



Consumers  
Power  
Company

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April 15, 1982

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



MIDLAND PROJECT  
MIDLAND DOCKET NO 50-329, 50-330  
MIDLAND SOILS SETTLEMENT REFERENCE INFORMATION  
SOURCE COMPILATION FOR SER EVALUATIONS  
FILE: 0485.16, 0505.16 SERIAL: 16639

In accordance with recent discussions between the NRC's management and Consumers Power Company's management, we are forwarding to the NRC a compilation of the soil-related informational sources available to the Staff for the Staff's use in completing its SER evaluations.

The enclosed document is composed of several separate lists, that is, one for each Standard Review Plan (SRP) pertinent to soils-related issues for Midland, each of which is keyed to the areas of review identified by the individual SRPs. The types of informational sources listed for these SRP's include Consumers' correspondence to the NRC, meetings and meeting summaries, telephone discussions with the Staff and its consultants, NRC technical audits, and hearing testimony transcripts.

We believe that the enclosed compilation of soils-related reference sources lends further support to our conclusion that the safety evaluations related to soils issues can be completed with the information already available to the Staff.

*For TW Cook*  
JWC/RLT/mkh

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8204200484 820415  
PDR ADOCK 05000329  
E PDR

CC Atomic Safety and Licensing Appeal Board, w/o  
CBechhoefer, ASLB, w/o  
MMCherry, Esq, w/o  
FPCowan, ASLB, w/o  
RJCook, Midland Resident Inspector, w/o  
RSDecker, ASLB, w/o  
DCFischer, ACRS, w/a  
SGadler, w/o  
JHarbour, ASLB, w/o  
GHarstead, Harstead Engineering, w/a  
RHernan, NRC, w/a  
DSHood, NRC, w/a (2)  
DFJudd, B&W, w/o  
JDKane, NRC, w/a  
FJKelley, Esq, w/o  
RBLandsman, NRC Region III, w/a  
WHMarshall, w/o  
JPMatra, Naval Surface Weapons Center, w/a  
WOtto, Army Corps of Engineers, w/o  
WDPaton, Esq, w/o  
SJPoulos, Geotechnical Engineers, w/a  
FRinaldi, NRC, w/a  
HSingh, Army Corps of Engineers, w/a  
BStamiris, w/o

ENCLOSURE

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

MIDLAND UNITS 1 AND 2  
DOCKET NO 50-329 and 50-330  
CONSUMERS POWER COMPANY

APRIL 14, 1982

\*NOTE: This is a set of listings of only the reference information for those sections of the SRPs which relate to soils settlement issues. Other information not related to soils issues can be found in the Midland FSAR or in other docketed submittals.

rp0482-1759f102

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 2.4.12  
Groundwater

I. Areas of Review

50.54(f) Q&R 24 - Shallow groundwater system, permeabilities, impact of water level changes to foundation conditions

50.54(f) Q&R 47 - Site dewatering adequacy to prevent liquefaction, well installation, operation and monitoring

50.54(f) Q&R 49 to 52 - Further response to questions on dewatering system design and assumptions and recharge sources and rates that could impact the system

06/04/80 US Corps of Engineers report to the NRC on Review of Geotechnical Aspects of the Seismic Safety of Midland Nuclear Plant

02/23/82 Meeting concerning recharge test results and proposed continuation of study. NRC meeting summary transmitted in NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results, proposed continuation of study, discussion of postulated failures and system response alternatives, liquefaction protection provided by systems, and other site areas which may not be protected from liquefaction (See NRC meeting summary transmitted in NRC letter of 3/16/82)

II.

SAR 2.4.12.1 Groundwater Description

50.54(f) Q&Rs 24, 47, 49, 50, 51, and 52

04/24/81 CP Co response to NRC requests for additional information on interceptor back-up wells (Serial 11818)

05/28/81 NRC letter with Staff comments on specification for dewatering

\*Note: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.

