20 Ex#7 i.d. (HOOD)

D Hood
PDR L 116-A

Gallagher

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

January 21, 1980

G. Fiorelli, Chief, Reactor Construction and Engineering Support Branch

D. W. Hayes, Chief, Engineering Support Section 1

E. J. Gallagher

MEETING WITH CONSUMERS POWER COMPANY ON JANUARY 16, 1980 REGARDING MIDLAND UNITS 1 AND 2 PLANT FILL

s held on January 16, 1980 with Consumers Power Company regarding the Midland plant fill settlement issue. The was to discuss the licensee's response to the supplemental f) questions 24 through 35 issues on November 19, 1979. the presentation materials distributed during the meeting.

observations were made during the meeting:

nificant safety issues regarding the suitability of the land foundation material remain unresolved, as has been situation since October 1978.

e transfer of lead responsibility from IE to NRR was made lovember 17, 1978, no progress has been made in the nical review of the outstanding plant fill safety issue.

e the Corps of Engineers has been contacted by NRR to ew the issues, in October 1979, no progress has been regarding a technical review.

the NRC order of December 6, 1979 to Consumers Power ny was issued, work has been permitted to continue o the wording of the order. That is, if a hearing was sted by the licensee the order would not be effective a date specified following a hearing. The licensee equested a hearing; therefore, the order is ineffective ork continues in the light of significant safety issues nsuitable material as foundation for the safety-related tures and components.

5. Consumers Power Company and Bechtel are proceeding with construction of remedial measures on the foundations of the plant without any review by the NRC staff and without any committal by NRR as to the feasibility or suitability of the proposed actions.

In view of the above, I believe that measures should be taken to preclude further construction of the remedial measures on the plant fill until a technical review of the suitability is complete.

G Fiorelli for
E. J. Gallagher
Reactor Inspector

Enclosure: As Stated

cc w/o encl:
J. G. Keppler
D. W. Hayes
R. C. Knop
T. E. Vandel
R. B. Landsman ✓

Consumers Ex #8 id.
10/8/80 (Head)

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

JAN 12 1979

DOCKET NOS. 50-329
50-330

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 & 2

SUBJECT: SUMMARY OF DECEMBER 4, 1978 MEETING ON STRUCTURAL SETTLEMENTS

On December 4, 1978, the NRC staff met in Midland, Michigan with Consumers Power Company (CPCO), Bechtel Associates, and consultants in geotechnical engineering to discuss excessive settlement of the Diesel Generator (DG) Building and pedestals, and settlement of other seismic Category I structures. These technical discussions followed a site tour on December 3, 1978 during which the NRC staff observed each of these structures. Attendees for the tour and technical discussions are listed in Enclosure 1. Enclosure 2 is the agenda used during the technical discussion.

1. Background

Pursuant to 10 CFR 50.55(e), CPCO notified Region III of the Office of Inspection and Enforcement (I&E) on September 7, 1978, that settlement of the Midland DG Building foundation and generator pedestals was greater than expected and that a soils boring program had been started to determine the cause and extent of the problem. An interim status report was provided I&E by CPCO's letter of September 29, 1978. I&E conducted inspections on this matter on October 24-27, 1978 and issued inspection report number 50-329/78-12; 50-330/78-12.

2. History

The Bechtel representative identified the Category I structures and the type of material supporting the structure:

a. Containment - Glacial Till

b. Borated Water Storage Tank - Plant Fill

c. Diesel Generator Building and Pedestal - Plant Fill

d. Auxiliary Building - Part Glacial Till & Part Plant Fill

e. Service Water Intake - Glacial Till (Completed portion only)
- Plant Fill (Small portion yet to be constructed)

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The settlement monitoring program began in June 1978; to date the measured settlements are as follows:

Containment - 1/4" to 5/8" over last 1-1/2 years

Auxiliary Building - Approximately 1/8" (central portion)

Service Water Pump House - 0 to 1/8"

Diesel Generator Building - 3 to 4" since footing was poured October 1977 and walls in Spring 1978.

The four electrical duct banks rising into the DG Building, and which extend downward into the glacial till, were cut loose to remove the settlement restriction on the north side of the DG Building. When the duct banks were cut loose, settlement on the order of 2" occurred on the north side of the DG Building at a rapid rate. The east wall exhibited rapid settlement (1/8" in one week), but the west wall showed very little subsequent settlement. This indicates that the east wall was being held up by the duct pedestal.

3. Soils Exploration

Bechtel discussed the soil exploration program, including the boring program and laboratory testing of the foundation materials. The conclusion that was made by Bechtel is that the material varies across the site in strength properties, i.e., unconfined compressive strength from 200 PSF to 4000 PSF and shear strength from 100 PSF to 2000 PSF. The soils classification ranged from Cl to Ml.

Bechtel also discussed possible causes based on input from a consultant, Dr. R. Peck. Some of these causes were:

(1) Variable quality of material used in the plant fill, however, the quality control records do not indicate the variation.

(2) Fill may have been placed on the dry side of optimum moisture, and then when the water table rose inundating the fill, the material may have become "soft."

(3) Initial fill may have been placed satisfactorily but after installing pipe trenches and duct banks, the fill may have been disturbed.

4. Consultants Perspective

Dr. R. B. Peck stated the following:

a. The compacted fill is comprised mainly of glacial till and was excavated from the cooling pond area.

b. Evidence exists from the Dutch cone curve that the looser and softer areas are limited to local zones or lenses.

c. Water content is higher than at the time the fill was placed. Settlement of the till has been occurring since original placement of fill, accelerated by increased moisture content resulting from filling of the discharge cooling pond. Soil settlement is occurring under its own weight and the added weight of the building is believed to be insignificant.

d. The DG Building would probably not have settled as much if the material had not been so wet (moisture content is high).

e. Bearing capacity is not a problem for the footings.

f. Short of removing all the fill above the hard glacial till, a "preload" program would be the best approach. The preload purpose would be to consolidate the fill materials.

g. The settlement with the preload would tend to be rapid (a few weeks to a few months).

h. The preload is a necessary first step even though other measures might be necessary.

i. The main unknown is what might happen to the rate of settlement as the water table rises and saturates the fill.

j. Preloading would occur in early 1979 and the sand used as the surcharge would be removed in mid-1979.

Mr. C. J. Dunnicliff of Goldberg, Zoino, Dunnicliff & Associates described the instrumentation program to monitor the settlement of the foundation material and structures during the preload. The purpose of the instrumentation is to determine if the surcharge is doing its job of consolidation and if it is causing any harm to the structures or utility lines under and around the building.

a. Instrumentation for the structure will include optical survey measurements as well as monitoring of cracks using electrical devices. Four locations for the electrical devices have been chosen; two on the exterior of the east wall of the DG Building and two on the west wall of bay number four in the DG Building. A mapping of cracks will be developed.

b. Foundation monitoring will include devices to measure settlement and pore water pressure. A total of 60 anchors will be installed (20 groups of 3 at different elevations). A total of 40 piezometers are to be installed to measure the pore water pressure.

The consultants indicated that 6" settlement would not be a surprise and that up to as much as 18" could occur. The preload will be made up of 15 to 20 feet of sand piled in and around the DG Building. No more than a 5-foot differential in the sand level between bays would be permitted.

The NRC questioned the effect of settlement and preloading on the condensate lines located under the DG Building. Fixed points for the piping, such as the Turbine Building wall, are also of interest for the potential of cantilever effects. Bechtel explained that the 20-inch condensate lines are encased in 24-inch lines surrounded by concrete and resting in well compacted sand. Instrumentation will be included to monitor the condensate lines. The possibility of cutting the lines loose at the DG Building and the Turbine Building is also being studied. The condensate lines have no safety-related function for the Midland design.

The NRC also expressed concern for the effect of settlement on the fuel oil lines under the building. CPCO stated that re-routing of lines can be readily accommodated if necessary. This matter is also under review.

The NRC Resident Inspector asked for a list of the equipment, with a discussion of the compacting capability and limitations of each, used for compacting the fill for the DG Building from elevation 618 to 628 feet. Bechtel will provide this information.

5. Program Status

Bechtel summarized the activities completed, in progress, and planned for the future:

a. Activities Completed

(1) Boring program

(2) Isolation of the electrical duct banks on the north side of the DG Building

b. Activities in Progress (or soon to be initiated)

(1) Foundation settlement monitoring program

(2) Preload instrumentation program

(3) Actual preload of the structure and foundation

(4) Filling the cooling pond to maximum elevation (Elevation 627)

(5) Complete construction of the rest of the DG Building structure

c. Activities Planned

(1) After removal of the surcharge, assure contact between footings and soil foundation material

(2) Verify utilities and structure integrity

6. Project Schedule

Bechtel presented the following project schedule information:

- Construction is 58% completed as of November 1978
- Engineering is 80% complete
- Structural concrete is 97% complete
- Fuel load target date is November 1980
- Earliest requirement for one diesel generator is January 1980
- Current completion date for one diesel generator is January 1980
- Latest date for one diesel generator is June 1980

Bechtel emphasized that the installed instrumentation will show when the preload surcharge may be removed and therefore the present schedule is somewhat tentative. Most settlement is predicted to occur rapidly as the area is being preloaded and frequent readings will be taken during this period and used as a basis for further projections. The rate of settlement will decrease thereafter and the total settlement is expected to be reached within a few months.

CPCO stated that if necessary, temporary diesels could be used during preoperational testing prior to fuel loading and that this matter is presently under study.

7. Response to Open Items in NRC Inspection Report

Bechtel addressed the open items included in NRC inspection report Nos. 50-329/78-12 and 50-330/78-12. CPCO stated that a written response would be sent to I&E Region III to resolve the conflict between the FSAR and site implementing procedures:

a. Conflict between FSAR Table 2.5-14 and Table 2.5-10 regarding the description of fill material and what was actually used in the random fill: Bechtel stated that this conflict was an oversight and that an FSAR amendment would be issued. The NRC staff stated that any such amendment should address both the previous and the adjusted entries such that the basis for the previous staff review is not obscured in the documentation.

b. Conflict between FSAR Table 2.5-21 and Bechtel Specification C-210 regarding number of passes for compaction: Bechtel stated that FSAR Table 2.5-21 is for the embankments for the cooling pond dikes.

c. FSAR Section 3.8.5.5 regarding expected settlement: Bechtel stated that 1/2-inch indicated in the FSAR was a mistake and that the FSAR would be amended to correct this mistake.

d. Conflict between FSAR Figure 2.5-47 and project drawing regarding foundation elevation: Bechtel stated the elevations in the FSAR was also a mistake and would be corrected.

e. Conflict in Bechtel Specification C-210 regarding compactive effort: Bechtel stated that Field Change Request C-302 dated 10/31/75 clarified this conflict and permitted the "Bechtel Modified Protector" using 20,000 ft-lbs compactive effort rather than the ASTM standard of 56,000 ft-lbs.

f. Conflict between Dames & Moore recommendation regarding lift thickness of 6 to 8 inches and the Bechtel specification permitting up to 12 inches: Bechtel stated that the greater depth permitted by their specification should not matter because of performance qualification tests. However, the NRC was then informed that the test qualifications performed were for Zone 1 clay only, and that no test qualifications on the random fill material using 12 inches was performed to qualify such lift thicknesses. Dr. Peck stated that the thicker the layer, the more differences in compaction through the thickness of the layer would occur.

g. Tolerance of ± 2% in moisture content permitted in Bechtel Specification C-210: Bechtel stated that this tolerance is in line with industry practice.

Dr. Peck was asked his view on this ± 2% tolerance. He stated that the important question is "± 2% of what material." Since the material used in the fill was variable, the ± 2% tolerance could cause a problem if the material is not consistent.

h. Cracks in the building structure: Bechtel stated that all cracks greater than the ACI 318-71 limit would be identified and repaired after the preload program.

i. FSAR question 362.2: Bechtel stated that the answer had been sent to NRC via FSAR revision 15 in November 1978.

CPCO stated that the reply to the inspection report is in process, and that the reply will include copies of all data, slides, and drawings presented during this meeting.

In concluding remarks, CPCO stated its intent to proceed with the preloading program as described during the meeting.

