Bechtel Associates Professional Corporation
Ann Arbor, Michigan

TECHNICAL SPECIFICATION

FOR

SUBCONTRACT FOR

AREA DEWATERING SYSTEM

FOR THE

CONSUMERS POWER COMPANY

MIDLAND PLANT

MIDLAND MICHIGAN

UNDER REVIEW

No.	DATE	REVISIONS	BY	CH'K	APP'R
0	6/12/84	ISSUE FOR BIDS			

ORIGIN: BAPC

CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1&2
MIDLAND MICHIGAN

JOB No. 7220
SPEC DES GUIDE No. C-88-Q
REV 0

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
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FACING SHEET

AREA DEWATERING SYSTEM
CONSUMERS POWER COMPANY
MIDLAND POWER PLANT UNITS 1&2
MIDLAND, MICHIGAN

JOB No. 7220

C-88-Q

ii

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AA-G-110273

TECHNICAL SPECIFICATION

FOR

SUBCONTRACT FOR

AREA DEWATERING SYSTEM

CONTENTS

1. SCOPE

A. GENERAL

1) The work to be performed under this Subcontract shall consist of designing a dewatering system capable of lowering the groundwater to a minimum el of 580' with the pond at el 627'+. The lowering of the groundwater will allow others to excavate portions of the auxiliary building and feedwater isolation valve pit in a dry condition. This specification includes Q-listed work to be performed exclusively by Contractor as noted in Article 7.

B. ITEMS INCLUDED

1) Design, furnish, install, maintain, operate, and remove dewatering system as indicated in the design drawings.

2) Provide and maintain standby equipment and power of sufficient capacity to perform the intended work.

3) Install, maintain, and observe observation wells and/or piezometers, and test pits for logging the water table elevations at the locations as required and approved by Contractor.

4) Dispose of the groundwater to the cooling pond by installing a piping system from the dewatering system indicated in the drawings to the site storm drain system via a weir box.

5) Provide protection of the dewatering system in areas designated as construction access as shown in the drawings.

6) Grout placement for all dewatering holes and wells upon completion of the subgrade dewatering.

C. RELATED ITEMS NOT INCLUDED

1) Access roads to the area

2) Inspect the water being pumped (weir box) to determine the amount of fines being removed.

3) Concrete grout for sealing holes and wells

4) The excavation required (trenching) to provide the areas for installing the dewatering systems

5) Location of all utilities, embedded plant facilities, and other subsurface structures at the location of the dewatering system

6) Drilling holes through the turbine building and auxiliary building concrete floors at el 614' at the locations required by Subcontractor

7) Repairing the holes drilled in the auxiliary building and turbine building concrete floors

2. QUALITY STANDARDS

A. GENERAL

1) Subcontractor shall be responsible for the quality of items and services to meet the requirements of this specification, applicable codes and standards, and other contract documents.

3. SUBMITTALS

A. STANDARD FORMS

1) Engineering document and quality verification document requirements are summarized in Form G-321-D and are augmented by detailed requirements in this specification.

B. PROCEDURES

Subcontractor shall submit the following procedures (in detail) to the satisfaction of Contractor.

1) Dewatering plant area procedure

2) Test pits procedure

3) Observation wells/piezometers procedure

4) Jetting procedure

5) Grouting procedure

4. SERVICE REQUIREMENTS

A. OPERATIONAL REQUIREMENTS

1) An adequate dewatering system shall be installed to lower and control the groundwater to provide a dry condition during construction, excavation, and placement of fill materials. The dewatering system shall be capable of lowering and continuously maintaining the groundwater level to el 600' initially so construction work can start and then lower and maintain the groundwater level as directed by Contractor to a minimum elevation of 580' until a written directive from Contractor to cease dewatering operations has been received.

2) The dewatering system shall be designed so there is independence between the pumping and discharge of the groundwater from beneath the Unit 1 auxiliary building and the pumping and discharge groundwater from the Unit 2 auxiliary building.

3) Contractor shall provide operating electrical power. The drawing will indicate these locations.

B. SUBCONTRACTOR'S RESPONSIBILITY

1) Subcontractor shall be solely responsible for the design, installation, operation, and removal of a dewatering system. This system shall prevent the loss of fines in the soil, seepage, boils, quick conditions, or softening of the foundation strata. The stability of sides and bottom of excavation shall be maintained, thereby resulting in every phase of the excavation and construction being performed in dry conditions.

C. DATA AVAILABLE

1) The subsurface data and preliminary pump test results are available upon request and are for Subcontractor's information only. Subcontractor assumes the responsibility for any deductions, interpretations, or conclusions made on the basis of these data.