05/28/81 CP Co letter on permanent plant dewatering with revised Specification C-88 (Serial 12225)

09/02/81 NRC letter with Staff concurrence for installation of eight back-up wells

09/16/81 CP Co letter with request for installation of 44 dewatering wells (Serial 13774)

10/22/81 NRC letter with Staff concurrence to install permanent dewatering wells

11/12/81 NRC Region III Inspection Report concerning dewatering wells and FSAR rereview of findings

02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

## II.

SAR 2.4.12.2 Groundwater Usage

50.54(f) Q&Rs 24, 47, 49, 50, 51, and 52

04/24/81 CP Co response to NRC requests for additional information on interceptor back-up wells (Serial 11818)

05/28/81 NRC letter with Staff comments on specification for dewatering

05/28/81 CP Co letter on permanent plant dewatering with revised Specification C-88 (Serial 12225)

09/02/81 NRC letter with Staff concurrence for installation of eight back-up wells

09/16/81 CP Co letter with request for installation of 44 dewatering wells (Serial 13774)

10/22/81 NRC letter with Staff concurrence to install permanent dewatering wells

11/12/81 NRC Region III Inspection Report concerning dewatering wells and FSAR rereview of findings

02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

## II.

### SAR 2.4.12.3 Protection of Groundwater Users

50.54(f) Q&Rs 24, 47, 49, 50, 51, and 52

04/24/81 CP Co response to NRC requests for additional information on interceptor back-up wells (Serial 11818)

05/28/81 NRC letter with Staff comments on specification for dewatering

05/28/81 CP Co letter on permanent plant dewatering with revised Specification C-88 (Serial 12225)

09/02/81 NRC letter with Staff concurrence for installation of eight back-up wells

09/16/81 CP Co letter with request for installation of 44 dewatering wells (Serial 13774)

10/22/81 NRC letter with Staff concurrence to install permanent dewatering wells

11/12/81 NRC Region III Inspection Report concerning dewatering wells and FSAR rereview of findings

02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

## II.

### SAR 2.4.12.4 Design Bases for Subsurface Hydrostatic Loadings

50.54(f) Q&Rs 24, 47, 49, 50, 51, and 52

04/24/81 CP Co response to NRC requests for additional information on interceptor back-up wells (Serial 11818)

05/28/81 NRC letter with Staff comments on specification for dewatering

05/28/81 CP Co letter on permanent plant dewatering with revised Specification C-88 (Serial 12225)

09/02/81 NRC letter with Staff concurrence for installation of eight back-up wells

09/16/81 CP Co letter with request for installation of 44 dewatering wells (Serial 13774)

10/22/81 NRC letter with Staff concurrence to install permanent dewatering wells

11/12/81 NRC Region III Inspection Report concerning dewatering wells and FSAR rereview of findings

02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

06/04/80 US Corps of Engineers report to NRC on Review of Geotechnical Aspects of the Seismic Safety of Midland Nuclear Plant

03/16/82 Informal transmittal of site boring location drawings indicating loose sand layers subject to possible liquefaction sent to J Kane (NRC) and Paul Hadala (COE)

03/19/82 Telecon to NRC and COE concerning areas of site having potential for liquefaction beneath Category I facilities

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 2.5.1  
Basic Geologic and Seismic Information

I.2      Seismic Features

50.54(f) Q&R 24 - Shallow groundwater system, permeabilities, impact of water level changes to foundation conditions

50.54(f) Q&R 47 - Site dewatering adequacy to prevent liquefaction, well installation, operation and monitoring

50.54(f) Q&Rs 49 to 52 - Further response to questions on dewatering system design and assumptions and recharge sources and rates that could impact the system

06/04/80      US Corps of Engineers report to the NRC on Review of Geotechnical Aspects of the Seismic Safety of Midland Nuclear Plant

02/23/82      Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82      Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

03/16/82      Informal transmittal of site boring location drawings indicating loose sand layers subject to possible liquefaction sent to J Kane (NRC) and Paul Hadala (COE)

03/19/82      Telecon to NRC and COE concerning areas of site having potential for liquefaction beneath Category I facilities

I.3      Man-Made Conditions

50.54(f) Q&R 24 - Shallow groundwater system, permeabilities, impact of water level changes to foundation conditions

50.54(f) Q&R 47 - Site dewatering adequacy to prevent liquefaction, well installation, operation and monitoring

\*Note: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.



50.54(f) Q&Rs 49 to 52 - Further response to questions on dewatering system design and assumptions and recharge sources and rates that could impact the system

- 06/04/80 US Corps of Engineers report to the NRC on Review of Geotechnical Aspects of the Seismic Safety of Midland Nuclear Plant
- 02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82
- 03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82
- 03/16/82 Informal transmittal of site boring location drawings indicating loose sand layers subject to possible liquefaction sent to J Kane (NRC) and Paul Hadala (COE)
- 03/19/82 Telecon to NRC and COE concerning areas of site having potential for liquefaction beneath Category I facilities

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 2.5.4  
Stability of Subsurface Materials and Foundations

I.1.d Unstable Rocks or Soils

50.54(f) Q&R 24 - Shallow groundwater system, permeabilities, impact of water level changes to foundation conditions