In its closing comments, the NRC staff stated that the proposed solution is at the risk of the applicant and that NRC intends to review and evaluate this matter in accordance with the original compaction requirements as set forth in the commitments in the PSAR. The staff also stated that while attention to remedial action is important, determination of the exact cause is also quite important for verifying the adequacy of the remedial action, assessing the extent of the matter relative to other structures, and in precluding repetition of such matters in the future.

Darl Hood

Darl Hood, Project Manager
Light Water Reactors Branch 4
Division of Project Management

Enclosures:
As stated

Consumers Power Company

JAN 12 1979

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ENCLOSURE 1

JAN 12 1979

ATTENDEES DECEMBER 4, 1978 MEETING

P. A. Martinez, Bechtel
Karl Wiedner, Bechtel
* S. S. Afifi, Bechtel
R. B. Peck, Bechtel Consultant
* W. R. Ferris, Bechtel
M. O. Rothwell, Bechtel
* D. B. Miller, CPCO - Project
* J. P. Betts, Bechtel
W. L. Barclay, Bechtel
* A. J. Boos, Bechtel
G. L. Richardson, Bechtel
* D. E. Horn, CPCO - QA
W. R. Bird, CPCO-QA
* R. M. Wheeler, CPCO - PMO
* C. A. Hunt, CPCO - Engineering Services
D. E. Sibbald, CPCO Project
John Dunnicliff, Bechtel Consultant
* Austin Marshall, Bechtel - Geotech
* Y. K. Lin, Bechtel - Geotech
* B. C. McConnel, Gechtel - Geotech
* B. Dhar, Bechtel
* N. Swanberg, Bechtel
* Darl Hood, NRC LPM
* Gene Gallagher, NRC Region III (I&E)
* Daniel Gillen, NRC/NRC Geosciences
* Lyman Hiller, NRC/NRR Geosciences
* Ronald Cook, NRC Resident Inspector

*Present during both the 12/3/78 site tour and the 12/4/78 meeting.

Enclosure 2

SUBJECT: CPCo Midland Plant Units 1 & 2
Diesel Generator Building

JAN 12 1979

Meeting with NRC at Midland

DATE: December 4, 1978

AGENDA

I. Introduction by CPCo

II. History by Bechtel (N. Swanberg)

a. Plant description
b. Settlement monitoring program
c. Brief history of site fill placement
d. Settlement of Category 1 structure
e. Settlement of diesel generator building and pedestals
f. Review settlement data and drawings (SK-C-620/623)
g. Consultants

III. Soil Exploration by Bechtel (S. Afifi)

a. Soil borings
b. Dutch cone penetrations
c. Laboratory tests
d. Possible causes

IV. Consultant's Recommendation by Dr. R.B. Peck and C.J. Dunnicliff

a. Preload
b. Instrumentation

V. Status report by Bechtel (B.C. McConnell)

a. Activities completed
b. Activities in progress
c. Activities planned for future
   1) Corrective action
   2) FSAR conformance

VI. Schedule by Bechtel (P. Martinez)

a. Overall project
b. Impact on project schedule
c. Schedule for remedial measures

VII. Responses to open items in NRC Inspector's report dated 11/17/78 by Bechtel (B. Dhar)

JAN 12 1979

a. Responses to Gallaghar's concerns:
   1) Conflict between FSAR Table 2.5-14 and Table 2.5-10 regarding fill material description
   2) Conflict between FSAR Table 2.5-21 and Specification C-210 regarding required number of passes for compaction
   3) FSAR Section 3.8.5.5 - expected settlement
   4) Conflict between FSAR Figure 2.5-47 and project drawing regarding foundation elevation
   5) Conflict in Specification C-210 regarding compactive effort in test method
   6) Conflict between consultant's recommendation and Specification C-210 regarding lift thickness
   7) $\pm$ 2% tolerance in moisture content permitted in Specification C-210
   8) Cracks in the building structure

b. FSAR Question 362.2 (Section 2.5.4.5.1)

VIII. Closing Comments by CPCo

Consumers Ex 91d
10/3/80 (Herd)

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cc: JWC
GSK
TCC
DMB
BWM
WRB
MGK
Doc Contr

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

APR 8 1980

MAR 31 1980

Docket Nos.: 50-329/330

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 & 2

SUBJECT: SUMMARY OF FEBRUARY 27 & 28, 1980 MEETING AND SITE TOUR WITH CONSULTANTS TO REVIEW SOIL SETTLEMENT

On February 27 and 28, 1980, the NRC staff and three organizations recently acquired to support the staff safety review of geotechnical and interfacing matters, met with Consumers Power Company (the applicant), Bechtel and Bechtel consultants at the site for Midland Plant, Units 1 & 2. The three organizations supporting the staff review are the U. S. Army Corps of Engineers, Energy Technology Engineering Center, and U. S. Naval Surface Weapons Center. The purpose of the visit was to review and observe site backfill deficiencies and effects. This was the initial visit for the staff's consultants and the meeting was held to assist these consultants with their review of existing documentation on the background, remedial work and present status of this matter. Meeting attendees are listed in Enclosure 1.

The information reviewed at this meeting is contained in Amendment 72 to the Midland FSAR, December 19, 1979, for which referenced material is forwarded in two volumes by the applicant's letter of February 11, 1980. One of the volumes entitled "10 CFR 50.55(e), Interim Reports, Settlement of Diesel Generator Foundations and Building," consists of the 10 CFR 50.55(e) reports sent by the applicant to the staff's Office of Inspection and Enforcement from November 7, 1978 through September 5, 1979. The other volume, entitled "Responses to NRC Requests Regarding Plant Fill," consists of the applicant's 10 CFR 50.54(f) responses to the Office of Nuclear Reactor Regulation submitted April 24, 1979 through November 13, 1979. These documents represent the applicant's reports upon which the staff's order of December 6, 1979 requiring modification of the construction permits is based. The meeting also included a preview of information to be contained in Revision 5 to the applicant's responses in the latter volume intended for submittal about the end of February, 1980. Revision 5 will include responses to the staff's supplemental requests of November 19, 1979. Only information not contained in these documents is included in this meeting summary.

In opening remarks, Mr. G. Keeley announced that Consumers Power Company has elected to defer all remedial work on inadequately supported structures until acceptance of the proposed work is received from the staff. This action is

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voluntary on the applicant's part since the effective date for the staff's December 6, 1979 order is to be established by the Hearing Board pursuant to 10 CFR 2.204. The basis for this decision was said to be to preclude potential loss of revenue associated with expenditures for which staff approval has not been granted. The staff observed that this was a prudent decision, particularly in view of the significant slip in construction completion projected by Bechtel and currently under review by the applicant and due to other causes, principally the TMI-2 accident.

Presentations were also given by Bechtel consultants. Mr. C. H. Gould described the procedure for placement of caissons beneath the electrical penetration area (i.e., wing walls) of the Auxiliary Building and beneath the Feedwater Isolation Valve Pit area. Mr. M. T. Davisson described the procedure for placement of piles to support the northern portion of the Service Water Building. Dr. A. J. Hendron, Jr. reviewed the preloading program completed for the Diesel Generator Building and discussed why the preload option was elected in lieu of other possible corrective alternatives. Dr. R. B. Peck summarized the recommendations of the Bechtel consultants and emphasized that the preloading option is considered to eliminate the need for any further testing or measurements as a basis for establishing confidence for future settlement potential of the Diesel Generator Building. A summary of these discussions by the Bechtel consultants will be submitted as an amendment to the FSAR.

During the meeting, references were made to certain information and reports which have not been made available to the NRR staff, although some of these have been examined by I&E through the audit mechanism. Examples include:

1. Some of the figures listed in the drawing summary for the interim reports to MCAR #24 which are not included with the compilation of reports forwarded by the applicant's letter of February 11, 1980, even after noted figure replacements and redundancy are taken into account.

2. Installation details of each piezometer used to monitor pore water pressures during the preload program (e.g., type and actual elevations of installed piezometers, backfill materials and zone thickness).

3. Reports, meeting summaries, or other written communications with or by consultants recommending or supporting remedial measures for structures and utilities located upon or in questionable soils.

4. Reports of the evaluation (e.g., bases, procedure, execution and results)of the initial qualification and subsequent requalification of compaction equipment.

5. The report "Tank Farm Investigation; Midland Units 1 & 2," issued October, 1979.

The staff noted that such documents as above are needed by its consultants for their independent assessment of the adequacy of the proposed remedial measures and requested that these be made publicly available. The applicant indicated a reluctance to this end, and noted that these were available through the I&E audit mechanism. The staff will issue a formal request for these documents. The staff also noted that the boring logs provided in Appendix 2A of the FSAR did not reflect those borings associated with piezometer installation; the applicant replied that these would be added.

Site tours were provided in groups based upon the following engineering disciplines: (1) Geotechnical, (2) Structural, (3) Mechanical, and (4) Hydrologic.

During the tour the Corps noted that except for the use of temporary blocks, the service water pipe would otherwise be in direct contact with the base of the penetration through the northern wall of the Service Water Building. It is postulated that this results from the more rapid settlement of the buried pipe relative to the building's cantilevered settlement. The Corps emphasized that special attention should be given this area to avoid stressing the pipe at the penetration, particularly during pile driving and after attachment of the piles to the structure.

The staff noted that the presentation by Mr. C. H. Gould included the specification of some quantitative criteria to be applied during the remedial action for the Auxiliary Building. The staff asked if similar criteria were specified by the other Bechtel consultants, but was advised that these other criteria were more of a qualitative, subjective nature.

The staff also requested the applicant to submit a description of the services to be performed by consultants R. B. Peck, A. J. Hendron, Jr., C. H. Gould and M. T. Davisson through the completion of construction on the remaining remedial fixes. This description should identify the extent of continued involvement of the consultants in overseeing construction operations and in evaluating the effectiveness of completed fixes for which they have provided major design input.

Darl S. Hood, Project Manager
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Enclosures:
1. Attendees
2. Agenda

cc w/enclosures:
See next page.

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ENCLOSURE 1

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Julius Rotc
Jim Wanzeck
Karl Wiedner
John Rutgers
Lynn Curtis
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Consultants

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A. J. Hendron, Jr.
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J. Kane
A. Cappucci
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J. Simpson

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R. Erickson

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P. Huang
J. Matra

ENCLOSURE 2

AGENDA FOR

MEETING WITH NRC ON MIDLAND PLANT FILL STATUS AND RESOLUTION

February 27 & 28, 1980

Midland Site

1.0	INTRODUCTION	G. Keeley
2.0	PRESENT STATUS OF SITE INVESTIGATIONS	T. Cooke
	2.1 Meetings with Consultants and Options Discussed (Historical)	
	2.2 Investigative Program	
	A. Boring Program B. Test Pits C. Crack Monitoring and Strain Gauges D. Utilities	
	2.3 Settlement	
	A. Area Noted B. Preload C. Instrumentation	
3.0	WORK ACTIVITY UPDATE	J. Wanzeck
	3.1 Summary of work activities and settlement surveys for all Category I structures and facilities founded partially or totally on fill	
4.0	REMEDIAL WORK IN PROGRESS OR PLANNED (Q4, 12, 27, 31, 33 & 35)	S. Afifi
	4.1 Diesel Generator Structures 4.2 Service Water Pump Structures 4.3 Tank Farm 4.4 Diesel Oil Tanks 4.5 Underground Facilities 4.6 Auxiliary Building and FW Isolation Valve Pits 4.7 Liquefaction Potential	
5.0	EVALUATION OF PIPING (Q16, 17, 18, 19 & 20)	D. Riat
6.0	DEWATERING (Q24)	B. Paris
7.0	ANALYTICAL INVESTIGATION	B. Dhar
	7.1 Structural Investigation (Q14, 26, 28, 29, 30 & 34) 7.2 Seismic Analysis (Q25) 7.3 Structural Adequacy with Respect to PSAR, FSAR, etc.	
8.0	SITE TOUR	All
9.0	CONSULTANTS SUMMARY	Peck/Hendron/ Gould/Davisson
.0	DISCUSSION	All

Consumers Ex. 10 rd.
10/3/80 (Hood)

B

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

December 7, 1979

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In the Matter of
CONSUMERS POWER COMPANY
(Midland Plant, Units 1 and 2)
Docket Nos. 50-329 and 50-330
(Operating Licenses Proceeding)

Gentlemen:

As you are aware, certain contentions admitted in this proceeding concern excessive settling of the diesel generator building. The NRC Staff, pursuant to 10 CFR 50.54(f), has been requesting detailed information concerning the matter from the Applicant, Consumers Power Company. The NRC Staff has concluded that the information supplied to date provides insufficient justification of acceptance criteria which should be applied to determine whether Consumers' proposed remedial actions are sufficient. Accordingly, the director of the Office of Inspection and Enforcement and the director of the Office of Nuclear Reactor Regulation have jointly issued the enclosed "Order Modifying Construction Permits". Attached to the Order are two notices of violation which describe items of noncompliance also related to the soil settlement matter.

