



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

J. Kane

OCT 14 1982
Staff Response to STAMIRIS CONTENTIONS 4.C.b, 4.D.1) (4.D.2)

Docket Nos.: 50-329/330

MEMORANDUM FOR: Elinor G. Adensam, Chief
Licensing Branch #4, DL

THRU: *[Signature]* James P. Knight, Assistant Director
for Components & Structures Engineering, DE

FROM: George E. Lear, Chief
Hydrologic and Geotechnical Engineering Branch, DE

SUBJECT: MIDLAND ASLB HEARINGS - GEOTECHNICAL ENGINEERING INPUT

Plant Name: Midland Plant Units 1 and 2
Licensing Stage: OL
Responsible Branch: LB No. 4, M. Miller, D. Hood and R. Hernan, LPM
Requested Completion Date: October 13, 1982
Status: Completed

In response to the verbal requests of W. Paton and M. Wilcove of OELD, we have enclosed our input for staff testimony in preparation for the upcoming ASLB hearings. The hearings scheduled for October 27 through November 4, 1982 are to cover (1) bearing capacity beneath the Diesel Generator Building, (2) underground piping, (3) Service Water Pump Structure and (4) Permanent Dewatering.

In the enclosure under Part I, we have identified the pertinent SSER sections where the geotechnical engineering staff has addressed the topics scheduled for the upcoming hearings. Under Part II of the enclosure we have identified either the SER or SSER sections or we have provided our response to the safety issues listed in the Stamiris and Warren contentions that are related to the identified hearing topics.

Any questions that you may have on the enclosed input may be referred to J. Kane (28153), Geotechnical Engineering Section, HGEB.

George Lear
George E. Lear, Chief
Hydrologic and Geotechnical
Engineering Branch
Division of Engineering

Enclosure:
As stated

cc: See next page

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9p.

cc w/o encl:
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L. Heller
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Midland Plant, Units 1 and 2

Docket Numbers: 50-329/330

Geotechnical Engineering Input into Staff Testimony

Prepared by: Joseph D. Kane, HGEB, NRR

PART I - PERTINENT SSER SECTIONS FOR HEARING TOPICS

1. Hearing Topic: Bearing Capacity beneath the Diesel Generator Building
SSER Section with Staff Safety Evaluation: | Section 2.5.4.4.2, | 2.5.4.5.1 |
Pg. 2-24 J. Kane | Pg. 2-31 J. Kane |
2. Hearing Topic: Underground Piping
SSER Section with Staff Safety Evaluation: | Pg. 2-35 J. Kane | Pg. 2-51 J. Kane |
| 2.5.4.7, | 2.5.4.8 |
Pg. 2-52 Kane | Pg. 2-53 J. Kane |
Pg. 2-15 Hsingh Sect. 2.5.4.3
3. Hearing Topic: Service Water Pump Structure | Pg. 2-16 S. Pavlos | Pg. 2-40 S. Pavlos |
SSER Section with Staff Safety Evaluation: | Sections 2.5.4.4.1, | 2.5.4.5.2, |
| 2.5.4.5.3, | 2.5.4.6.1.1, | 2.5.4.6.1.2, | 2.5.4.7, | 2.5.4.8 |
Pg. 2-42 S. Pavlos | Pg. 2-44 S. Pavlos | Pg. 2-46 S. Pavlos | Pg. 2-52 J. Kane | Pg. 2-53 J. Kane |
4. Hearing Topic: Permanent Dewatering
SSER Section with Staff Safety Evaluation: | Sections 2.5.4.4.4, | 2.5.4.5.5. |
Pg. 2-35 J. Kane | Pg. 2-42 J. Kane |
Permanent Dewatering | Liquefaction

PART II - RESPONSE TO CONTENTIONS

1. Stamiris Contention 4.C.b, as supplemented on 4/20/81 and as it pertains to this hearing session, reads as follows:
 1. Consumers Power Company performed and proposed remedial actions regarding soils settlement that are inadequate as presented because:
 - A. -----
 - B. -----
 - C. Remedial soil settlement actions are not based on adequate evaluation of dynamic response regarding dewatering effects, differential soil settlement, and seismic effects for these structures:
 - a. -----
 - b. Service Water Intake Building and Its Retaining Walls //
 - c. -----
 - d. -----
 - e. -----
 - f. -----

Staff Response

With respect to the concern on differential soil settlement, it is the staff's understanding of this contention that it is directed to the adequacy of the soil-structure interaction study for earthquake loading and whether that study for the underpinned Service Water Pump Structure properly evaluated the effects of differential soil settlement.

During earthquake loading the amount of settlement which will result in the foundation soils has been estimated using dynamic soil spring constants. As indicated in SSER Section 7.5.4.5.6, the staff has concluded that the soil shear moduli values, adopted by the applicant for use in dynamic analysis, are reasonable and acceptable and the applicant's decision to allow + 50% variation in the resulting soil spring constants is conservative. Therefore, the staff concludes that differential soil settlements have been properly addressed in the dynamic analysis of the underpinned Service Water Pump Structure.