50.54(f) Q&R 47 - Site dewatering adequacy to prevent liquefaction, well installation, operation and monitoring

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

03/16/82 Informal transmittal of site boring location drawings indicating loose sand layers subject to possible liquefaction sent to J Kane (NRC) and Paul Hadala (COE)

03/19/82 Telecon to NRC and COE concerning areas of site having potential for liquefaction beneath Category I facilities

I.1.f Consolidation and Preconsolidation Pressures and Methods

08/17/81 Soil preconsolidation pressure vs post overburden pressure of the DGB (Serial 13422)

I.2 Static and Dynamic Soil/Rock Properties Underlying Site

11/24/81 Results of soil borings and testing program for Aux Bldg (Part 2) (Serial 14874)

11/10/81 Results of soil boring and testing program for the BWST (Serial 14281)

11/06/81 Test results of soil boring and testing program for SWPS (Serial 14280)

09/22/81 Results of soil boring and testing program for Aux Bldg (Part 1) (Serial 13794)

07/31/81 Test results of soil boring and testing program for DGB (Serial 13382)

\*Note: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.

07/27/81 Final results of soil boring and testing program for perimeter and baffle dike areas (Serial 13340)

### I.3 Relationship of Foundations and Underlying Materials

11/24/81 Results of soil borings and testing program for Aux Bldg (Part 2) (Serial 14874)

11/10/82 Results of soil boring and testing program for the BWST (Serial 14281)

11/06/81 Test results of soil boring and testing program for SWPS (Serial 14280)

09/22/81 Results of soil boring and testing program for Aux Bldg (Part 1) (Serial 13794)

07/31/81 Test results of soil boring and testing program for DGB (Serial 13382)

07/27/81 Final results of soil boring and testing program for perimeter and baffle dike areas (Serial 13340)

### I.6 Groundwater Conditions and Dewatering

50.54(f) Q&R 47 - Site dewatering adequacy to prevent liquefaction, well installation, operation and monitoring

50.54(f) Q&R 49 to 52 - Further response to questions on dewatering system design and assumptions and recharge sources and rates that could impact the system

09/11/81 CP Co letter with new settlement plots, Borros Anchor and piezometer plots (Serial 13784)

07/27/81 CP Co letter with revised settlement plots and piezometer plots (Serial 12809)

06/04/80 US Corps of Engineers report to the NRC on Review of Geotechnical Aspects of the Seismic Safety of Midland Nuclear Plant

04/24/81 CP Co response to NRC requests for additional information on interceptor back-up wells (Serial 11818)

05/28/81 NRC letter with Staff comments on specification for dewatering

05/28/81 CP Co letter on permanent plant dewatering with revised Specification C-88 (Serial 12225)

09/02/81 NRC letter with Staff concurrence for installation of eight back-up wells

09/16/81 CP Co letter with request for installation of 44 dewatering wells (Serial 13774)

10/22/81 NRC letter with Staff concurrence to install permanent dewatering wells

11/12/81 NRC Region III Inspection Report concerning dewatering wells and FSAR rereview of findings

02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

#### I.7 Responses of Site Soils to Dynamic Loading

03/10/82 Settlement of underground diesel fuel tanks due to seismic shakedown (Serial 16243)

10/21/81 CP Co letter on remaining NRC concerns for the DGB (Serial 14316)

#### I.8 Liquefaction

50.54(f) Q&R 47 - Site dewatering adequacy to prevent liquefaction, well installation, operation and monitoring

06/04/80 US Corps of Engineers report to the NRC on Review of Geotechnical Aspects of the Seismic Safety of Midland Nuclear Plant

02/23/82 Meeting concerning recharge test results as documented in NRC meeting summary transmitted by NRC letter of 3/12/82

03/03/82 Meeting concerning recharge test results and liquefaction protection as documented in NRC meeting summary transmitted by NRC letter of 3/16/82

03/16/82 Informal transmittal of site boring location drawings indicating loose sand layers subject to possible liquefaction sent to J Kane (NRC) and Paul Hadala (COE)

03/19/82 Telecon to NRC and COE concerning areas of site having potential for liquefaction beneath Category I facilities

I.10 Foundation Material Stability, Deformation and Settlement Under Static Conditions

- 10/21/81 CP Co letter on remaining NRC concerns for the DGB (Serial 14316)
- 09/11/81 Table of Midland updated marker settlement vs time plots (Serial 13784)
- 02/23-26/82 Meeting on the Diesel Generator Building and Service Water Pump Structure as documented in NRC meeting summary of 3/12/82