Sincerely,

William J. Olmstead
Counsel for NRC Staff

Enclosure as stated

cc (w/ encl.):
Frank J. Kelley
Myron M. Cherry, Esq.
Ms. Mary Sinclair
Michael I. Miller, Esq.
Atomic Safety & Licensing Board Panel
Atomic Safety & Licensing Appeal Panel
Docketing and Service Section
Judd L. Bacon, Esq.
Mr. Steve Gadler
Wendell H. Marshall
P.L. Davis, Esq.

9912140100

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

December 6, 1979

Docket Nos. 50-329
50-330

Consumers Power Company
ATTN: Mr. Stephen H. Howell
Vice President
1945 West Parnall Road
Jackson, MI 49201

Gentlemen:

This letter transmits to you an Order Modifying Construction Permits No. CPPR-81 and No. CPPR-82. This action is being taken as a result of findings by inspectors from Region III, Office of Inspection and Enforcement made during the period of October 1978 to January 1979, and the conclusions of the NRC staff after reviewing responses to the 10 CFR 50.54(f) request of March 21, 1979, regarding the proposed remedial work under and around safety-related structures and systems at the site, some of which is currently underway. The Order pertains to the problems associated with the soil foundation materials at the site.

As part of the Order there are two Notices of Violation. The first Notice of Violation is Appendix A which contains information concerning four infractions with several examples, all of which relate to the soil foundation problems. The second Notice of Violation, Appendix B, contains information concerning an item of noncompliance which was determined to be a material false statement. Actions that Consumers Power Company may take as a result of this Order are described in the Order.

Sincerely,

Edson G. Case
Acting Director
Office of Nuclear Reactor
Regulation

Sincerely,

Victor Stello, Jr.
Director
Office of Inspection
and Enforcement

Enclosures:
1. Order Modifying Construction Permits, CPPR-81 and CPPR-82
2. Appendix A
3. Appendix B

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

7912200642

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
CONSUMERS POWER COMPANY	)	Docket No. 50-329
(Midland Nuclear Power Plant,	)	50-330
Units 1 and 2)	)	

ORDER MODIFYING CONSTRUCTION PERMITS

I

The Consumers Power Company (the Licensee) is a holder of Construction Permits No. CPPR-81 and No. CPPR-82 which authorize the construction of two pressurized water reactors in Midland, Michigan. The construction permits expire on October 1, 1981 and October 1, 1982, for Unit 2 and Unit 1 respectively.

II

On August 22, 1978, the Licensee informed the NRC Resident Inspector at the Midland site that unusual settlement of the Diesel Generator Building had occurred. The Licensee reported the matter under 10 CFR 50.55(e) of the Commission's regulations by telephone on September 7, 1978. This notification was followed by a series of interim reports dated September 29, 1978, November 7, 1978, December 21, 1978, January 5, 1979, February 23, 1979, April 3, 1979, June 25, 1979, August 10, 1979, September 5, 1979, and November 2, 1979.

Following the September 1978 notification, inspectors from the Region III, Office of Inspection and Enforcement, conducted an investigation over the period of October 1978 through January 1979. This investigation revealed a breakdown in quality assurance related to soil construction activities under and around safety-related structures and systems in that (1) certain design and construction specifications related to foundation-type material properties

and compaction requirements were not followed; (2) there was a lack of clear direction and support between the contractor's engineering office and construction site as well as within the contractor's engineering office; (3) there was a lack of control and supervision of plant fill placement activities which contributed to inadequate compaction of foundation material; (4) corrective action regarding noncomformances related to plant fill was insufficient or inadequate as evidence by repeated deviations from specification requirements; and (5) the FSAR contains inconsistent, incorrect, and unsupported statements with respect to foundation type, soil properties and settlement values. The details of these findings are described in the inspection reports 50-329/78-12, 50-330/78-12 (November 14, 1978) and 50-329/78-20, 50-330/78-20 (March 19, 1979) which were sent to the Licensee on November 17, 1978 and March 22, 1979 respectively.

The items of noncompliance resulting from the NRC investigation are described in Appendix A to this Order. In addition, as described in Appendix B to this Order, a material false statement was made in the FSAR in that the FSAR falsely stated that "All fill and backfill were placed according to Table 2.5-9." This statement is material in that this portion of the FSAR would have been found unacceptable without further Staff analysis and questions if the Staff had known that Category I structures had been placed in fact on random fill rather than controlled compacted cohesive fill as stated in the FSAR.

As a result of questions raised during the NRC investigation of the Diesel Generator Building settlement, additional information was necessary to evaluate

the impact on plant safety caused by soil conditions under and around safety-related structures and systems in and on plant fill, and the Licensee's related quality assurance program. On March 21, 1979, the Director, Office of Nuclear Reactor Regulation, formally requested under 10 CFR 50.54(f) of the Commission's regulations information concerning these matters to determine whether action should be taken to modify, suspend or revoke the construction permit. Additional information was requested by the Staff in letters dated September 11, 1979 and November 19, 1979. The Licensee responded to these letters, under oath, in letters dated April 24, 1979, May 31, 1979, July 9, 1979, August 10, 1979, September 13, 1979, and November 13, 1979. The Licensee has not yet responded to the November 19, 1979 requests.

Several of the Staff's requests were directed to the determination and justification of acceptance criteria to be applied to various remedial measures taken and proposed by the licensee. Such criteria, coupled with the details of the remedial action, are necessary for the Staff to evaluate the technical adequacy and proper implementation of the proposed action. The information provided by the licensee fails to provide such criteria. Therefore, based on a review of the information provided by the Licensee in response to the Staff questions, the Staff cannot conclude at this time that the safety issues associated with remedial action taken or planned to be taken by the Licensee to correct the soil deficiencies will be resolved. Without the resolution of these issues the Staff does not have reasonable assurance that the affected safety-related portions of the Midland facility will be constructed and operated without undue risk to the health and safety of the public.

III

Under the Atomic Energy Act of 1954, as amended, and the Commission's regulations, activities authorized by construction permits or portions thereof may be suspended should the Commission find information which would warrant the Commission to refuse to grant a construction permit on an original application. We have concluded that the quality assurance deficiencies involving the settlement of the Diesel Generator Building and soil activities at the Midland site, the false statement in the FSAR, and the unresolved safety issue concerning the adequacy of the remedial action to correct the deficiencies in the soil construction under and around safety-related structures and systems are adequate bases to refuse to grant a construction permit and that, therefore, suspension of certain activities under Construction Permits No. CPPR-81 and No. CPPR-82 is warranted until the related safety issues are resolved.

IV

Accordingly, pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 CFR Parts 2 and 50, IT IS HEREBY ORDERED THAT, subject to Part V of this Order, Construction Permits No. CPPR-81 and No. CPPR-82 be modified as follows:

(1) Pending the submission of an amendment to the application seeking approval of the remedial actions associated with the soil activities for safety-related structures and systems founded in and on plant fill material and the issuance of an amendment to Construction Permits No. CPPR-81 and

and No. CPPR-82 authorizing the remedial action, the following activities are prohibited:

(a) any placing, compacting, or excavating soil materials under or around safety related structures and systems;

(b) physical implementation of remedial action for correction of soil-related problems under and around these structures and systems, including but not limited to:

(i) dewatering systems

(ii) underpinning of service water building

(iii) removal and replacement of fill beneath the feedwater isolation valve pit area

(iv) placing caissons at the ends of the auxiliary building electrical penetration areas

(v) compaction and loading activities;

(c) construction work in soil materials under or around safety-related structures and systems such as field installation of conduits and piping.

(2) Paragraph (1) above shall not apply to any exploring, sampling, or testing of soil samples associated with determining actual soil properties on site which has the approval of the Director of Region III, Office of Inspection and Enforcement.

V

The Licensee or any person whose interest is affected by this Order may within 20 days of the date of this Order request a hearing with respect to all or any part of this Order. In the event a hearing is requested, the issues to be considered will be:

(1) whether the facts set forth in Part II of this Order are correct; and

(2) whether this Order should be sustained.

This Order will become effective on the expiration of the period during which a hearing may be requested, or in the event a hearing is requested, on the date specified in an Order made following the hearing.

FOR THE NUCLEAR REGULATORY COMMISSION

Edson G. Case, Acting Director
Office of Nuclear Reactor
Regulation

Victor Stello, Jr., Director
Office of Inspection
and Enforcement

Attachments:
1. Appendix A
2. Appendix B

Dated at Bethesda, Maryland,
this 6th day of December, 1979.

DEC 6 1979

Appendix A

NOTICE OF VIOLATION

Consumers Power Company

Docket No. 50-329
Docket No. 50-330

This refers to the investigation conducted by the Office of Inspection and Enforcement at the Midland Nuclear Power Plant, Units 1 and 2, Midland, Michigan, at your offices in Jackson, Michigan, and at Bechtel Corporation, Ann Arbor, Michigan of activities authorized by NRC License No. CPPR-81 and No. CPPR-82.

Based on the results of the investigation conducted during the period December 11, 1978 through January 25, 1979, it appears that certain of your activities were not conducted in full compliance with NRC requirements as noted below. These items are infractions.

1. 10 CFR 50, Appendix B, Criterion III requires, in part, that measures shall be established and executed to assure that regulatory requirements and the design basis as specified in the license application for structures are correctly translated into specifications, drawings, procedures and instructions. Also, it provides that measures shall be established for the identification and control of design interfaces and for coordination among participating design organizations.

   CPCo Topical Report CPC-1-A, Policy No. 3, Section 3.4 states, in part, "the assigned lead design group or organization (i.e., the NSSS supplier, A&E supplier, or CPCo) assure that designs and materials are suitable and that they comply with design criteria and regulatory requirements."

   CPCo is committed to ANSI N45.2 (1971), Section 4.1, which states, in part, "measures shall be established and documented to assure that the applicable specified design requirements, such as a design basis, regulatory requirements . . . are correctly translated into specifications, drawings, procedures, or instructions."

   Contrary to the above, measures did not assure that design bases were included in drawings and specifications nor did they provide for the identification and control of design interfaces. As a result, inconsistencies were identified in the license application and in other design basis documents. Specific examples are set forth below:

   a. The FSAR is internally inconsistent in that FSAR Figure 2.5-4B indicates settlement of the Diesel Generator Building to be on the order of 3" while FSAR Section 3.8.5.5 (structural acceptance criteria) indicates settlements on shallow spread footings

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founded on compacted fill to be on the order of 1/2" or less. The Diesel Generator Building is supported by a continuous shallow spread footing.

b. The design settlement calculations for the diesel generator and borated water storage tanks were performed on the assumption of uniform mat foundations while these foundations were designed and constructed as spread footing foundations.

c. The settlement calculations for the Diesel Generator Building indicated a load intensity of 3000 PSF while the FSAR, Figure 2.5-47, shows a load intensity of 4000 PSF, as actually constructed.

d. The settlement calculations for the Diesel Generator Building were based on an index of compressibility of the plant fill between elevations 603 and 634 of 0.001. These settlement values were shown in FSAR Figure 2.5-48. However, FSAR, Table 2.5-16, indicates an index of compressibility of the same plant fill to be 0.003.

e. PSAR, Amendment 3, indicated that if filling and backfilling operations are discontinued during periods of cold weather, all frozen soil would be removed or recompacted prior to the resumption of operations. Bechtel specification C-210 does not specifically include instructions for removal of frozen/ thawed compacted material upon resumption of work after winter periods.

f. PSAR Amendment 3 indicates that cohesionless soil (sand) would be compacted to 85% relative density according to ASTM D-2049. However, Bechtel specification C-210, Section 13.7.2 required cohesionless soil to be compacted to not less than 80% relative density.

2. 10 CFR 50, Appendix B, Criterion V requires, in part, that activities affecting quality shall be prescribed and accomplished in accordance with documented instructions, procedures or drawings.