2) The test boring report and the Dames and Moore Report for this plant are located at Contractor's office and are available for review.

3) The estimated elevation of the groundwater table is 627'.

D. APPROVAL OF DEWATERING SYSTEM

1) Approval by Contractor of the dewatering system proposed by Subcontractor will be only with respect to the basic methods Subcontractor intends to use. Approval of the dewatering system will be based on the demonstrated performance of the system to satisfy the requirements for dewatering as specified.

E. CONTROL

1) The observation wells, piezometers, and measurements of soil fines shall be used as a primary basis of determining compliance with the requirements of this specification.

2) Test pits shall be used only as directed by Contractor in writing.

5. FIELD OPERATIONS

A. GENERAL

1) Subcontractor shall furnish, install, operate, and maintain the dewatering system and, upon completion, remove all dewatering equipment except as approved in writing in advance by Contractor. Subcontractor shall perform all associated work required to remove and control the subsurface water so that the excavation, construction, and backfilling operations can be performed completely in dry conditions as approved by Contractor. All associated work required to remove and control local groundwater within the excavation will be done by others.

B. TRENCHING

1) Contractor shall perform excavation where required to allow for installation of the dewatering system.

C. TESTING DEWATERING SYSTEM

1) Prior to any excavation below the groundwater level, the dewatering system shall be tested and placed in operation to lower the water levels as required and shall function continuously as required to provide a dry construction area. The pumping shall continue until the excavation and backfill operations are completed to the upper limits of the original groundwater level. Subcontractor shall obtain written approval from Contractor before discontinuing the dewatering operation.

D. DISPOSAL OF WATER

1) Subcontractor shall be responsible for all surface and subsurface water resulting from its operations and shall dispose of all water removed from the dewatering system in a manner that will not endanger public health, property, or any portion of the work under construction by other Subcontractors and associates working in the area. The water shall be conveyed through piping from the dewatering system to the existing site storm drain system only after it has been monitored for soil fines by passing through the weir box.

E. STANDBY EQUIPMENT

1) Subcontractor shall provide standby equipment installed and available for immediate operation as may be required to maintain the dewatering adequately on a continuous basis in the event that all or any part of the dewatering system may become inadequate or fail.

2) Subcontractor shall provide and maintain in an operable condition standby diesel-powered pumps and/or generators of sufficient capacity to start and operate all pumps and other required dewatering equipment for the duration of the dewatering.

F. OBSERVATION WELLS

1) Subcontractor shall supply, install, take measurements, and maintain the required number of observation wells and/or piezometers and such additional observation wells as may be ordered by Contractor. Water levels in the observation wells and/or piezometers and volume of water shall be recorded and submitted to Contractor daily, Monday through Friday, during dewatering.

2) The observation wells shall be of a type that will permit portions of the riser to be removed as the excavation work progresses. The proposed type shall be submitted to Contractor for approval prior to installation.

3) Subcontractor shall, by adding or removing water from all observation well risers, demonstrate that the observation wells are functioning properly prior to commencement of dewatering.

4) Any observation wells and/or piezometers that become inactive, damaged, or destroyed by Subcontractor shall be replaced within 24 hours by Subcontractor at no additional expense to Contractor.

5) Jetting shall not be used for the installation of the observation wells/dewatering wells under any structure. Controlled jetting may be used for the installation of the observation wells/dewatering wells outside the structures, provided the jet water is brought up through the inside of the jetted casing and does not blow up the outside of the jetted casing The above is applicable after the casing has been installed 10 feet below the ground surface.

G. DEWATERING

1) Subcontractor shall be solely responsible for the arrangement, location, and depths of the dewatering system necessary to accomplish the work described under this section of the specification. Limits of the work are shown in the drawing. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head in water-bearing strata below any excavation to the extent that the water level and piezometric water levels in the construction area are substantially (a minimum of 3 feet) below the prevailing excavation surface; will prevent the loss

of fines, seepage, boils, quick conditions, or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in a dry condition. For the area outside of the structures where pervious soil strata overlay considerably less pervious soil strata above the subgrade level, the groundwater in the pervious strata shall be lowered to within less than 2 feet of the top of the less pervious strata. As the area is excavated to the top of the less pervious strata, any groundwater remaining perched in the pervious strata above the less pervious strata shall be removed by others.

2) The dewatering operation shall be controlled in such a manner that the amount of fines of the soil in the discharge water shall be limited to 5 ppm. This is to be determined by measuring the amount of fines in the weir box and corresponding water meter. Contractor shall perform this inspection as described in Article 6. of this specification.

3) Jetting of any type shall be approved in advance in writing by Contractor and as indicated in Subparagraph 5.F.5 of this specification.