I.11 Criteria and Design Methods for Static and Dynamic Analyses of Foundation Material

- 07/27/81 Final results of soil boring and testing program for perimeter and baffle dike areas (Serial 13340)

I.12 Techniques and Specifications to Improve Subsurface Conditions

- 03/18/82 Surcharge removal for the BWST valve pits (Serial 16559)
- 01/06/82 Aux Bldg underpinning freeze wall - effects of the freeze wall on utilities and structures (Serial 15424)
- 02/04/82 Aux Bldg soil remedial measures access shaft - augering method for soldier pile holes (Serial 15528)
- 11/16/81 Aux Building - response to NRC questions (Serial 14869)
- 11/06/81 Response to NRC request for additional information pertaining to the proposed underpinning of the SWPS (Serial 14843)
- 10/26/81 Surcharge of the BWST foundation (Serial 14591)
- 01/18-20/82  
and NRC audit of the Aux Building
- 02/01-05/82
- 03/15-19/82 NRC audit of the SWPS
- 03/26/82 Telecon closing items on SWPS: (1) soil spring constants; (2) construction dewatering; and (3) settlement monitoring plans.

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN Section 3.7.1  
Seismic Design Parameters

I.2 Critical Damping Values

12/14-15/81 Hearing transcript testimonies of Dr R P Kennedy,  
F Rinaldi, and J Matra

I.3 Supporting Media for Cat I Structures

50.54 (f) Q&R's 12, 24, & 25

03/23/82 Test Results of the Soil Boring and Testing  
Program for the Retaining Walls (Serial 16573 w/encl)

11/24/81 Results of Soil Boring and Testing Program for  
Auxiliary Building (Part 2)(Serial 14874 w/encl)

11/06/81 Test Results of Soil Boring and Testing Program  
for the SWPS (Serial 14280 w/encl)

09/22/81 Results of Soil Boring and Testing Program for  
Auxiliary Building (Part 1) (Serial 13794 w/encl)

07/31/81 Test Results of Soil Boring and Testing Program for DGB  
(Serial 13382 w/2 encl)

07/27/81 Updates of DGB Area Settlement and Piezometer Plots  
(Serial 12809 w/2 encl)

11/10/81 Results of Soil Boring and Test Program for the BWST  
(Serial 14281 w/3 encl)

10/21/81 Estimates of Relative Density of Granular Fire Materials  
Under the DGB (Serial 14316 w/8 encl)

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MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN Section 3.7.2  
Seismic System Analysis

I.1 Seismic Analysis Method

10/21/81      Relative Density and Shakedown Settlement of Sand  
                 Under the DGB (Serial 14316 w/8 encl)

12/14-15/81   Hearing transcript testimony of Dr R P Kennedy

I.3 Procedures Used for Analytical Modeling

Auxiliary Building

12/14-15/81   Hearing transcript testimonies of Dr R P Kennedy,  
                 F Rinaldi, and J Matra

50.54(f) Q&R 15

01/25/82      NRC letter summarizing 10/2/81 meeting on seismic  
                 models for Aux Bldg and SWPS

03/11/82      NRC letter summarizing 3/8/82 telecon on soil spring  
                 stiffnesses for Aux Bldg underpinning and Phase II  
                 construction

09/30/81      SWPS and Aux Bldg Seismic Models  
                 (Serial 14110 w/3 encl)

BWST

12/14-15/82   Hearing transcript testimonies of Dr R P Kennedy,  
                 F Rinaldi and J Matra

11/24/81      Addendum No 1 to the Design Report for  
                 the BWST Foundation Analysis (Serial 14902 w/encl)

SWPS

12/14-15/82   Hearing transcript testimonies of Dr R P Kennedy,  
                 F Rinaldi and J Matra

03/02/82      Appendix A: SWPS Three-Dimensional Finite-Element Models  
                 (Serial 16352 w/encl)

50.54(f) Q&R 15

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01/25/82 NRC letter summarizing 10/2/81 meeting on seismic models  
for the Aux Bldg and SWPS

DGB

01/08/82 Draft testimony of K Wiedner

50.54(f) Q&R 13

10/21/81 Relative Density and Shakedown Settlement of  
Sand Under the DGB (Serial 14316 w/8 encl)

I.4 Soil-Structure Interaction

12/14-15/81 Hearing transcript testimonies of Dr R P Kennedy  
and Paul Hadala.