Additional comments - Following underpinning - the entire SWPS ftn. will be on fill whose characteristics are essentially UNAFFECTED by dewatering. With removal of buoyancy, an increase in effective stress would occur. The eff. stress increase would have very little effect on shear wave velocity, V_s used to establish $C & R$. Remedial foundation measures for the seismic Category I retaining wall adjacent to the SWPS were not required. The staff has concluded that the plant fill problem did not extend to the foundation of this retaining wall.

2. Stamiris Contention 4.D, parts 1) and 2) reads as follows:

4.D.1) & 2) :

Consumers Power Company performed and proposed remedial actions regarding soils settlement that are inadequate as presented because:

A. -----

B. -----

C. -----

D. Permanent ^Wdewatering

1) would change the water table, soil and seismic characteristics of the dewatered site from their originally approved PSAR characteristics - characteristics on which the safety and integrity of the plant were based, thereby necessitating a reevaluation of these characteristics for affected Category I structures;

2) may cause an unacceptable degree of further settlement in safety related structures due to the anticipated drawdown effect; -----

Response to Part 1) of 4.D.

The NRC staff has considered the following information in its evaluation of the dewatering effects on the various plant subsoil layers at the Midland site.

- a. Because the long term dewatering will lower the groundwater level in the upper perched groundwater system to approximately el. 595 feet, there will be minimum effect to plant subsoils below this level which would include the approximately 150 feet thick preconsolidated impervious clay layer which separates the two groundwater systems. This impervious clay layer has been shown by subsurface explorations to be located between approximately el. 580 feet and bottom el. 430 feet in the auxiliary building area.
- b. In the depths of subsoils which will be affected by dewatering, the staff anticipates both improvements to the engineering properties of the foundation soils above el. 595 and certain adverse effects due to dewatering as discussed below. Reevaluation of soil engineering properties has been performed by methods that include additional subsurface explorations, laboratory testing and seismic surveys in the field. The staff's conclusions on this work are presented in SSER Sections 2.5.4.1.3, 2.5.4.2 and 2.5.4.3.
- c. An increase in the shear strength of the subsoils would reasonably be expected as dewatering would remove pore water and lower the water content of the foundation soils. This increased shear strength would result in higher margins of safety against bearing capacity type failures. The staff has not required the applicant to estimate the improvement in safety if acceptable levels of safety had been demonstrated under the more severe conditions (e.g. non-dewatered condition).
- d. Lowering the groundwater to levels below the walls of embedded structures will reduce lateral forces on foundation walls by removing water pressures. This reduction will result in an increase in structure stability.
- e. A potential adverse effect of long term dewatering could be the removal of soil finds caused by lowering and pumping of the groundwater in the dewatering wells. The staff's position has been, since the time dewatering was initially selected as a remedial measure, to ensure that a high quality dewatering system would be designed and properly controlled and installed in the field so as to avoid the loss of soil fines problem. The staff efforts in this regard are documented in 50.54(f) questions numbered 24, 47, 49, 50, 51, 52 and 53. The staff has met on several occasions and has participated in numerous conference calls with the applicant to resolve its safety concerns on the design and installation of the dewatering system. One of the more important documents which summarizes the staff's review effort is the letter of June 18, 1981 from R. Tedesco, NRC to J. Cook, Consumers Power Company.

As a check on the acceptability of the dewatering system design and field installation, the applicant has successfully completed the full

scale field drawdown and recharge test. The monitoring of loss of soil fines which has been completed with portions of both the temporary construction and permanent dewatering wells in operation has indicated that the dewatering system can safely operate and meet the required conservative acceptance criteria on loss of soil particles. The established criteria which ensures that the detrimental loss of soil particles will not occur requires that soil fines larger than 0.005 mm that are measured in the collected seepage water are not to exceed 10 parts per million. If this level is reached during plant operation the applicant is required to determine which well or wells are causing the loss of fines and to stop pumping from the well(s). If necessary, the problem well(s) will be repaired or replaced.

On the basis of the above information and our review of additional information provided by the applicant on permanent dewatering, the FSAR and technical reports, the staff has concluded in SSER Section 2.5.4.5.5 that the permanent dewatering system will eliminate the potential for liquefaction.

Response to Part 2) of 4.d.

The major disadvantage of dewatering on the plant subsoils is the removal of buoyancy. This removal causes an increase in the effective weight of the soil mass which in turn places greater loads on the foundation soils leading to greater soil compression. The staff pursued resolution with the applicant of its concern for increased soil compression due to dewatering in 50.54(f) questions numbered 33, 39(1), 40(1), 41(2)(b), 42(2)(e), 44(2) and 47(9). The staff is satisfied that the settlements estimated by the applicant to occur due to dewatering during plant operation are conservative and acceptable for use in structural analysis which evaluate the effects of these settlements. In addition, long term settlement monitoring during plant operation will be carried out to verify that estimated settlements are not being exceeded.

3. Warren Contention 2B expresses a concern for liquefaction of the foundation soils. The staff's evaluation of this issue has been provided in Section 2.5.4.5.5 of the SSER.