4) If the dewatering requirements are not satisfied because of inadequacy or failure of the dewatering system, loosening of the foundation strata and/or instability of the slopes may occur. The supply of all labor, materials, and the performance of all work necessary to carry out additional work for reinstatement of foundation soil resulting from such inadequacy or failure shall be undertaken by Subcontractor to the full satisfaction of Contractor, and at no additional expense to Contractor.

5) Prior to any excavation below the groundwater level, the dewatering system shall be placed into operation to lower the water levels as required and then shall be operated continuously 24 hours a day, 7 days a week until construction and placement of the subgrade structure and backfill has been satisfactorily completed and no longer requires dewatering, as notified by Contractor in written form.

6) Subcontractor shall obtain written approval from Contractor before discontinuing the operation of the dewatering system.

7) Subcontractor shall seal, with 2,000 psi minimum concrete grout, any dewatering equipment buried or left in place under the structure and all observation wells, test pits, and holes after the dewatering

operation is discontinued in accordance with the latest Michigan Wells Act.

6. INSPECTION

A. CONTRACTOR

1) Contractor shall inspect the effluent of the well points to determine the amount of material (fines) being removed by the dewatering operation. This monitoring is Q-listed and shall be in accordance with 10 CFR 50, Appendix B.

2) The dewatering system shall be accepted by Contractor based on the quantity of fine observed in the weir box calibrated in gallons. The quantity of fines shall not exceed 5 gallons for every one million gallons of water (5 ppm) pumped. The quantity of fines shall be determined using a full flow weir box and an in-line flowmeter with a totalizer which will be provided by Contractor. Measurements shall be taken as close to a whole million-gallon figure as practical (i.e., 1 million, 2 million, 3 million, etc).

3) Each individual well shall also be inspected by Contractor during installation in accordance with the following criteria. After the initial 15 minutes of pumping, the effluent shall be tested for fines using an Imhoff cone.
   a) If the fines observed are 0.1 ml/l or less, the well shall be accepted.
   b) If the fines observed exceed 10 ml/l, the well shall be rejected and pumping stopped.
   c) If the fines observed are less than 10 ml/l, but more than 0.1 ml/l, the pumping shall stop. The well may be retested in accordance with the above criteria after a minimum of a 1-hour delay. If the well has not met the acceptance criteria for fines within three retests, the well shall be rejected and pumping stopped.

4) Records shall be maintained for each well and for the entire system, including the amount of fines, ppm or ml/l as applicable, each time readings are taken.

B. SUBCONTRACTOR

1) Subcontractor shall perform all inspection and recording of the piezometers/observation wells in accordance with its approved procedure. All other inspection shall be in accordance with Subcontractor's approved procedures.

7. CLEANING AND RESTORATION

A. Subcontractor shall leave the work area in the same condition as prior to the start of operation and to the satisfaction of Contractor.

8. QUALITY ASSURANCE REQUIREMENTS

A. The monitoring of the fines of the soil in the discharge water is Q-listed and shall be performed and controlled by Contractor's quality assurance program.

B. Contractor has the authority to stop or regulate any part of the dewatering operation to prevent damage to any part of Contractor's work.

9. MEASUREMENT FOR PAYMENT

A. BASIS OF MEASUREMENT

1) Mobilization and demobilization will be at a fixed price for each occurrence.

2) Designing, scheduling, furnishing, installing, and providing the dewatering system, complete with specified standby equipment and specified observation wells, piezometers, and test pits, will be paid on a fixed unit price basis.

3) Operation and maintenance of the dewatering system to ensure water-free excavation and backfilling operation (24 hours a day, 7 days a week) will be paid at a fixed calendar per diem rate.

4) The following items will be measured for direct payment, and the cost of such items shall be included in Item 2 above.
   a) Well point - per linear foot
   b) Collection and discharge headers - per linear foot
   c) Observation wells
   d) Piezometers
   e) Test pits
   f) Sealing with 2,000 psi concrete grout, all observation wells and/or piezometers, and any dewatering equipment buried or left in place

5) The following items will not be measured for direct payment, and the cost of such shall be included in Item 2 above.
   a) Monitoring and recording of observation wells
   b) Surveying as required to accomplish the work
   c) Any period during which the dewatering system is shut down because of malfunction of equipment or other unauthorized shutdown and the time required to operate the dewatering system to lower the

groundwater to its level before the unauthorized shutdown

6) The following items will be paid as extra work on a unit price basis:
   a) The cost of any dewatering equipment left in place as approved by Contractor

APPENDIX A

DOCUMENTATION REQUIREMENTS

1.0 The Subcontractor shall furnish documentation in accordance with the specification as summarized and directed by form G-321-D. To complete form G-321-D, the Subcontractor shall check in column 8 which documents are being transmitted, and shall sign line 21. The Subcontractor shall fill in lines 13 through 20 as applicable. Entries such as N/A (not applicable) and "See attached sheets" are permissible. The completed G-321-D form is then used for a cover sheet as directed on the back of the form.