50.54(f) Q&R's 13, 15, & 25

I.8 Interaction of Non-Cat I Structures with Cat I

02/23/82

to Meetings in Bethesda as documented in NRC meeting  
02/26/82 summary transmitted by NRC letter of 3/12/82

I.11 Methods Used to Account for Torsional Effects

12/14-15/81 Hearing transcript testimonies of Dr R P Kennedy,  
J Matra, and F Rinaldi

I.13 Analysis Procedure for Damping

12/14-15/81 Hearing transcript testimonies of Dr R P Kennedy,  
J Matra, and F Rinaldi



MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 3.7.3  
Seismic Subsystem Analysis

I.12 Category I Buried Piping, Tanks, Ducts, etc.

50.54(f) Q&R's 7, 17, 18, 19 & 20

03/16/82      Additional Information Concerning Safety Grade Buried Piping  
(Serial 16269 )

03/10/82      Settlement of Underground Diesel Fuel Tanks Due to  
Seismic Shakedown (Serial 16243)

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MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 3.8.4  
Other Category I Structures

I.2 Applicable Codes, Standards & Specs

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01-20-82  
- Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant

\*Note: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.

### I.3 Loads & Load Combinations

#### Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

#### SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/82 Draft Testimony by Applicant

#### DGB

02/24/82 Draft Testimony by Applicant

### I.4 Design & Analysis

#### A. Boundary Conditions & Behavior

#### Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
12/03/81 Addendum to Tech Report on Aux Bldg - Results of Static  
Analysis (Serial 14899)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

#### SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda

03/16/82  
     to     Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81 Draft Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant  
 02/24/82 Meeting w/Staff at Bethesda

B. Transmission of Lateral Loads & OTM

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
           (Serial 14110)  
 10/01/81 Meeting w/Staff at Bethesda  
 01/18/82  
     to     Audit by Staff at Ann Arbor  
 01/20/82  
     -     Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
 03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
           (Serial 16352)  
 09/17/81 Meeting w/Staff at Bethesda  
 02/23/82 Meeting w/Staff at Bethesda  
 03/16/82  
     to     Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81 Draft Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant  
 02/24/82 Meeting w/Staff at Bethesda

C. Computer Programs

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
           (Serial 14110)  
 12/03/81 Addendum to Report on Aux Bldg - Results of Static  
           Analysis (Serial 14899)  
 10/01/81 Meeting w/Staff at Bethesda  
 01/18/82  
     to     Audit by Staff at Ann Arbor  
 01/20/82  
     -     Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
 03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
 (Serial 16352)  
 09/17/81 Meeting w/Staff at Bethesda  
 02/23/82 Meeting w/Staff at Bethesda  
 03/16/82  
     to Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81 Draft Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant

D. Design ReportAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
 (Serial 14110)  
 12/03/81 Addendum to Tech Report Aux Bldg - Results of Static  
 Analysis (Serial 14899)

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
 03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
 (Serial 16352)

E. Structural AuditAuxiliary Building & FIVP

May/82 Forthcoming Audit

SWPS

03/16/82  
     to Audit by Staff at Ann Arbor  
 03/19/82

I.5 Structural Acceptance CriteriaA. Compliance with ACI & AISC

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
12/03/81 Addendum to Tech Report Aux Bldg - Results of Static  
Analysis (Serial 14899)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant

B. Cracks Issue

Auxiliary Building & FIVP

01/25/82 Evaluation of Cracking in the Feedwater Isolation Valve Pits  
(Serial 15493)  
01/29/82 Evaluation of Cracking in the Auxiliary Building Control  
Tower and Electrical Penetration Areas at Midland Plant  
(Serial 15527)  
12/10/81 Meeting w/Staff at Bethesda  
01/11/82 Meeting w/Staff at Bethesda  
- Testimony by Applicant

SWPS

03/02/82 Evaluation of Cracking in the Service Water Pump Structure  
(Serial 16009)  
12/10/81 Meeting w/Staff at Bethesda  
01/11/82 Meeting w/Staff at Bethesda  
12/31/81 Draft Testimony by Applicant

DGB

02/16/82 Evaluation of the Effect on Structural Strength of Cracks  
in the Walls (Serial 15978)  
10/02/81 Adina Concrete Cracking Analysis (Serial 14111)  
09/30/81 Meeting w/Staff at Bethesda  
12/10/81 Meeting w/Staff at Bethesda  
01/11/82 Meeting w/Staff at Bethesda  
02/24/82 Meeting w/Staff at Bethesda

I.6 Materials, QC, & Spl Constr TechniqueA. MaterialsAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
09/17/81 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