CPCo Topical Report CPC-1-A, Policy No. 5, Section 1.0 states, in part, that, "Instructions for controlling and performing activities affecting quality of equipment or operation during design, construction and operations phase of the nuclear power plant such as procurement manufacturing, construction, installation, inspection, testing . . . are documented in instructions, procedures, specifications . . . these documents provide qualitative and quanititive acceptance criteria for determining important activities have been satisfactorily accomplished."

CPCo is commited to ANSI N45.2 (1971), Section 6 which states, in part, "activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings."

a. Contrary to the above, instructions provided to field construction for substituting lean concrete for Zone 2 material did not address the differing foundation properties which would result in differential settlement of the Diesel Generator Building.

b. Also, contrary to the above, certain activities were not accomplished according to instructions and procedures, in that:

(1) The compaction criteria used for fill material was 20,000 ft-lbs (Bechtel modified proctor test) rather than a compactive energy of 56,000 ft-lbs as specified in Bechtel Specification C-210, Section 13.7.

(2) Soils activities were not accomplished under the continuous supervision of a qualified soils engineer who would perform in-place density tests in the compacted fill to verify that all materials are placed and compacted in accordance with specification driteria. This is required by Bechtel Specification C-501 as well as PSAR, Amendment 3 (Dames and Moore Report, page 16).

3. 10 CFR 50, Appendix B, Criterion X requires, in part, that a program for inspection of activities affecting quality shall be established and executed to verify conformance with the documented instructions, procedures and drawings for accomplishing the activity.

CPCo Topical Report CPC 1-A, Policy No. 10, Section 3.1, states, in part, that "work activities are accomplished according to approved procedures or instructions which include inspection hold points beyond which work does not proceed until the inspection is complete or written consent for bypassing the inspection has been received from the organization authorized to perform the inspections."

CPCo is commited to ANSI N45.2 (1971), which states, in part, "A program for inspection of activities affecting quality shall be established and executed by or for the organization performing the activity to verify conformance to the documented instructions, procedures, and drawings for accomplishing the activity."

Contrary to the above, Quality Control Instruction C-1.02, the program for inspection of compacted backfill issued on October 18, 1976, did not provide for inspection hold points to verify that soil work was satisfactorily accomplished according to documented instructions.

4. 10 CFR 50, Appendix B, Criterion XVI requires, in part, that measures shall be established to assure that conditions adverse to quality such as failures, deficiencies, defective material and nonconformances are promptly identified and corrected. In case of significant conditions adverse to quality, measures shall assure that corrective action is taken to preclude repetition.

CPCo Topical Report CPC-1-A, Policy No. 16, Section 1.0 states, in part, "corrective action is that action taken to correct and preclude recurrence of significant conditions adverse to the quality of items or operations. Corrective action includes an evaluation of the conditions that led to a nonconformance, the disposition of the nonconformance and completion of the actions necessary to prevent or reduce the possibility of recurrence."

Contrary to the above, measures did not assure that soils conditions of adverse quality were promptly corrected to preclude repetition. For example:

a. As of January 25, 1979, moisture control in fill material had not been established nor adequate direction given to implement this specification requirement. The finding that the field was not performing moisture control tests as required by specification C-210 was identified in Quality Action Request SD-40, dated July 22, 1977.

b. Corrective action regarding nonconformance reports related to plant fill was insufficient or inadequate to preclude repetition as evidenced by repeated deviations from specification requirements. For example, nonconformance reports No. CPCo QF-29, QF-52, QF-68, QF-147, QF-174, QF-172 and QF-199 contain numberous examples of repeated nonconformances in the same areas of plant fill construction.

DEC 6 1979

APPENDIX B

NOTICE OF VIOLATION

Consumers Power Company

Docket No. 50-329
Docket No. 50-330

This refers to the investigation conducted by the Office of Inspection and Enforcement at the Midland Nuclear Power Plant, Units 1 and 2, Midland, Michigan, at your offices in Jackson, Michigan, and at Bechtel Corporation, Ann Arbor, Michigan, of activities authorized by NRC License No. CPPR-81 and No. CPPR-82.

During this investigation conducted on various dates between December 11, 1978 and January 25, 1979, the following apparent item of noncompliance was identified.

The Midland Final Safety Analysis Report (FSAR) contains the following:

Section 2.5.4.5.3, Fill, states: "All fill and backfill were placed according to Table 2.5-9."

Table 2.5-9, Minimum Compaction Criteria, contains the following:

"Function	Zone Designation (1)	Soil Type	Compaction Criteria	
			Degree	ASTM Designation
Support of structures	"2"	Clay + Sand	95%	ASTM D 1557-66T (modified)(2)

(1) For zone designation see Table 2.5-10.
(2) The method was modified to get 20,000 foot-pounds of compactive energy per cubic foot of soil."

Section 2.5.4.10.1, Bearing Capacity, states: "Table 2.5-14 shows the contact stress beneath footings subject to static and static plus dynamic loadings, the foundation elevation, and the type of supporting medium for various plant structures."

Table 2.5-14, Summary of Contact Stresses and Ultimate Bearing Capacity for Mat Foundations Supporting Seismic Category I and II Structures, contains, in part; the following:

"Unit	Supporting Soils
Diesel Generator Building	Controlled compacted cohesive fill."

This information is false, in that materials other than controlled compacted cohesive fill were used to support the diesel generator building and information presented concerning the supporting soils influenced the staff review of the FSAR.

Consumers Ex 11 i.d.
10/5/80 (11022d)

B

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

AUG 9 1979

MEMORANDUM FOR: File

FROM: Darl Hood, Project Manager, Light Water Reactors Branch No. 4, DPM

SUBJECT: NRR COMMENTS REGARDING ENFORCEMENT ACTION ON MIDLAND SOIL DEFICIENCIES

An April 3, 1979 memorandum from J. Keppler to H. Thornburg identified five statements from the FSAR regarding the backfill deficiency at the Midland site which I&E considered to be false, and requested a determination as to the materiality of these statements. Following receipt of this memorandum by NRR on May 7, 1979, it was distributed to technical review branches for review and a meeting was held August 1 to provide NRR comments. Meeting attendees, listed by Enclosure 1, included both I&E and OELD. A summary of the NRR comments as to the materiality of the five same-numbered statements of the Keppler memo is given in Enclosure 2.

OELD defined "materiality" of FSAR statements. This definition served as the basis for judgments in the meeting. A statement was deemed to be "material" if, not withstanding the fact that it was detected by the I&E investigation, it would or could have an influence upon a safety conclusion of the NRR staff (i.e., if it could have resulted in an improper finding or less probing analysis by the staff). The technical significance and willfullness of any such false statement is relevant to selection of the specific enforcement action deemed to be appropriate.

It was noted that some of the technical reviewers had not yet completed review of some of the relevant background material, and therefore only preliminary comments could be given at the meeting. A subsequent meeting on or about August 3, 1979 was scheduled to confirm or modify these preliminary comments.

Darl S. Hood, Project Manager
Light Water Reactors Branch No. 4
Division of Project Management

Enclosures:
As stated

cc: See next page

8106090704

cc: All Attendees

G. Gower
L. Rubenstein
S. Varga
D. Vassallo
W. Olmstead
H. Thornburg
J. Keppler
W. Haass
D. Skovholt
J. Murray

ENCLOSURE 1

ATTENDEES
August 1, 1979

aker	(I&E HQ)
e[illegible]	(I&E HQ)
n	(NRR GSB)
rman	(OELD)
an	(OELD)
	(NRR DPM)
r	(NRR GSB)
y	(NRR QAB)
l	(NRR QAB)
t	(NRR AD:Eng)
	(I&E HQ)
ski	(NRR SEB)
er	(NRR SEB) (part-time)
	(NRR LWR#4:Acting BC)
on	(NRR GSB:Chief)

ENCLOSURE 2

NRR COMMENTS ON APRIL 3, 1979 KEPPLER MEMORANDUM

1. This statement is considered by NRR to be material; the fact that the Midland fill is of the wrong type (random fill verses structural fill) and was not sufficiently compacted is viewed by NRR as the core of the settlement problem. Other findings in the report appear to be subparts of (contributers to) this central problem and NRR suggested consideration be given to combining all five findings.

2. NRR stated that the difference between use of 3.0 KSF and 4.0 KSF for the load density for the Diesel Generator Building calculation would not or did not influence a safety conclusion by the NRR staff, and therefore, was not considered to be "material". Rather, the finding is viewed as an indicator of poor QA performance.

3. NRR stated that the difference between use of 0.001 and 0.003 for the index of compressibility for the Diesel Generator Building calculation would not or did not infuence a safety conclusion by the NRR staff, and therefore, was not considered to be "material." Rather, the finding is viewed as an indicator of poor QA performance.

4. NRR recognizes the statements in FSAR sections 2.5.4.10.3.5 and 3.8.4.1.2 regarding the type of mat for the Diesel Generator Building to be inconsistent. However they are not false insofar as they reflect what was actually done. In its review, NRR interpretated the use of 41 points to represent a mat foundation, whereas FSAR section 3.8.4.1.2 accurately identified the buidling to have continuous footings. The improper calculation is viewed by NRR as an indicator of poor QA performance.

5. This statement is considered to be a subpart of statement 1. It also appears to be relevant to poor QA performance.

Consumers Ex 12 i.d.
10/8/80 (Hood)

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

SEP 27 1979

Docket No. 50-329/330

MEMORANDUM FOR: George C. Gower, Acting Executive Officer for Operations Support, IE

FROM: Harold D. Thornburg, Director, Division of Reactor Construction Inspection, IE

SUBJECT: COMMENTS ON NEEDED ACTION ON MIDLAND ENFORCEMENT PACKAGE

RIII transmitted an enforcement package to me dated April 3, 1979 and that package was sent to XOOS as directed by J. Davis's memorandum of March 21, 1979.

RCI provided comments on the enforcement package in a memorandum dated June 13, 1979 (see Enclosure 1) to XOOS for coordination. We have not seen any positions in writing from NRR on the package. Since that date there have been several meetings (8/1, 8/3 and 8/16) which addressed, at least in part, the questions centering around further action on the enforcement package. The meetings were attended by personnel from NRR, ELD and IE. The various elements necessary to make a finding on a material false statement were examined.

a. Is the statement false?

b. Is the statement material?

c. Under what circumstances or in what frame of mind was the statement made (willful, deceitful, careless disregard)?

As a result of these meetings and the subsequent discussions by telephone with NRR representatives, we are of the opinion that the enforcement action should be taken on Item 1 of the package as a material false statement in that the fill used ~~at~~ the site was not the type stated in the FSAR as having been used (random vs engineered structural fill). The NRR conclusions on the other four items were that the statements were not material and indicated "poor QA performance" on the part of the licensee.

CONTACT: R. E. Shewmaker, IE
49-27551

~~7912140299~~

Further, it is our opinion that the fact that there are four clear instances of conflicting statements in the FSAR vs what was actually done, is evidence of improper internal coordination and failure on the part of the licensee to assure that accurate information was being provided in the FSAR. These constitute sufficient facts to make a finding that the material false statement was made in careless disregard of the facts. This would make the material false statement subject to a civil penalty vs actions allowed under the Administrative Procedures Act for the "second chance."

We strongly recommend that XOOS advise RIII to prepare the enforcement package in this manner and that we proceed quickly on this matter. We understand that there is a reluctance by some in the NRC against finalizing an action on material false statements while the bigger questions of the QA program and work being done at the site as corrective actions which are not yet approved by the NRC are being considered for action. In our opinion, the two matters are distinct and IE should proceed with the initiation of enforcement action on the false statement.

If you have any questions, please contact us.

Harold D. Thornburg

Harold D. Thornburg
Director
Division of Reactor
Construction Inspection, IE

cc: G. W. Reinmuth, IE
J. G. Keppler, RIII
T. W. Brockett, IE
D. Hood, NRR
C. E. Norelius, RIII

Consumers Ex 13 i.d.
10/8/80 (Hood)

D. Hood, NRC

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

OCT 04 1979

Docket Nos. 50-329
50-330

MEMORANDUM FOR: James G. Keppler, Director, Region III

FROM: George C. Gower, Acting Executive Officer for Operations Support, IE

SUBJECT: ENFORCEMENT ACTION RELATED TO MIDLAND DIESEL GENERATOR BUILDING AND PLANT FILL AREAS (A/I F30487H1)

This refers to your memorandum to H. D. Thornburg dated April 3, 1979. You requested that five items be reviewed to determine whether or not they involved material false statements.