Attachments:

1. Form G-321-D, Engineering and Quality Verification Document Requirements

Appendix A

READ INSTRUCTIONS ON BACK BEFORE FILLING IN FORM

These requirements for Engineering and Quality Verification Documents are to be fulfilled in accordance with the schedule set forth below. Supplier's failure to comply with these requirements may result in order cancellation or withholding of payment until compliance is established.

1. Document Category Number	2. Specification Paragraph Reference	3. Kind of Copies	ENGINEERING DOCUMENTS 4. Quantity Required: Initial	4. Quantity Required: Final	5. Prior Approval Required: Yes	5. Prior Approval Required: No	QUALITY VERIFICATION DOCUMENTS 6. Quantity Required for Release	7. Distribution Code	8. Supplier Conform Check	9. Inspection Release	10. Engineering Review	11. Field QCE Check In	12. Remarks
4.2E	3.B.5	Reproducible	1	1	X		N/A						
		Microfilm											
4.2E	3.B.1 3.B.2	Reproducible	1	1	X		N/A						
		Microfilm											
4.2E	3.B.3 3.B.4	Reproducible	1	1	X		N/A						
		Microfilm											
8.0E	4.D.1 5.F.2	Reproducible	1	1	X		N/A						
		Microfilm											
25.0V	4.E.1 5.F.1	Reproducible	N/A				2	C					
		Microfilm											
27.0H	4.D.1 5.C.1	Reproducible	1	1	X		N/A						
		Microfilm											
27.0V	4.D.1 5.C.1	Reproducible	N/A				2	C					
		Microfilm											
		Reproducible											
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		Microfilm											

13. Supplier's Order No. | 14. Supplier's Part No. | 15. Supplier's Part Name | 16. Quantity

17. Buyer's Req. Item No. | 18. Buyer's Line/Equip., Tag or Code No. | 19. Buyer's Part Name | 20. Traceability

21. **Supplier's Conformance Statement** — We certify that the listed work and required documents meet the requirements of the procuring documents. Supplier _____ Signature _____ Title _____ Date _____ ☐ YES, Noted under 12, Remarks ☐ NONE Authorized Deviations

22. **Inspection Release Statement** — Work was released based on satisfactory completion of inspection and review of documentation. Bechtel Inspector _____ Signature _____ Date _____

23. **Engineering Review Statement** — The Quality Verification Documents submitted to Engineering with this form have been reviewed for conformance to the specified requirements and are acceptable. Engineer _____ Signature _____ Date _____

24. **QCE Check-in Statement** — This form and the Quality Verification Documents referenced hereon have been received and their relationship to the hardware items verified. QCE _____ Signature _____ CONTROL NO. _____ FILE NO. _____ Date _____

After QCE Check-in Distribute to: Procurement Manager, Field Office Manager, Material Supervisor

JOB NO. 7220

P.O./SPEC. NUMBER 7220-C-88(Q)

SHEET 1 OF 4

MIDLAND PLANT UNITS 1 AND 2
CONSUMERS POWER COMPANY

ENGINEERING AND QUALITY VERIFICATION DOCUMENT REQUIREMENTS

QUALITY VERIFICATION DOCUMENT TRANSMITTAL—REPRODUCE THIS SIDE ONLY

S-321-0
AA REV 2
5/74

REPRODUCTION OF THIS FORM IS AUTHORIZED

INSTRUCTIONS FOR PREPARING G-321-O

A. PURPOSE: This is a multi-purpose form to be used by Buyer/Contractor to specifically identify documents required of the supplier to satisfy specification requirements, and is to be used by the supplier as a cover sheet for Quality Verification Documents when submitting them to the Buyer/Contractor.

B. GENERAL INFORMATION: Engineering (E) and Quality Verification (V) Documents are identified by Category number and title in section H, below.

C. USE: A copy of the front of this form shall be completed by the supplier and provided to the Buyer's/Contractor's Inspector along with the applicable Quality Verification Documents for his review prior to release of the unit(s).

D. DISTRIBUTION: All Engineering (E) Documents are to be sent to the Project Engineer at the address shown below (Code a).