DGB

NA

B. Special Construction TechniquesAuxiliary Building & FIVP (Includes Const Analysis, Monitoring  
and Post Tensioning)

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
11/16/81 Response to NRC Staff Request for Additional Info  
Pertaining to the Proposed Underpinning of the Aux Bldg  
& FIVP (Serial 14869)  
10/01/81 Meeting w/Staff at Bethesda  
11/04/81 Meeting w/Staff at Bethesda  
02/26/82 Meeting w/Staff at Bethesda

01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
02/01/82  
to Audit by Staff at Ann Arbor  
02/05/82  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
- Testimony by Applicant

SWPS (Includes Const Analysis, Monitoring and Post Tensioning)

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
11/06/81 Responses to the NRC Staff Request for Additional Info  
Pertaining to the Proposed Underpinning of the SWPS  
(Serial 14843)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant  
03/02/82 Three-Dimensional Finite-Element Models for the SWPS  
(Serial 13652)

DGB

NA



MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 3.8.5  
Foundations

I.1 Description of Foundations

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
11/16/81 Response to NRC Staff Request for Additional Info  
Pertaining to the Proposed Underpinning of the  
Aux Bldg & FIVP (Serial 14869)  
10/01/81 Meeting w/Staff at Bethesda  
11/04/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
02/01/82  
to Audit by Staff at Ann Arbor  
02/05/82  
- Testimony by Applicant  
- Testimony by NRC Staff

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
11/06/81 Responses to the NRC Staff Request for Additional Info  
Pertaining to the Proposed Underpinning of the SWPS  
(Serial 14843)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage  
Tank Foundation Analysis (Serial 14339)  
01/13/81 Meeting w/Staff at Bethesda  
- Testimony by Applicant  
02/05/82 Testimony by NRC

NOTE: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.

DGB

NA

I.2 Applicable Codes, Standards & SpecsAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant  
- Testimony by NRC Staff

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three Dimensional Finite Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage  
Tank Foundation Analysis (Serial 14339)  
01/13/81 Meeting w/Staff at Bethesda  
- Testimony by Applicant  
02/05/82 Testimony by NRC

DGB

02/24/82 Draft Testimony by Applicant

I.3 Loads & Load CombinationsAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
 03/02/82 Three Dimensional Finite Element Models for the SWPS  
 (Serial 16352)  
 09/17/81 Meeting w/Staff at Bethesda  
 02/23/82 Meeting w/Staff at Bethesda  
 03/16/82  
     to Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage  
 Tank Foundation Analysis (Serial 14339)  
 01/13/81 Meeting w/Staff at Bethesda  
 02/23/82  
     to Meeting w/Staff at Bethesda  
 02/26/82  
     - Testimony by Applicant  
 02/05/82 Testimony by NRC

DGB

02/24/82 Draft Testimony by Applicant

I.4 Design & AnalysisA. Boundary Conditions & BehaviorAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
 (Serial 14110)  
 12/03/81 Addendum to Tech Report on Aux Bldg - Results of Static  
 Analysis (Serial 14899)  
 10/01/81 Meeting w/Staff at Bethesda  
 01/18/82  
     to Audit by Staff at Ann Arbor  
 01/20/82  
     - Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
 03/02/82 Three Dimensional Finite Element Models for the SWPS  
 (Serial 16352)  
 09/17/81 Meeting w/Staff at Bethesda  
 02/23/82 Meeting w/Staff at Bethesda

03/16/82  
     to     Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81   Draft Testimony by Applicant

BWST

11/13/81   Design Report for the Borated Water Storage  
             Tank Foundation Analysis (Serial 14339)  
 01/13/81   Meeting w/Staff at Bethesda  
             -     Testimony by Applicant  
 02/05/82   Testimony by NRC

DGB

02/24/82   Draft Testimony by Applicant

B. Transmission of Lateral Loads & OTM

Auxiliary Building & FIVP

09/30/81   Technical Report on Underpinning the Aux Bldg & FIVP  
             (Serial 14110)  
 10/01/81   Meeting w/Staff at Bethesda  
 01/18/82  
     to     Audit by Staff at Ann Arbor  
 01/20/82  
     -     Testimony by Applicant

SWPS

08/26/81   Technical Report on Underpinning the SWPS (Serial 13738)  
 03/02/82   Three Dimensional Finite Element Models for the SWPS  
             (Serial 16352)  
 09/17/81   Meeting w/Staff at Bethesda  
 02/23/82   Meeting w/Staff at Bethesda  
 03/16/82  
     to     Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81   Draft Testimony by Applicant