Attachment

The remaining contentions, some of which raise similar if not identical concerns, read as follows:

Stamiris Contentions

4. Consumers Power Company performed and proposed remedial actions regarding soils settlement that are inadequate as presented because:

Oct. 1982 SSER

A. Preloading of the diesel generator building

1) does not change the composition of the improper soils to meet the original PSAR specifications;

Oct. 1982 SSER
Pages 2-31, 2-32

2) does not preclude an unacceptable degree of further differential settlement of the diesel generator building;

Oct. 1982 SSER

3) does not allow proper evaluation of compaction procedures because of unknown locations of cohesionless soil pockets;

Oct. 1982 SSER

Post
Plan

4) may adversely affect underlying piping, conduits or nearby structures; and

Oct. 1982 SSER

5) yields effects not scientifically isolated from the effects of a rise in cooling water and therefore not measured properly;

May 1982 SER

Page 2-50, Par. 2.5.b.7

B. Slope stability of cooling pond dikes is not assured because they were built with the same improper soils and procedures (NCR QF172);

Response by
J. Kune
R. Gonzales
F. Rinaldi

Nov '82 session
for 4.C.b

C. Remedial soil settlement actions are not based on adequate evaluation of dynamic responses regarding dewatering effects, differential soil settlement, and seismic effects for these structures:

a. Aux. Bldg. Electrical Penetration Areas & Feedwater isolation Valve Pits

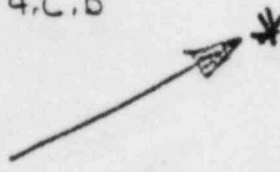
b. Service Water Intake Building & its Retaining Walls

c. Borated Water Storage Tanks

d. Diesel Fuel Oil Storage Tanks

e. DGB

BACKGROUND



f. Related Underlying Piping & Conduit

* D. Permanent dewatering

Response by
J. Kane
R. Gonzales
Nov '82 session

* 1) would change the water table, soil and seismic characteristics of the dewatered site from their originally approved PSAR characteristics - characteristics on which the safety and integrity of the plant were based, thereby necessitating a reevaluation of these characteristics for affected Category I structures;

Response by
D. Hood
Nov '82 session

* 2) may cause an unacceptable degree of further settlement in safety related structures due to the anticipated drawdown effect;

* 3) to the extent subject to failure or degradation, would allow inadequate time in which to initiate shutdown, thereby necessitating reassessment of these times.

Warren Contentions

Response by
J. Kane for
anticipated
Dec 82 session

1. The composition of the fill soil used to prepare the site of the Midland Plant - Units 1 and 2 is not of sufficient quality to assure that pre-loading techniques have permanently corrected soil settlement problems. The NRC has indicated that random fill dirt was used for backfill. The components of random fill can include loose rock, broken concrete, sand, silt, ashes, etc. all of which cannot be compacted through pre-loading procedures.

Response by
R. Gonzales
Nov 82 session

2A. Because of the known seepage of water from the cooling pond into the fill soils in the power block area, permanent dewatering procedures being proposed by Consumers Power Company are inadequate, particularly in the event of increased water seepage, flooding, failure of pumping systems and power outages. Under these conditions, Consumers cannot provide reasonable assurance that stated maximum levels can be maintained.

*
Response by
J. Kane
R. Gonzales
F. Rinaldi
Nov '82 Session

* 2B. Given the facts alleged in Contention 2.A, and considering also that the Saginaw Valley is built upon centuries of silt deposits, these highly permeable soils which underlie, in part, the diesel generator building and other class I structures may be adversely affected by increased water levels producing liquefaction of these soils. The following will also be affected:

- 1) borated water tanks
- 2) diesel fuel oil tanks.

Response
by J. Kane
for anticipated
Dec '82 session

3. Pre-loading procedures undertaken by Consumers Power have induced stresses on the diesel generating building structure and have reduced the ability of this structure to perform its essential functions under that stress. Those remedial actions that have been taken have produced uneven settlement and caused inordinate stress on the structure and circulating water lines, fuel oil lines, and electrical conduit.

Sinclair (OL) Contention #24

Response
by J. Kane
for anticipated
Dec '82 session

24. The present site for the Midland facility is not only inappropriate for the reasons set forth in Contention 9, but also affirmatively unsafe. Serious questions have been raised concerning the ground stability of portions of the site. At least one of the essential buildings of the reactor complex is reported sinking, and construction has been halted on that building. As a result of the serious and unresolved questions concerning ground stability, the findings required by 10 C.F.R. §§ 50.57(a)(3) and 50.57(a)(6) cannot be made. 1/

Marshall (OL) Contention #2

2. Present geological conditions, according to newspaper accounts, is causing the settling of the generator building at the Nuclear Power Plant site.

1/ This contention should be read to raise an issue not of site suitability, but of the quality of soils used at the site. Disregard the reference to Contention 9. The soils quality issue is raised by other contentions, such as Warren #1 and Stamiris 4A and 4B, for example.