When inspection release is completed, the Verification (V) Documents are to be distributed to the respective addresses shown below in accordance with the distribution code specified in Column 7. A copy of the completed Form G-321-O must accompany each "package" of Verification Documents to its destination. Also, a copy of completed Form G-321-O is to be included with the hardware shipment and a copy sent separately to the Project Field Quality Control Engineer at the jobsite.

Code a.	Code b. With hardware shipment	Code c.
Bechtel Associates Professional Co. P.O. Box 1000 Ann Arbor, Michigan 48106 Attn: Project Engineer, Job 7220	Bechtel Power Corp. 3500 E. Miller Rd. Midland, Michigan 48640	N/A

E. DEFINITIONS OF TERMS: (See also Document Category Definitions G-321-SUP A)

Supplier – This is a generic term and is synonymous with the terms seller, vendor, contractor, sub-contractor, sub-supplier, etc.
Reproducible – can be legibly duplicated by either macroreproduction or electrostatic dry process.
Microfilm – 35mm microfilm conforming to the requirements of the procurement documents. When not specified, supplier shall submit his standard for approval.
Prior Approval Required – Bechtel approval required prior to use of documents in the design, fabrication, installation, or other work process.
Initial – the first submittal of a document in accordance with the schedule mutually agreed to by the Buyer and the supplier.
Final – the submittal that reflects the resolution of review comments, or the complete submittal required. Both are to be accepted prior to rendering final payment. Drawings submitted as final must be full size reproducibles made from original document. Adjacent to the title block, each drawing must be certified and show Buyer's job title, job number, purchase order number, line, equipment, tag or code number, and the manufacturer's serial number(s).
Certified – the dated Signature and Title of an authorized and responsible employee of the supplier.
N/A – Not applicable – can be used for individual entries, columns and lines by Project engineering, and for individual entries by the supplier.

F. BECHTEL ENTRY INSTRUCTIONS

Entry No.	Information Required
1	Enter Document Category Number.
2	Enter Specification paragraph reference.
3	Make no entry. Relates to kind of copies required.
4	Enter the number of each kind of copy for "Initial" or "Final" submittals of Engineering Documents.
5	Enter approval requirement by X under "Yes" or "No" column.
6	Enter the number of each kind of copy of Quality Verification Documents required for release of the item or installation.
7	Enter Quality Verification Document distribution code letter in accordance with paragraph D above.
8	Make no entry. For supplier use only.
9	Bechtel Inspector to complete upon release. Sign on line 22.
10	Enter Bechtel Engineering review confirmation. Sign on line 23.
11	Bechtel QCE to complete check-in. Sign on line 24.
12	Enter remarks as appropriate.

G. SUPPLIER ENTRY INSTRUCTIONS

Entry No.	Information Required
8	Enter number of pages of each type of Quality Verification Documents being submitted for the unit(s) being released. Sign Statement of Conformance on line 21.
12	Enter remarks as appropriate. When a deviation has occurred, reference the deviation(s) and Buyer/Contractor's authorization in this column, and include the authorization document(s) in the Verification Document Package.
13, 14, 15	Enter information as required.
16	Enter the numbers of units covered by the Quality Verification Documents being submitted. For each requisition item no. being released provide a separate copy of this completed form and the supporting Quality Verification Documents.
17, 18, 19	Enter information as required.
20	Enter identification number(s) traceable to the unit(s) being released, e.g. serial no., heat no. of major component, cable reel no. or other unique designator.

H. DOCUMENT CATEGORY NUMBERS: Engineering (E) and Quality Verification (V) Document Requirements as entered in Column 1, and defined in G-321-SUP A Document Category Definitions. For details, see specification paragraph(s) referenced in Column 2.