BWST

11/13/81   Design Report for the Borated Water Storage  
             Tank Foundation Analysis (Serial 14339)  
 01/13/81   Meeting w/Staff at Bethesda  
             -     Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant

C. Computer ProgramsAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
12/03/81 Addendum to Report on Aux Bldg - Results of Static  
Analysis (Serial 14899)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three Dimensional Finite Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage  
Tank Foundation Analysis (Serial 14339)  
- Testimony by Applicant

DGB

02/24/82 Draft Testimony by Applicant

D. Design ReportAuxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
12/03/81 Addendum to Tech Report Aux Bldg - Results of Static  
Analysis (Serial 14899)

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)

03/02/82 Three Dimensional Finite Element Models for the SWPS  
(Serial 16352)

BWST

11/13/81 Design Report for the Borated Water Storage  
Tank Foundation Analysis (Serial 14339)  
11/24/81 Addendum No 1 - Design Report for the BWST Foundation  
Analysis (Serial 14902)

E. Structural Audit

Auxiliary Building & FIVP

May/82 Forthcoming Audit

SWPS

03/16/82  
to Audit by Staff At Ann Arbor  
03/19/82

BWST

01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
April/82 Forthcoming Audit of Calcs

I.5 Structural Acceptance Criteria

A. Compliance with ACI

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
12/03/81 Addendum to Tech Report on Aux Bldg - Results of Static  
Analysis (Serial 14899)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
03/02/82 Three Dimensional Finite Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda

03/16/82  
     to     Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage  
           Tank Foundation Analysis (Serial 14339)  
 01/13/81 Meeting w/Staff at Bethesda  
     -     Testimony by Applicant  
 02/05/82 Testimony by NRC

DGB

02/24/82 Draft Testimony by Applicant

B. Factors of Safety-Sliding & OT

Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
           (Serial 14110)  
 12/03/81 Addendum to Tech Report on Aux Bldg - Results of Static  
           Analysis (Serial 14899)  
 10/01/81 Meeting w/Staff at Bethesda  
 01/18/82  
     to     Audit by Staff at Ann Arbor  
 01/20/82  
     -     Testimony by Applicant

SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
 11/06/81 Responses to the NRC Staff Request for Additional Info  
           Pertaining to the Proposed Underpinning of the SWPS  
           (Serial 14843)  
 09/17/81 Meeting w/Staff at Bethesda  
 02/23/82 Meeting w/Staff at Bethesda  
 03/16/82  
     to     Audit by Staff at Ann Arbor  
 03/19/82  
 12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage  
           Tank Foundation Analysis (Serial 14339)  
 01/13/81 Meeting w/Staff at Bethesda  
     -     Testimony by Applicant

DGB

NA

## I.6 Materials, QC, & Spl Constr Technique

### A. Materials

#### Auxiliary Building & FIVP

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
10/01/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
- Testimony by Applicant

#### SWPS

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
09/17/81 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

#### BWST

11/13/81 Design Report for the Borated Water Storage  
Tank Foundation Analysis (Serial 14339)  
01/13/81 Meeting w/Staff at Bethesda  
- Testimony by Applicant

### B. Special Construction Techniques

#### Auxiliary Building & FIVP (Includes Const Condition Analysis, Monitoring and Post Tensioning)

09/30/81 Technical Report on Underpinning the Aux Bldg & FIVP  
(Serial 14110)  
11/16/81 Response to NRC Staff Request for Additional Info  
Pertaining to the Proposed Underpinning of the Aux Bldg  
& FIVP (Serial 14869)  
10/01/81 Meeting w/Staff at Bethesda  
11/04/81 Meeting w/Staff at Bethesda  
01/18/82  
to Audit by Staff at Ann Arbor  
01/20/82  
02/01/82  
to Audit by Staff at Ann Arbor  
02/05/82



03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
- Testimony by Applicant

SWPS (Includes Const Condition Analysis, Monitoring  
and Post Tensioning)

08/26/81 Technical Report on Underpinning the SWPS (Serial 13738)  
11/06/81 Responses to the NRC Staff Request for Additional Info  
Pertaining to the Proposed Underpinning of the SWPS  
(Serial 14843)  
03/02/82 Three Dimensional Finite Element Models for the SWPS  
(Serial 16352)  
09/17/81 Meeting w/Staff at Bethesda  
02/23/82 Meeting w/Staff at Bethesda  
03/16/82  
to Audit by Staff at Ann Arbor  
03/19/82  
12/31/81 Draft Testimony by Applicant