Based on several meetings between IE, NRR, and ELD, item 1 in Attachment 1 of your letter is considered a material false statement. Items 2-5 in Attachment 1 are not considered material false statements; these four items should be treated as items of noncompliance as you presented in Attachment 2. The Headquarters review is summarized in a memorandum from H. D. Thornburg dated September 27, 1979; a copy is enclosed.

A proposed civil penalty package should be prepared and forwarded to X00S for action. We recommend following the format use in the D. C. Cook case. The letter to the licensee would have three appendices. Appendix A would be a Notice of Violation related to the material false statement. Appendix B would be a Notice of Proposed Imposition of Civil Penalties. Appendix C would be another Notice of Violation specifying the four infractions found during the Region III investigation Based on the information presented, we do not believe that the four infractions to be included in Appendix C meet the civil penalty criteria and, therefore, would not carry monetary penalties.

We understand that you plan to have a meeting at Headquarters in the near future to discuss other actions that may be taken with regard to the Midland facility.

This memorandum closes Action Item F30487H1.

G. C. Gower

George C. Gower, Acting Executive Officer
for Operations Support
Office of Inspection and Enforcement

Enclosure:
(See next page)

8401230651

Enclosure:
Memo from HDThornburg
dtd 9/27/7

cc w/enclosure:
D. Thompson, IE
G. W. Reinmuth, RCI
D. S. Hood, NRR
T. W. Brockett, XOOS

Consumers Power Co Exhibit #4 10/9/80
Heller Deposition
M.T. List

JWC JL 03 '80

cc: SHN
JWC
GSK
TCC
DMB
BWM
WRB
MCK
Doc Control
Serial

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

JUN 30 1980

cc TCC
DAR
TRT
JHC

Docket Nos.: 50-329/330

Mr. J. W. Cook
Vice President
Consumers Power Company
1945 West Parnall Road
Jackson, Michigan 49201

Dear Mr. Cook:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING PLANT FILL

We have reviewed your responses to our requests of November 19, 1979 regarding the quality of plant fill, effects and remedial actions resulting therefrom. Our review is being performed with the assistance of the U. S. Army Corps of Engineers. We and they find that the results of additional explorations and laboratory testing identified in Enclosure 1 (Request 37) are needed to support required geotechnical engineering studies. Details on the extent of these studies will be provided shortly by separate correspondence. Enclosure 1 is provided in order that you may initiate planning of the required explorations in a timely manner. However we suggest you await receipt of these further details prior to physically beginning the explorations. Enclosure 1 (Footnote 4 of Table 37-1) also includes requests for advanced notification of the availability of certain samples.

As noted in our Request 37 of Enclosure 1, your position in previous responses to Requests 5 and 35 not to complete additional explorations, sampling and laboratory testing after preloading continues to be unacceptable to us. So that you might better understand our position, we offer the following observations:

(1) The preload program as completed on the heterogeneous materials which were placed for the purpose of structural fill is not necessarily an improvement, nor does it necessarily produce foundation soils of more uniform engineering properties, compared to the soil performance which would have resulted if the material had been properly compacted to the original requirements established in the Midland PSAR.

(2) To develop reasonable assurance of plant safety, the required studies are needed to serve as an independent verification of the predictions of future settlements and the conclusions of the preload program.

Dr. Peck

8007180081

(3) The required studies will permit an estimate of total and differential settlement for involved structures and systems following drawdown with the proposed permanent dewatering system.

(4) Certain aspects of the preload program, such as the complication introduced by the simultaneous raising of the cooling pond reservoir, present difficulties in our full acceptance of your conclusion of the preload program.

Enclosure 1 also includes other requests for information which we and the U. S. Army Corps of Engineers need to continue our review.

We would appreciate your response to Enclosure 1 at your earliest opportunity. A partial reply based upon data already available should be submitted rather than to await the results of new borings and tests contained in parts of Enclosure 1. Should you require clarifications of these requests and positions, please contact us.

Sincerely,

A. Schwencer, Acting Chief
Licensing Branch No. 3
Division of Licensing

Enclosure:
As stated

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ADDITIONAL REQUESTS REGARDING PLANT FILL

36. We have reviewed your response to Request 24 and find that information from additional boring logs is needed.

Provide the boring logs for the following explorations:

a. Pull down holes PD-1 thru PD-27 (35 holes that include 8A, 20A, 20B, 20C, 15A, 15B, 15C and 27A)
b. LOW-1 thru LOW-14 (14 holes)
c. TW-1 thru TW-5 and PZ-1 thru PZ-48 (55 holes)
d. OW-1 thru OW-5 (5 holes)
e. TEW-1 thru TEW-8 (8 holes)

The logs should include date and method of drilling, the type and location of samples attempted. Also provide the locations, boring logs and available test data of any exploration completed in 1979 and 1980 which has not yet been submitted.

37. (RSP) Your position in previous responses to Requests 5 and 35 not to complete additional explorations, sampling and laboratory testing following the preload program continues to be unacceptable. We require that you complete as a minimum, the exploration and testing program indicated by Table 37-1.

38. Discuss the foundation design for any seismic safety-related piping and conduit connected to or located under the Radwaste Building and Turbine Building where piping and conduit have been placed on plant fill.

Table 37-1

Request for Additional Explorations, Sampling and Testing

Location 1/	Depth 2/	Sampling 3/	Lab Testing 4/	Anticipated Geotechnical 6/ Engineering Studies to be Required
Diesel Generator Building (6 holes along perimeter)	Thru fill and a minimum of 5' into natural glacial till soils	Classify samples according to Unified Soils Classification System	For cohesive soils C-D (Consolidated-Drained) C-U (Consolidated-Undrained) Consolidation 5/ For sands Drained Direct Shear on both loose & dense specimens Relative Density	Bearing Capacity Settlement Piping Distortion
Auxiliary Building (2 holes)	Same as above	Same as above	Same as above except add U-U (Unconsolidated-Undrained for cohesive soils	Design (Vertical and Lateral Load Support)
Service Water Pump (1 hole) Structure and Retaining Walls (2 holes)	Same as above	Same as above	Same as above except consolidation testing would be limited to samples in retaining wall foundations.	Pile Foundation Design (Vertical and Lateral Load Support) Retaining Wall Stability Settlement.
Cooling Pond Embankments (7 holes along perimeter)	Extend thru fill and a minimum of 5' into natural residual soils except hole no. 5 which should extend to bottom elevation of cooling pond.	Same as above	For cohesive soils C-D (Consolidated-Drained) C-U (Consolidated-Undrained) U-U (Unconsolidated-Undrained)	Slope Stability Fill compaction adequacy

NOT See page 2

Table 37-1 (continued)

NOTES:

1/ See attached Figs. 37-1 and 37-2 for approximate boring location. Holes to be accurately located in the field to avoid obstructions, underground piping and conduits and slurry trench area.

2/ No boring is to be terminated in loose or soft soils.

3/ Continuous split spoon sampling using SPT is required. Holes are to be held open using either casing or hollow stem auger. Additional borings to obtain representative undisturbed samples for detailed laboratory testing should be located at the completion and elevation of the split spoon sampling program. The groundwater level should be recorded at the completion of drilling in all borings once the level has stabilized.

4/ Normal classification (e.g., gradation, Atterberg Limits) unit weight and moisture content testing to be performed on representative samples from each significant foundation layer. This column pertains to lab testing in addition to the above mentioned tests. It is requested that at least one week notice be provided to the NRC before opening undisturbed samples to permit on site visual observation by Corps of Engineer representative.

5/ The maximum load should be great enough to establish the straight-line portion of the void ratio-pressure curve.

6/ Details on the extent of geotechnical engineering studies to be completed using the results of field and lab testing work will be provided in a separate letter.