- 1.0 DRAWINGS (E)
  - 1.1 Outline Dimensions, Services and Foundation/Mounting Details
  - 1.2 Assembly Drawings
  - 1.3 Shop Detail Drawings
  - 1.4 Wiring Diagrams
  - 1.5 Control Logic Diagrams
  - 1.6 P & IDs
- 2.0 PARTS LIST AND COST (E)
- 3.0 COMPLETED BECHTEL DATA SHEETS (E)
- 4.0 INSTRUCTIONS (E)
  - 4.1 Erection/Installation
  - 4.2 Operating
  - 4.3 Maintenance
  - 4.4 Site Storage and Handling
- 5.0 SCHEDULES: ENGINEERING AND FABRICATION/ERECTION (E)
- 6.0 QUALITY ASSURANCE MANUAL/PROCEDURES (E)
- 7.0 SEISMIC DATA REPORT (E)
- 8.0 ANALYSIS AND DESIGN REPORT (E)
- 9.0 ACOUSTIC DATA REPORT (E)
- 10.0 SAMPLES (E)
  - 10.1 Typical Quality Verification Documents
  - 10.2 Typical Material Used
- 11.0 MATERIAL DESCRIPTION (E)
- 12.0 WELDING PROCEDURES AND QUALIFICATIONS (E), AND VERIFICATION REPORTS (V)
- 13.0 WELD ROD CONTROL PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 14.0 REPAIR PROCEDURES (E), AND MAJOR REPAIR VERIFICATION REPORTS (V)
- 15.0 CLEANING AND COATING PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 16.0 HEAT TREATMENT PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 17.0 CERTIFIED MATERIAL PROPERTY REPORTS (V)
  - 17.1 MTR (Certified Material Test Reports)
  - 17.2 Impact Test Data
  - 17.3 Ferrite Data
  - 17.4 Material Certificate of Compliance
  - 17.5 Electrical Property Reports
- 18.0 CODE COMPLIANCE (V)
- 19.0 UT – ULTRASONIC EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 20.0 RT – RADIOGRAPHIC EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 21.0 MT – MAGNETIC PARTICLE EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 22.0 PT – LIQUID PENETRANT EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 23.0 EDDY CURRENT EXAMINATION PROCEDURES (E), AND VERIFICATION REPORTS (V)
- 24.0 PRESSURE TEST – HYDRO, AIR, LEAK, BUBBLE OR VACUUM TEST PROCEDURE (E), AND VERIFICATION REPORTS (V)
- 25.0 INSPECTION PROCEDURE (E), AND VERIFICATION REPORTS (V)
- 26.0 PERFORMANCE TEST PROCEDURES (E), AND VERIFICATION REPORTS (V)
  - 26.1 Mechanical Tests
  - 26.2 Electrical Tests
- 27.0 PROTOTYPE TEST REPORT (E & V)
- 28.0 SUPPLIER SHIPPING PREPARATION PROCEDURE (E)

DOCUMENT CATEGORY DEFINITIONS

(E) – Engineering Documents. This term comprises procedures, drawings, specifications, QA plans, prototype qualification test reports, and other similar documents that require Bechtel approval prior to fabrication, or prior to use of the document in the design, fabrication, installation, or other work process. The term is also applied to price lists, and instructional documents for handling, storage, maintenance, etc., that are of informational interest only to project engineering.

(V) – Quality Verification Documents. This term comprises material test reports, heat treatment charts, welding records, NDE results, performance test reports, etc., which demonstrate or certify conformance to the technical or inspection requirements of the procurement documents.

1.0 DRAWINGS (E)

1.1 Outline Dimensions, Services and Foundation/Mounting Details – Drawings providing external envelope, including lugs, center line(s), location and size for electrical cable, conduit, fluid, and other service connections, isometrics, and details related to foundations and mountings.

1.2 Assembly Drawings – Detailed drawings indicating sufficient information to facilitate assembly of the component parts of an equipment item.

1.3 Shop Detail Drawings – Drawings which provide sufficient detail to facilitate the fabrication or manufacture of the equipment item. This includes but is not limited to, spool drawings, heat exchanger internal details, internal piping and wiring, cross-section details and architectural details.

1.4 Wiring Diagrams – Drawings which show the schematic wiring and connection information for electrical items.

1.5 Control Logic Diagrams – Drawings which show the paths which input signals must follow to accomplish the required responses.

1.6 P & IDs – Piping and Instrumentation Diagrams which show piping system details and the basic control elements.

2.0 PARTS LIST AND COST (E) – Exploded view with identified parts and recommended spare parts for one year's operation with unit cost.

3.0 COMPLETED BECHTEL DATA SHEETS (E) – Information provided by a supplier on data sheets furnished by Bechtel which states serial numbers, operating ranges, etc., of equipment that the supplier intends to deliver to satisfy the specification requirements.

4.0 INSTRUCTIONS (E)

4.1 Erection/Installation – Detailed written procedures, instructions, and drawings required to erect or install material or equipment.

4.2 Operating – Detailed written instructions describing how an item or system should be operated.

4.3 Maintenance – Detailed written instructions required to disassemble, reassemble and maintain items or systems in an operating condition.

4.4 Site Storage and Handling – Detailed written instructions which define the requirements and time period, for lubrication, rotation, heating, lifting or other handling requirements to prevent damage or deterioration during storage and handling at jobsite. This includes return shipping instructions.

5.0 SCHEDULES: ENGINEERING AND FABRICATION/ERECTION (E) – Bar charts, critical path methods, etc., which chronologically detail the sequence of activities.

6.0 QUALITY ASSURANCE MANUAL/PROCEDURES (E) – The document(s) which describe(s) the planned and systematic measures that are used to assure that structures, systems, and components will meet the requirements of the procurement documents.