BWST

11/13/81 Design Report for the Borated Water Storage Tank  
Foundation Analysis (Serial 14339)  
01/13/81 Meeting w/Staff at Bethesda  
- Testimony by Applicant  
02/23/82  
to Meeting w/Staff at Bethesda  
02/26/82

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 3.9.2  
Dynamic Testing and Analysis of Systems,  
Components, and Equipment

I.2.j. Seismic System Analysis for Category I Buried Piping Systems

- 10/20/80 NRC request for details of stress analyses for underground piping
- 11/14/80 CP Co response to request for stress analyses for underground piping (Serial 10113)
- 12/15/81 CP Co letter w/enclosed report "Analysis of Buried Piping for Midland" (Serial 15093)
- 02/03/82 Sample calc and Bechtel Design Guide C-2.44 on seismic analysis of underground piping
- 03/08/82 Informal transmittal to J Kane of service water pipe profile plots and borros anchor plots
- 03/16/82 CP Co Letter on future monitoring program and reinstallation of service water piping (Serial 16269)
- 01/20/81 Meeting to review the method of calculations for underground piping
- 05/04/81 Meeting on fill settlement and stresses in underground piping
- 10/06/81 Meeting to present CP Co demonstration-type solution on underground piping.
- 01/21/82 Meeting on future monitoring, geotech concerns, and seismic concerns for underground piping
- 02/05/82 NRC meeting summary for 10/6-7/81 meeting on proposed performance - based acceptance criteria for service water piping and other piping
- 02/11/82 Meeting to discuss underground piping terminal end analysis, rattlespace criteria, and pipe ovalization
- 08/10/81 Telecon to discuss how CP Co proposes to demonstrate structural integrity of underground piping

\*Note: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.

08/25/81 Telecon to discuss NRC position on proposals for the  
demonstration of underground piping integrity

01/08/82 Telecon concerning monitoring and rebedding of underground  
piping

03/24/82

03/25/82 Telecon on geotech parameters used for buried piping seismic  
analysis

02/05/82 CP Co written testimony for Soils Hearings

02/18/82

02/19/82 Soils hearings transcript

MIDLAND SOILS SETTLEMENT  
REFERENCE INFORMATION FOR SER EVALUATIONS\*

STANDARD REVIEW PLAN 9.5.4  
Emergency Diesel Engine Oil  
Storage and Transfer System

I.1.a Seismic Design Requirements

- 50.54(f) Q&R 33 - Load test buried tanks and impact piping connections
- 12/15/'81 CP Co letter on the Analysis of Buried Piping (Serial 15093)
- 03/10/82 Settlement of underground fuel tanks due to seismic shakedown (Serial 16243)
- 03/03/82 Meeting to discuss the liquefaction potential of loose sand layer (s)
- 03/19/82 Telecon with Paul Hadala (US Corps of Engineers WES) concerning liquefaction of loose sand layer(s)
- 03/30/82 Telecon with J Kane/P Hadala on additional boring data for the buried fuel tanks
- 02/18-19/82 Applicant and NRC testimony presented at Midland Soil Hearings

I.1.b System Design, Fabrication, Erection, and Testing to Quality Standards

- 50.54(f) Q&R 6.b - Settlement of buried tanks
- 50.54(f) Q&R 17 - Seismic Category I buried piping
- 50.54(f) Q&R 33 - Load test buried tanks and impact piping connections
- 50.54(f) Q&R 44 - Buried tank bearing capacity, settlement, and uplift stability
- 12/15/81 CP Co letter on the Analysis of Buried Piping (Serial 15093)
- 02/18-19/82 Applicant and NRC testimony presented at Midland Soil Hearings

\*Note: This is a listing of only the reference information and the subsections of this SRP which relate to soils settlement issues for Midland Units 1 and 2. Other information not related to soils issues can be found in the Midland FSAR or in separate submittals, meeting notes, etc.

I.1.f Protection from Natural Phenomenon and External Missiles

12/15/81	CP Co letter on the Analysis of Buried Piping (Serial 15093)
03/10/82	Settlement of underground fuel tanks due to seismic shakedown (Serial 16243)
03/03/82	Meeting to discuss the liquefaction potential of loose sand layer(s)
03/19/82	Telecon with Paul Hadala (US Corps of Engineers WES) concerning liquefaction of loose sand layer(s)
03/30/82	Telecon with J Kane/P Hadala on additional boring data for the buried fuel tanks
02/18-19/82	Applicant and NRC testimony presented at Midland Soil Hearings