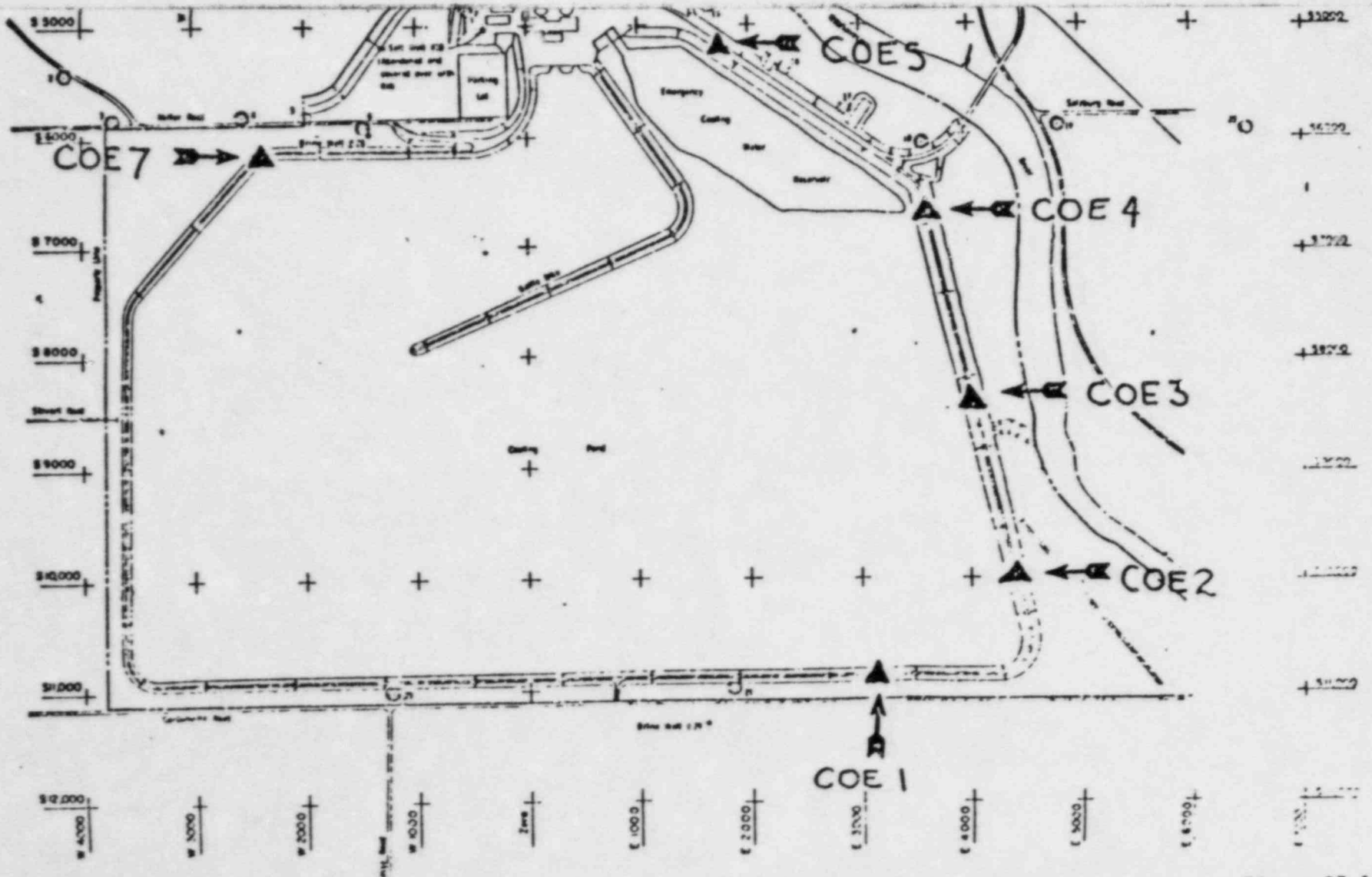

Figure 37-1

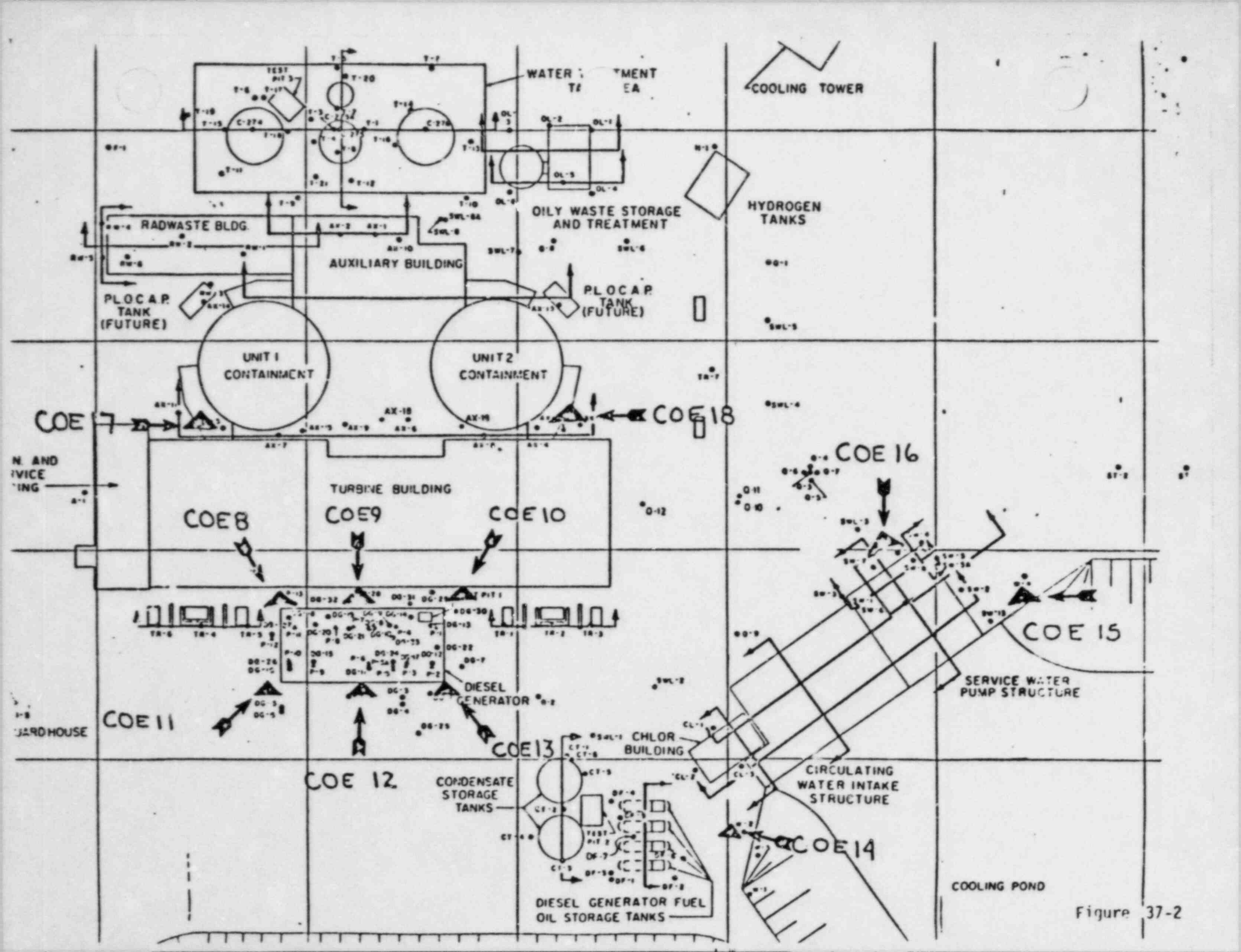
COOLING TOWER
HYDROGEN TANKS
OILY WASTE STORAGE AND TREATMENT
RADWASTE BLDG.
AUXILIARY BUILDING
PLOCAP TANK (FUTURE)
PLOCAP TANK (FUTURE)
UNIT 1 CONTAINMENT
UNIT 2 CONTAINMENT
COE 7
COE 18
COE 16
TURBINE BUILDING
COE 8
COE 9
COE 10
COE 15
SERVICE WATER PUMP STRUCTURE
DIESEL GENERATOR
COE 11
COE 13
CHLOR BUILDING
COE 12
CONDENSATE STORAGE TANKS
CIRCULATING WATER INTAKE STRUCTURE
COE 14
DIESEL GENERATOR FUEL OIL STORAGE TANKS
COOLING POND

Figure 37-2

Power Co Exhibit #5 —
Heller deposition - 10/21/82

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

AUG 4 1980

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AUG 07 1980
MIDLAND PROJECT
MANAGEMENT

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Karl Weidner
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GINEERS REPORT AND REQUEST FOR ADDITIONAL INFORMATION
ILL

1980 requested the results of additional explorations
g needed to support certain geotechnical engineering
d plant fill and associated remedial actions. That
tails on the extent of these studies would be provided
dence. Enclosure 1 is a letter report of July 7, 1980
e U.S. Army Corps of Engineers, and is forwarded to

rps report identifies additional information needed to
lems identified in paragraph 3. For purposes of con-
ered the subparagraphs of paragraph 4 to be sequential
ts on this matter. They have also been marked to
f NRR review. Your reply should reference the revised
should address the requests as marked to reflect our

e Corps report entitled Liquefaction Potential, is not
mbering since it represents an evaluation rather than
er this evaluation to be tentative at this time since
determination of suitable seismic design input for the
s this matter shortly by separate correspondence.

8008270158

We would appreciate your reply at your earliest opportunity. Should you need clarification of these requests for additional information, please contact us.

Sincerely,

A. Schwencer, Acting Chief
Licensing Branch No. 3
Division of Licensing

Enclosure:
COE Letter Report
dated 7/7/80

cc: See next page

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DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231

ENCLOSURE 1

REPLY TO ATTENTION OF
NCEED-T

7 JUL 1980

SUBJECT: Interagency Agreement No. NRC-03-79-167, Task No. 1 - Midland Plant Units 1 and 2, Subtask No. 1 - Letter Report

THRU: Division Engineer, North Central
ATTN: NCDED-G (James Simpson)

TO: U.S. Nuclear Regulatory Commission
ATTN: Dr. Robert E. Jackson
Division of Systems Safety
Mail Stop P-314
Washington, D. C. 20555

1. The Detroit District hereby submits this letter report with regard to completion of subtask No. 1 of the subject Interagency Agreement concerning the Midland Nuclear Plant, Units 1 and 2. The purpose of this report is to identify unresolved issues and make recommendations on a course of action and/or cite additional information necessary to settle these matters prior to preparation of the Safety Evaluation Report.

2. The Detroit District's team providing geotechnical engineering support to the NRC to date has made a review of furnished documents concerning foundations for structures, has jointly participated in briefing meetings with the NRC staff, Consumers Power Company (the applicant) and personnel from North Central Division of the Corps of Engineers and has made detailed site inspections. The data reviewed includes all documents received through Amendment 78 to the operating license request, Revision 28 of the FSAR, Revision 7 to the 10 CFR 50.54(f) requests and MCAR No. 24 through Interim Report No. 8. Generally, each structure within the complex was studied as a separate entity.

3. A listing of specific problems in review of Midland Units 1 and 2 follows for Category I structures. The issues are unresolved in many instances, because of inadequate or missing information. The structures to be addressed follow the description of the problem.

a. Inadequate presentation of subsurface information from completed borings on meaningful profiles and sectional views. All structures.

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b. Discrepancies between soil descriptions and classifications on boring logs with submitted laboratory test results summaries. Examples of such discrepancies are found in boring T-14 (Borated water tank) which shows stiff to very stiff clay where laboratory tests indicate soft clay with shear strength of only 500 p.s.f. The log of boring T-15 shows stiff, silty clay, while the lab tests show soft, clayey sand with shear strength of 120 p.s.f. All structures.

c. Lack of discussion about the criteria used to select soil samples for lab testing. Also, identification of the basis for selecting specific values for the various parameters used in foundation design from the lab test results. All structures.

d. The inability to completely identify the soil behavior from lab testing (prior to design and construction) of individual samples, because in general, only final test values in summary form have been provided. All structures.

(1) Lack of site specific information in estimating allowable bearing pressures. Only textbook type information has been provided. If necessary, bearing capacity should be revised based on latest soils data. All structures on, or partially on, fill.

(2) Additional information is needed to indicate the design methods used, design assumptions and computations in estimating settlement for safety related structures and systems. All structures except Diesel Generator Building where surcharging was performed.

e. A complete detailed presentation of foundation design regarding remedial measures for structures undergoing distress is required. Areas of remedial measures except Diesel Generator Building.

f. There are inconsistencies in presentation of seismic design information as affected by changes due to poor compaction of plant fill. Response to NRC question 35 (10 CFR 50.54f) indicates that the lower bound of shear wave velocity is 500 feet per second. We understand that the same velocity will be used to analyze the dynamic response of structures built on fill. However, from information provided by the applicant at the site meeting on 27 and 28 February 1980, it was stated that, except for the Diesel Generator Building, higher shear wave velocities are being used to re-evaluate the dynamic response of the structures on fill material. Structures on fill or partially on fill except Diesel Generator Building.

4. A listing of specific issues and information necessary to resolve them.

39. a. Reactor Building Foundation

(1) Settlement/Consolidation. Basis for settlement/consolidation of the reactor foundation as discussed in the FSAR assumes the plant site would

not be dewatered. Discuss and furnish computation for settlement of the Reactor Buildings in respect to the changed water table level as the result of site dewatering. Include the effects of bouyancy, which were used in previous calculations, and fluctuations in water table which could happen if the dewatering system became inoperable.

(2) Bearing Capacity. Bearing capacity computations should be provided and should include method used, foundation design, design assumptions, adopted soil properties, and basis for selecting ultimate bearing capacity and resulting factor of safety.

40.f. Diesel Generator Building.

(1) Settlement/Consolidation. In the response to NRC Question 4 and 27, (10 CFR 50.54f), the applicant has furnished the results of his computed settlements due to various kinds of loading conditions. From his explanation of the results, it appears that compressibility parameters obtained by the preload tests have been used to compute the static settlements. Information pertaining to dynamic response including the amplitude of vibration of generator pedestals have also been furnished. The observed settlement pattern of the Diesel Generator Building indicates a direct correlation with soil types and properties within the backfill material. To verify the preload test settlement predictions, compute settlements based on test results on samples from new borings which we have requested in a separate memo and present the results. Reduced ground water levels resulting from dewatering and diesel plus seismic vibration should be considered in settlement and seismic analysis. Furnish the computation details for evaluating amplitude of vibration for diesel generator pedestals including magnitude of exciting forces, whether they are constant or frequency dependent.

(2) Bearing Capacity. Applicant's response to NRC Question 35 (10 CFR 50.54f) relative to bearing capacity of soil is not satisfactory. Figure 35-3, which has been the basis of selection of shear strength for computing bearing capacity does not reflect the characteristics of the soils under the Diesel Generator Building. A bearing capacity computation should be submitted based on the test results of samples from new borings which we have requested in a separate memo. This information should include method used, foundation design assumptions, adopted soil properties and basis for selection, ultimate bearing capacity and resulting factor of safety.

(3) Preload Effectiveness. The effectiveness of the preload should be studied with regard to the moisture content of the fill at the time of preloading. The height of the water table, its time duration at this level, and whether the plant fill was placed wet or dry of optimum would be all important considerations.

(a) Gramular Soils.

When sufficient load is applied to granular soils it usually causes a reorientation of grains and movement of particles into more stable positions plus (at high stresses) fracturing of particles at their points of contact. Reorientation and breakage creates a chain reaction among these and adjacent particles resulting in settlement. Reorientation is resisted by friction between particles. Capillary tension would tend to increase this friction. A moisture increase causing saturation, such as a rise in the water table as occurred here, would decrease capillary tension resulting in more compaction. Present a discussion on the water table and capillary water effect on the granular portion of the plant fill both above and below the water table during and after the preload.

(b) Impervious and/or Clay Soils.

Clay fill placed dry of optimum would not compact and voids could exist between particles and/or chunks. In this situation SPT blow counts would give misleading information as to strength. Discuss the raising of the water table and determine if the time of saturation was long enough to saturate possible clay lumps so that the consolidation could take place that would preclude further settlement.

Discuss the preload effect on clay soils lying above the water table (7 feet $\pm$) that were possibly compacted dry of optimum. It would appear only limited consolidation from the preload could take place in this situation and the potential for further settlement would exist.

Discuss the effect of the preload on clays placed wet of optimum. It would appear consolidation along with a gain in strength would take place. Determine if the new soil strength is adequate for bearing capacity.