7.0 SEISMIC DATA REPORT (E) – The analytical or test data which provides physical response information on an item, material, component or system in relation to the conditions imposed by the stated seismic criteria.

8.0 ANALYSIS AND DESIGN REPORT (E) – The analytical data, (stress, electrical loading, fluid dynamics, etc.), which assures that an item satisfies specified requirements.

9.0 ACOUSTIC DATA REPORT (E) – The noise, sound and other vibration data required by specification which is in the audible range and above the seismic frequency.

10.0 SAMPLES (E)

10.1 A representative data package which will be submitted for the items purchased as required in the specification.

10.2 A representative example of the material to be used.

11.0 MATERIAL DESCRIPTION (E) – The technical data describing a material which a supplier proposes to use for a specific order. This usually applies architectural items, e.g.,metal siding, decking, doors, paints, coatings.

12.0 WELDING PROCEDURES AND QUALIFICATIONS (E), AND VERIFICATION REPORTS (V) – The welding procedure specification and support welding procedure qualification test records required for welding, hard facing, overlay, brazing and soldering. A verification report of welds perfor includes the identification of the qualified welder(s), and the procedure(s) used, and certification that the welder(s) were qualified.

13.0 WELD ROD CONTORL PROCEDURES (E), AND VERIFICATION REPORTS (V) – The procedures for controlling issuance, handling, storage traceability. Verification report(s) for weld rod are defined as certified material test reports which include the requirements defined by the code and mat specification imposed by the procurement documents.

14.0 REPAIR PROCEDURES (E), AND MAJOR REPAIR VERIFICATION REPORTS (V) – The procedures for controlling material removal and replacemer welding, brazing, etc., subsequent thermal treatments, and final acceptance inspection. Verification reports may include weld repair locations (maps), ma test reports for filler metal, pre-and-post-weld heat treatment records, NDE records, etc. The resolution of whether a repair is major or not is a Bc responsibility.

AUG 1 3 1979

To File

From TCCooke

Date August 10, 1979

Consumers Power Company

Subject MIDLAND PROJECT GWO 7020 - PRE-MEETING AND GENERAL MEETING WITH CONSULTANTS
File: B3.0.3 UFI: 00234-S Serial: CSC-4306

Internal Correspondence

CC Attendees
GSKeeley, P14-408A
DBMiller
RMWheeler
KCBrooks(2)

Attendees:

Karl Wiedner, Bechtel
Phil Martinez, Bechtel
Sheriff Afifi, Bechtel
Bimal Dhar, Bechtel
Al Boos, Bechtel
Art Arnold, Bechtel
Dr. Ralph Peck, Consultant
Dr. A. Hendron, Jr., Consultant
Dr. M. T. Davisson, Consultant
Chuck Gould, Consultant
Dick Loughney, Consultant
Tom Cooke, Consumers Power Company
Don Sibbald, Consumers Power Company
Don Horn, Consumers Power Company
Thiru Thiruvengandam, Consumers Power Co.

Please note that serials CSC-4274 and CSC-4255, above subject, omitted the location and dates of the meetings. Both meetings were held in Denver, Colorado. The Pre-Meeting (CSC-4274) was held on June 27, 1979, and the General Meeting (CSC-4255) was held on June 28, 1979.

Please attach this letter to your copy of the meeting notes.

sld

CAM 23

7 9 7 (Cla.) AUG 1 0 1979

TO File

FROM TCCooke/RMW

DATE August 8, 1979

SUBJECT MIDLAND PROJECT GWO 7020 - MEETING TO DISCUSS CONSULTANTS' REVISED PROPOSAL - CHANGE TO PERMANENT DEWATERING - JUNE 22, 1979
File: B3.0.3 UFI#-00234 Serial: CSC-4297

CC Attendees
KCBrooks (2)

Consumers Power Company

INTERNAL CORRESPONDENCE

Attendees

Consumers Power Company

T. C. Cooke
G. S. Keeley
D. B. Miller
W. R. Bird
B. W. Marguglio
D. E. Horn
T. R. Thiruvengadam
D. E. Sibbald
K. R. Kline

Bechtel Power Corporation

S. Afifi
R. L. Rixford
G. L. Richardson
L. A. Dreisbach
J. Milandin
G. Tuveson
A. J. Boos
D. Jinnett
R. Simanek
P. A. Martinez
W. Jones
J. Wanzeck
S. Blue
T. Johnson

After lunch at a meeting in Ann Arbor on June 19, 1979, the consultants got together and decided that there may be some advantages to the Project in installing a permanent dewatering system as an alternative to some of the fixes transmitted to the NRC in conjunction with the 50.54f. questions. In the opinion of the consultants, this revised scheme would resolve all questions for potential liquefaction; and, therefore, eliminate the problems associated with the chemical grout. The consultants had noted that the chemical grout in the area of the Diesel Generator Building would not be completed until June or July 1980 at the earliest. They also discussed the problems with the grout penetrating building cracks, utilities, etc. The railroad bay grouting is not required and no longer needs to be considered. The consultants also requested that the need for complete mining below the Auxiliary Building wings be re-evaluated if liquefaction problems are eliminated.

