL GRAVEL	S.S.	7	17'6"	8	12	14		
			S.S.	8	20'0"	7	9	11		

GEOTECH
ANN ARBOR
DISTRIBUTION

DISC	ACT	INFO	W/A	INIT
MGR				
ADMIN				
DRFT				
SOILS				
GEOL				
H&H				
EWP				
Proj Mgr				
Proj Eng				
JOB FILE				
REC'D				

WATER ENC. AT 6'9" 4" AUGER

Ground Surface to _____ ft. used _____ " casing.

Water level is 6'6" ft. below Ground surface 4 hrs. after completion.

Water level is _____ ft. below Ground surface _____ hrs. after completion.

Boring stopped by _____

Foreman HERSCHEL BOYD

Boring No. B-3

SB 19096

RAYMOND INTERNATIONAL INC.
SERVICE CONTRACTS DIVISION
TEST BORING DEPARTMENT

Date. July 27-1977 Job No. _____

Job Address MIDLAND, MICH.

Fixed Datum used is _____

Ground Surface this boring is _____

DEPTH From	DEPTH To	CLASSIFICATION Be Careful and Accurate	Sample Type	Sample No.	Depth	No. of 30" blows on Spoon 1st 6"	2nd 6"	3rd 6"	Recovery in.	Lost Wa or Remar
Grd. Surface	1'6"	MEDIUM BLACK SILTY SAND								
1'6"	6'0"	MEDIUM BROWN FINE SILTY	S.S.	1	2'6"	5	7	9		
		SAND	S.S.	2	5'0"	5	7	8		
6'0"	10'6"	LOOSE BROWN & GRAY FINE	SS	3	7'6"	3	1	1		
		SILTY SAND TRACE OF ORGANICS	SS	4	10'0"	2	2	5		
10'6"		STIFF GRAY SANDY CLAY	3-T	5	10'0" TO 13'0"				24"	
		SOME SMALL GRAVEL	S.S.	6	14'6"	3	4	4		
			3-T	7	16'6" TO 18'0"				11"	
			S.S.	8	25'0"	8	8	7		

GEOTECH
~~ANN ARBOR~~
DISTRIBUTION

DISC	ACT	INFO	W/A	INIT
MGR				
ADMIN				
DRFT				
SOILS				
~~GEOL~~				
H&H				
EWP				
Proj Mgr				
Proj Eng				
JOB	FILE			
REC'D	[illegible] 0 6 1977			

WATER ENC. AT 6'6"

Ground Surface to _____ ft. used _____ " casing.

Water level is 7'0" ft. below Ground surface 1/2 hrs. after completion.

Water level is _____ ft. below Ground surface _____ hrs. after completion.

Boring stopped by _____

Foreman Hassler Boyd

Boring No. B-4

SB 19097