Conclusion: Since the reliability of existing fill and compaction information is uncertain, additional borings and tests to determine void ratio (granular soils) relative density, moisture content, density, consolidation properties and strength (triaxial tests) would appear to be desirable in order to satisfactorily answer the above questions. Borings should be continuous push with undisturbed cohesive soil samples taken.

Deleted: Covered by 6/30/80 Letter

(4) Miscellaneous. A contour map, showing the settlement configuration of the Diesel Generator Building, furnished by the applicant at the meeting of 27 and 28 February 1980 indicates that the base of the building has warped due to differential settlements. Additional stresses will be induced in the various components of the structure. The applicant should evaluate these stresses due to the differential settlement and furnish the computations and results for review.

7 JUL 1980

reement No. NRC-03-79-167, Task No. 1 - Midland Plant
Subtask No. 1 - Letter Report

ilding Foundation.

acity. A detailed pile design based upon pertinent
loped in order to more effectively evaluate the
stem prior to load testing of test piles. Provide
reference to test data on which they are based, and
sed to estimate pile design capacity including
stimated maximum static and dynamic loads to be
ontribution (DL, LL, OBE, SSE) on the maximum loaded
safety against soil failure due to maximum pile load.

provide analysis evaluating possible differential
cur between the pile supported end and the portion
al till. Describe the impact of failure on safety related features (e.g., diesel fuel oil storage tanks) behind or near the wall.
cuss why the retaining wall adjacent to the intake
d to be a Seismic Category I structure. Evaluate the
oth the service water pumphouse retaining walls and
aining wall and the significance of the settlement
ent prediction on the safe operation of the Midland
ation should address actual stresses induced by the
owable stresses permitted by approved codes.
lysis. Provided the proposed 100 ton ultimate pile
eved and reasonable margin of safety is available, the
oposed for the overhang section of the Service Water
ide the support necessary for the structure under
hic inertial loadings even if the soil under the
structure should liquefy. There is no reason to think
t this time, and the applicant has committed to a load
pile capacity. The dynamic response of the structure,
oads for which the structure itself is designed and
contained therein, would change as a result of the
s. Therefore:

arize or provide copies of reports on the dynamic
e in its old and proposed configuration. For the
information on the stiffness assigned to the piles
stiffnesses were obtained and show the largest change
al response spectra resulting from the proposed
pposed configuration has not yet been analyzed,
at are to be performed giving particular attention to
h or selection, of and the range of numerical
d to the vertical piles.

er completion of the new pile foundation, in
t No. 6, item 125, Consumers Power Company memorandum

NCEED-T
SUBJECT: Interagency Agreement No. NRC-03-79-167, Task No. 1 - Midland Plant Units 1 and 2, Subtask No. 1 - Letter Report

dated 13 March 1980, the results of measurements of vertical applied load and absolute pile head vertical deformation which will be made when the structural load is jacked on the piles so that the pile stiffness can be determined and compared to that used in the dynamic analysis.

42. k. Auxiliary Building Electrical Penetration Areas and Feedwater Isolation Valve Pits.

(1) Settlement. Provide the assumptions, method, computation and estimate of expected allowable lateral and vertical deflections under static and seismic loadings.

(2) Provide the construction plans, and specifications for underpinning operations beneath the Electrical Penetration Area and Feedwater Valve Pit. The requested information to be submitted should cover the following in sufficient details for evaluation:

(a) Details of the temporary dewatering system (locations, depth, size and capacity of wells) including the monitoring program to be required, (for example, measuring drawdown, flow, frequency of observations, etc.) to evaluate the performance and adequacy of the installed system.

(b) Location, sectional views and dimensions of access shaft and drift to and below auxiliary building wings.

(c) Details of temporary surface support system for the valve pits.

~~(d)~~ Dewatering before underpinning is recommended in order to preclude differential settlement between pile and soil supported elements and negative drag forces.

(d) Provide adopted soil properties, method and assumptions used to estimate caisson and/or pile design capacities, and computational results. Provide estimated maximum static and dynamic load (compression, uplift and lateral) to be imposed and the individual contribution (DL, LL, OBE, SSE) on maximum loaded caisson and/or pile. Provide factor of safety against soil failure due to maximum pile load.

(e) Discuss and furnish computations for settlement of the portion of the Auxiliary Building (valve pits, and electrical penetration area) in respect to changed water level as a result of the site dewatering. Include the effect of bouyancy, which was used in previous calculations, and fluctuations in water table which could happen, if dewatering system becomes inoperable.

(f) Discuss protection measures to be required against corrosion, if piling is selected.

(g) Identify specific information, data and method of presentation to be submitted for regulatory review at completion of underpinning operation. This report should summarize construction activities, field inspection records, results of field load tests on caissons and piles and an evaluation of the completed fix for assuring the stable foundation.

43. Borated Water Tanks.

(1) Settlement. The settlement estimate for the Borated Water Storage Tanks furnished by the applicant in response to NRC Question 31 (10 CFR 50.54f) is based upon the results of two plate load tests conducted at the foundation elevation (EL 627.00±) of the tanks. Since a plate load test is not effective in providing information regarding the soil beyond a depth more than twice the diameter of the bearing plate used in the test, the estimate of the settlement furnished by the applicant does not include the contribution of the soft clay layers located at depth more than 5' below the bottom of the tanks (see Boring No. T-14 and T-15, and T-22 thru T-26).

(a) Compute settlements which include contribution of all the soil layers influenced by the total load on the tanks. Discuss and provide for review the analysis evaluating differential settlement that could occur between the ring (foundations) and the center of the tanks.

(b) The bottom of the borated tanks being flexible could warp under differential settlement. Evaluate what additional stresses could be induced in the ring beams, tank walls, and tank bottoms, because of the settlement, and compare with allowable stresses. Furnish the computations on stresses including method, assumptions and adopted soil properties in the analysis.

(2) Bearing Capacity. Laboratory test results on samples from boring T-15 show a soft stratum of soil below the tank bottom. Consideration has not been given to using these test results to evaluate bearing capacity information furnished by the applicant in response to NRC Question 35 (10 CFR 50.54f). Provide bearing capacity computations based on the test results of the samples from relevant borings. This information should include method used, foundation design assumptions, adopted soil properties, ultimate bearing capacity and resulting factor of safety for the static and the seismic loads.

44. Underground Diesel Fuel Tank Foundation Design

(1) Bearing capacity. Provide bearing capacity computation based on the test results of samples from relevent borings, including method used, foundation design assumptions, adopted soil properties, ultimate bearing capacity and the resulting factor of safety.

(2) Provide tank settlement analysis due to static and dynamic loads including methods, assumptions made, etc.

(3) What will be effects of uplift pressure on the stability of the tanks and the associated piping system if the dewatering system becomes inoperable?

45. Underground Utilities:

(1) Settlement

(a) Inspect the interior of water circulation piping with video cameras and sensing devices to show pipe cross section, possible areas of crackings and openings, and slopes of piping following consolidation of the plant fill beneath the imposed surcharge loading.

(b) The applicant has stated in his response to NRC Question 7 (10 CFR 50.54f) that if the duct banks remain intact after the preload program has been completed, they will be able to withstand all future operating loads. Provide the results of the observations made, during the preload test, to determine the stability of the duct banks, with your discussion regarding their reliability to perform their design functions.

(c) The response to Question 17 of "Responses to NRC Requests Regarding Plant Fill" states that "there is no reason to believe that the stresses in Seismic Category I piping systems will ever approach the Code allowable." We question the above statement based on the following:

Profile 26" - OHBC-54 on Fig. 19-1 shows a sudden drop of approx. 0.2 feet within a distance of only 20 feet. Using the procedure on p. 17-2,

$$\sigma_b = E(e) = E\left(\frac{D}{2R}\right) = E\,\frac{D}{2}\,\frac{8\delta}{L^2}$$

$$\sigma_b = 30000\,\frac{26}{2}\left[\frac{8(0.2)(12)}{(20\times12)^2}\right] = 130.0\ \text{KSI}$$

as allowable

~~Furthermore, the Eq. 10(a) of Article NC-3652.3, Sec. III, Division 1, of the ASME Code requires that some Stress Intensification Factor "i" be assigned to all computed settlement stresses.~~ Yet, Table 17-2 lists only 52.5 KSI stress for this pipe. This matter requires further review. Please respond to this apparent discrepancy and also specify the location of each computed settlement stress at the pipeline stationing shown on the profiles. More than one critical stress location is possible along the same pipeline.

(d) During the site visit on 19 February 1980, we observed three instances of what appeared to be degradation of rattlespace at penetrations of Category I piping through concrete walls as follows:

West Borated Water Tank - in the valve pit attached to the base of the structure, a large diameter steel pipe extended through a steel sleeve placed in the wall. Because the sleeve was not cut flush with the wall, clearance between the sleeve and the pipe was very small.

Service Water Structure - Two of the service water pipes penetrating the northwest wall of the service water structure had settled differentially with respect to the structure and were resting on slightly squashed short pieces of 2 x 4 placed in the bottom of the penetration. From the inclination of the pipe, there is a suggestion that the portions of the pipe further back in the wall opening (which was not visible) were actually bearing on the invert of the opening. The bottom surface of one of the steel pipes had small surface irregularities around the edges of the area in contact with the 2 x 4. Whether these irregularities are normal manufacturing irregularities or the result of concentration of load on this temporary support caused by the settlement of the fill, was not known.

These instances are sufficient to warrant an examination of those penetrations where Category I pipe derives support from plant fill on one or both sides of a penetration. In view of the above facts, the following information is required.

(1) What is the minimum seismic rattlespace required between a Category I pipe and the sleeve through which it penetrates a wall?

(2) Identify all those locations where a Category I pipe deriving support from plant fill penetrates an exterior concrete wall. Determine and report the vertical and horizontal rattlespace presently available and the minimum required at each location and describe remedial actions planned as a result of conditions uncovered in the inspection. It is anticipated that the answer to Question (1) can be obtained without any significant additional excavation. If this is not the case, the decision regarding the necessity to obtain information at those locations requiring major excavation should be deferred until the data from the other locations have been examined.

(e) Provide details (thickness, type of material etc.) of bedding or cradle placed beneath safety related piping, conduits, and supporting structures. Provide profiles along piping, and conduits alignments showing the properties of all supporting materials to be adopted in the analysis of pipe stresses caused by settlement.

(f) The two reinforced concrete return pipes which exit the Service Water Pump Structure, run along either side of the emergency cooling water reservoir, and ultimately enter into the reservoir, are necessary for safe shutdown. These pipes are buried within or near the crest of Category I slopes that form the sides of the emergency cooling water reservoir. There is no report on, or analysis of, the seismic stability of post earthquake residual displacement for these slopes. While the limited data from this area do not raise the specter of any problem, for an important element of the plant such as this, the earthquake stability should be examined by state-of-the-art methods. Therefore, provide results of the seismic analysis of the slopes leading to an estimate of the permanent deformation of the pipes. Please provide the following: (1) a plan showing the pipe location with respect to other nearby structures, slopes of the reservoir and the coordinate system; (2) cross-sections showing the pipes, normal pool levels, slopes, subsurface conditions as interpreted from borings and/or logs of excavations at (a) a location parallel to and about 50 ft from the southeast outside wall of the service water pipe structure and (b) a location where the cross section will include both discharge structures. Actual boring logs should be shown on the profiles; their offset from the profile noted, and soils should be described using the Unified Soil Classification System; (3) discussion of available shear strength data and choice of strengths used in stability analysis; (4) determination of static factor or safety, critical earthquake acceleration, and location of critical circle; (5) calculation of residual movement by the method presented by Newmark (1965) or Makdisi and Seed (1978); and (6) a determination of whether or not the pipes can function properly after such movements.

46. Cooling Pond.

(1) Emergency Cooling Pond. In recognition that the type of embankment fill and the compaction control used to construct the retention dikes for the cooling pond were the same as for the problem plant fill, we request reasonable assurance that the slopes of the Category I Emergency Cooling Pond (baffle dike and main dike) are stable under both static and dynamic loadings. We request a revised stability analysis for review, which will include identification of locations analyzed, adopted foundation and embankment conditions (stratification, seepage, etc.) and basis for selection, adopted soil properties, method of stability analysis used and resulting factor of safety with identification of sliding surfaces analyzed. Please address any potential impact on Category I pipes near the slopes, based on the results of this stability study. Recommendations for location of new exploration and testing have been provided in a separate letter.

(2) Operating Cooling Pond. A high level of safety should be required for the remaining slopes of the Operating Cooling Pond unless it can be assured that a failure will not: (a) endanger public health and properties, (b) result in an assault on environment, (c) impair needed emergency access. Recommendations for locations of new borings and laboratory tests have been submitted in a separate letter. These recommendations were made on the assumptions that the stability of the operating cooling pond dikes should be demonstrated.

47. Site Dewatering Adequacy.

(1) In order to provide the necessary assurance of safety against liquefaction, it is necessary to demonstrate that the water will not rise above elevation 610 during normal operations or during a shutdown process. The applicant has decided to accomplish this by pumping from wells at the site. In the event of a failure, partial failure, or degradation of the dewatering system (and its backup system) caused by the earthquake or any other event such as equipment breakdown, the water levels will begin to rise. Depending on the answer to Question (a) below concerning the normal operating water levels in the immediate vicinity of Category I structures and pipelines founded on plant fill, different amounts of time are available to accomplish repair or shutdown. In response to Question 24 (10 CFR 50.54f) the applicant states "the operating groundwater level will be approximately el 595 ft" (page 24-1). On page 24-1 the applicant also states "Therefore el 610' is to be used in the designs of the dewatering system as the maximum permissible groundwater level elevation under SSE conditions." On page 24-15 it is stated that "The wells will fully penetrate the backfill sands and underlying natural sands in this area." The bottom of the natural sands is indicated to vary from elevation 605 to 580 within the plant fill area according to Figure 24-12. The applicant should discuss and furnish response to the following questions:

(a) Is the normal operating dewatering plan to (1) pump such that the water level in the wells being pumped is held at or below elevation 595 or (2) to pump as necessary to hold the water levels in all observation wells near Category I Structures and Category I Pipelines supported on plant fill at or below elevation 595, (3) to pump as necessary to hold water levels in the wells mentioned in (2) above at or below elevation 610, or (4) something else? If it is something else, what is it?

(b) In the event the water levels in observation wells near Category I Structures or Pipelines supported on plant fill exceed those for normal operating conditions as defined by your answeer to Question (a) what action will be taken? In the event that the water level in any of these observation wells exceeds elevation 610, what action will be taken?

(c) Where will the observation wells in the plant fill area be located that will be monitored during the plant lifetime? At what depths will the screened intervals be? Will the combination of (1) screened interval in cohesionless soil and (2) demonstration of timely response to changes in cooling pond level prior to drawdown be made a condition for selecting the observation wells? Under what conditions will the alarm mentioned on page 24-20 be triggered? What will be the response to the alarm? A worst case test of the completed permanent dewatering and groundwater level monitoring systems could be conducted to determine whether or not the time required to accomplish shutdown and cooling is available. This could be done by shutting off the entire dewatering system when the cooling pond is at elevation 627 and determining the water level versus time curve for each observation well. The test should be continued until the water level under Category I structure, whose foundations are potentially liquefiable, reaches elevation 610 (the normal water level) or the sum of the time intervals allotted for repair and the time interval needed to accomplish shutdown (should the repair prove unsuccessful) has been exceeded, whichever occurs first. In view of the heterogeneity of the fill, the likely variation of its permeability and the necessity of making several assumptions in the analysis which was presented in the applicant's response to Question 24a, a full-scale test should give more reliable information on the available time. In view of the above the applicant should furnish his response to the following:

If a dewatering system failure or degradation occurs, in order to assure that the plant is shutdown by the time water level reaches elevation 610, it is necessary to initiate shutdown earlier. In the event of a failure of the dewatering system, what is the water level or condition at which shutdown will be initiated? How is that condition determined? An acceptable method would be a full-scale worst-case test performed by shutting off the entire dewatering system with the cooling pond at elevation 627 to determine, at each Category I Structure deriving support from plant fill, the water level at which a sufficient time window still remains to accomplish shutdown before the water rises to elevation 610. In establishing the groundwater level or condition that will trigger shutdown, it is necessary to account for normal surface water inflow as well as groundwater recharge and to assume that any additional action taken to repair the dewatering system, beyond the point in time when the trigger condition is first reached, is unsuccessful.

(2) As per applicant response to NRC Question 24 (10 CFR 50.54f) the design of the permanent dewatering system is based upon two major findings: (1) the granular backfill materials are in hydraulic connection with an underlying discontinuous body of natural sand, and (2) seepage from the cooling pond is restricted to the intake and pump structure area, since the plant fill south of Diesel Generator Building is an effective barrier to the inflow of the cooling pond water. However, soil profiles (Figure 24-2 in the "Response to NRC Requests Regarding Plant Fill"), pumping test time-drawdown graphs (Figure 24-14), and plotted cones of influence (Figure 24-15) indicate that south of Diesel Generator Building, the plant fill material adjacent to

the cooling pond is not an effective barrier to inflow of cooling pond water. The estimated permeability for the fill material as reported by the applicant is 8 feet/day and the transmissivities range from 29 to 102 square feet/day. Evaluate and furnish for review the recharge rate of seepage through the fill materials from the south side of the Diesel Generator Building on the permanent dewatering system. This evaluation should especially consider the recovery data from PD-3 and complete data from PD-5.

(3) The interceptor wells have been positioned along the northern side of the Water Intake Structure and service water pump structures. The calculations estimating the total groundwater inflow indicate the structures serve as a positive cutoff. However, the isopachs of the sand (Figures 24-9 and 24-10) indicate 5 to 10 feet of remaining natural sands below these structures. The soil profile (Figure 24-2) neither agrees nor disagrees with the isopachs. The calculations for total flow, which assumed positive cutoff, reduced the length of the line source of inflow by 2/3. The calculations for the spacing and positioning of wells assumed this reduced total flow is applied along the entire length of the structures. Clarify the existence of seepage below the structures, present supporting data and calculations, and reposition wells accordingly. Include the supporting data such as drawdown at the interceptor wells, at midway location between any two consecutive wells, and the increase in the water elevations downstream of the interceptor wells. The presence of structures near the cooling pond appears to have created a situation of artesian flow through the sand layer. Discuss why artesian flow was not considered in the design of the dewatering system.

(4) Provide construction plans and specification of permanent dewatering system (location, depths, size and capacity of wells, filtarpack design) including required monitoring program. The information furnished in response of NRC Question 24 (10 CFR 50.54f) is not adequate to evaluate the adequacy of the system.

(5) Discuss the ramifications of plugging or leaving open the weep holes in the retaining wall at the Service Water Building.

(6) Discuss in detail the maintenance plan for the dewatering system.

(7) What are your plans for monitoring water table in the control tower area of the Auxiliary Building?

(8) What measures will be required to prevent incrustation of the pipings of the dewatering system. Identify the controls to be required during plant operation (measure of dissolved solids, chemical controls). Provide basis for established criteria in view of the results shown on Table 1, page 23 of tab 147.

(9) Upon reaching a steady state in dewatering, a groundwater survey should be made to confirm the position of the water table and to insure that no perched water tables exist.

Dewatering of the site should be scheduled with a sufficient lead time before plant start up so that the additional settlement and its effects (especially on piping) can be studied. Settlement should be closely monitored during this period.

Provide your plans for conducting this groundwater survey.

N/A j. Liquefaction Potential.

An independent Seed-Idriss Simplified Analysis was performed for the fill area under the assumption that the groundwater table was at or below elevation 610. For 0.19 g peak ground surface accceleration, it was found that blow counts as follows were required for a factor of safety of 1.5:

Elevation ft	Minimum SPT Blow Count*[1] For F.S. = 1.5
610	14
605	16
600	17
595	19

The analysis was considered conservative for the following reasons (a) no account was taken of the weight of any structure, (b) liquefaction criteria for a magnitude 6 earthquake were used whereas an NRC memorandum of 17 Mar 80 considered nothing larger than 5.5 for an earthquake with the peak acceleration level of 0.19 g's, (c) unit weights were varied over a range broad enough to cover any uncertainty and the tabulation above is based on the most conservative set of assumptions. Out of over 250 standard penetration tests on cohesionless plant fill or natural foundation material below elevation 610, the criteria given above are not satisfied in four tests in natural materials located below the plant fill and in 23 tests located in the plant fill. These tests involve the following borings:

SW3, SW2, DG-18, AX 13, AX 4, AX 15, AX 7, AX 5, AX 11, DG 19, DG 13, DG 7, DG 5, D 21, GT 1, 2.

Some of the tests on natural material were conducted at depths of at less than 10 ft before approximately 35 ft of fill was placed over the location. Prior to comparison with the criteria these tests should be multiplied by a factor of about 2.3 to account for the increase in effective overburden pressure that results from the placement and future dewatering of the fill.

1*For M = 7.5, blow counts would increase by 30%.

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Of the 23 tests on plant fill which fail to satisfy the criteria, most are near or under structures where remedial measures alleviating necessity for support from the fill are planned. Only 4 of the tests are under the Diesel Generator Building (which will still derive its support from the fill) and 3 others are near it. Because these locations where low blow counts were recorded are well separated from one another and are not one continuous stratum but are localized pockets of loose material, no failure mechanism is present.

In view of the large number of borings in the plant fill area and the conservatism adopted in analysis, these few isolated pockets are no threat to plant safety. The fill area is safe against liquefaction in a Magnitude 6.0 earthquake or smaller which produces a peak ground surface acceleration of 0.19 g or less provided the groundwater elevation in the fill is kept at or below elevation 610.

48. X. Seismic analysis of structures on plant fill material.

(1) Category I Structures. From Section 3.7.2.4 of the FSAR it can be calculated that an average V_s of about 1350 ft/sec was used in the original dynamic soil structure interaction analysis of the Category I structures. This is confirmed by one of the viewgraphs used in the 28 February Bechtel presentation. Plant fill V_s is clearly much lower than this value. It is understood from the response to Question 13 (10 CFR 50.54f) concerning plant fill that the analysis of several Category I structures are underway using a lower bound average V_s = 500 ft/sec for sections supported on plant fill and that floor response spectra and design forces will be taken as the most severe of those from the new and old analysis. The questions which follow are intended to make certain if this is the case and gain an understanding of the impact of this parametric variation in foundation conditions.

(a) Discuss which Category I structures have been and/or will be reanalyzed for changes in seismic soil structure interaction due to the change in plant fill stiffness from that envisioned in the original design. Have any Category I structures deriving support from plant fill been excluded from reanalysis? On what basis?

(b) Tabulate for each old analysis and each reanalysis, the foundation parameters (v_s, ν and ρ) used and the equivalent spring and damping constants derived therefrom so the reviewer can gain an appreciation of the extent of parametric variation performed.

(c) Is it the intent to analyze the adequacy of the structures and their contents based upon the envelope of the results of the old and new analyses? For each structure analyzed, please show on the same plot the old, new, and revised enveloping floor response spectra so the effect of the

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changed backfill on interior response spectra predicted by the various models can be readily seen.

(2) Category I retaining wall near the southeast corner of the Service Water Structure. This wall is experiencing some differential settlement. Boring information in Figure 24-2 (Question 24, Volume 1 Responses to NRC Requests Regarding Plant Fill) suggests the wall is founded on natural soils and backfilled with plant fill on the land side. Please furnish details clarifying the following:

(a) Is there any plant fill underneath the wall? What additional data beyond that shown in Figure 24-2 support your answer?

(b) Have or should the design seismic loads (FSAR Figure 2.5-45) be changed as a result of the changed backfill conditions?

(c) Have or should dynamic water loadings in the reservoir be considered in the seismic design of this wall? Please explain the basis of your answer.

5. In your response for the comments and questions in paragraph 4 above, if you feel that sufficiently detailed information already exists on the Midland docket that may have been overlooked, please make reference to that information. Resolution of issues and concerns will depend on the expeditious receipt of data mentioned above. Contact Mr. Neal Gehring at FTS 226-6793 regarding questions.

FOR THE DISTRICT ENGINEER:

P. McCALLISTER
Chief, Engineering Division

Common Power Co
Exhibit # 6
Holler deposit
10/9/80

LINES 0YJK-1 & -YJK-2
BE DETERMINED BY THE FIELD ENGR.
BE CAPPED FOLLOWING THE HYDRO-TEST
LL BE EXTENDED TO EL. 605-0" & SHALL

'OR' TAPPING ARE NON-Q. & INSTALLATION