They stated there is a possibility the remaining work would include shear velocity testing underneath the Auxiliary Building electrical penetration areas to estimate contact stresses with possible grouting of local void areas. Profiling of pipes before and after dewatering and duct bank checks and verification would also have to be made. The piling solution for the service water structures will remain

unaffected. Resolution of whether or not permanent dewatering system would have to be a safety system and structure, the possibility of combining the permanent system with the temporary system, installation of Q-list monitoring wells, and a system to monitor the effluent for fines would be required. At the meeting on June 22, 1979, Mr. Tuveson also noted that he would have to recheck his design calculations on the buildings to see whether or not the removal of the buoyant forces would have any effect on the 40-year life of the structures.

The consultants apparently believe that the dewatering system would be easier to defend to the NRC and that it is a less complicated fix for liquefaction.

It was noted on June 22, 1979 that the consultants possibly did not consider the structural recheck required without the buoyant support or the FSAR revisions, which were primarily administrative in nature. W. Jones noted that the cost of total dewatering would be in the neighborhood of $10 to $15 Million with required redundancies. This was for a cased well with permanent submersible pumps considered. Dewatering for the Diesel Generator only would cost approximately $2 Million. This would be balanced by a savings of $2 Million for grouting, $2.2 Million for underpinning, $750,000 for dewatering, with nothing allowed for elimination of tie-up of the Diesel Generator area or mining obstructions.

As a sidelight, I&E Report 79-10 discussing Air Bubbles in the Tank Farm, was also suggested as a topic for the July 10 meeting with the NRC in Washington. Prior to the Thursday meeting with the consultants in Denver (June 28), a matrix should be drawn to show the advantages and disadvantages of various methods proposed to date. This would include not only our responses to the 50.54f. items and the consultants' latest proposal, but also some of the earlier alternates used which were previously discarded for one reason or another, since conditions have changed. These items will be discussed prior to the Thursday meeting with the consultants in Denver and at a meeting in Ann Arbor at 8:00 AM on June 27. It was also decided to send the MCAR 6 Interim Report with a copy letter noting that there are other evaluations being made at this time and mentioning the dewatering option.

pp

AUG 9 1979

TO File

FROM TCCooke/RJM

DATE August 6, 1979

SUBJECT MIDLAND PROJECT CWO 7020
GENERAL MEETING WITH CONSULTANTS
File: B3.0.3 Serial: CSC-4755 UFI#-00234.S

Consumers Power Company

INTERNAL CORRESPONDENCE

CC Attendees
GSKeeley, P14-408B
DBMiller
KCBrooks (2)

Attendees:

Karl Wiedner, Bechtel
Phil Martinez, Bechtel
Sherif Afifi, Bechtel
Bimal Dhar, Bechtel
Al Boos, Bechtel
Art Arnold, Bechtel
Dr. Ralph Peck, Consultant
Dr. A. Hendron, Jr., Consultant
Dr. M. T. Davisson, Consultant
Chuck Gould, Consultant
Dick Loughney, Consultant
Tom Cooke, Consumers Power Co.
Don Sibbald, Consumers Power Co.
Don Horn, Consumers Power Co.
Thiru Thiruvengadam, Consumers Power Co.

Introduction

P. A. Martinez noted that this meeting was being held to finalize the consultants' recommendations for information to be sent to the NRC on July 6 in preparation for the July 18 meeting. Mr. Martinez also stated that liquefaction and treatment of material below the Class I structures were the main topics and he briefly reviewed the discussion of the previous evening.

Liquefaction Potential and Sand Backfill around Category I Containment Structures

There is no problem with dewatering since the till can easily support the containment load of 10KSF. Containment Building diameter change of approxima , 1/4" due to pre-stressing is too trivial to consider and should be deleted from any concerns. The consultants stated that the permanent dewatering sys em should be designed to do the job regardless of site conditions (dike locations). After completion of the conceptual design, the initial wells should be installed and dewatering should quickly determine (a few weeks after start of pumping) what is required for the minimum practical design. The permanent dewatering system should contain sufficient redundancy, with more units than required for maintenance purposes. Routine maintenance and renovation over the years will take up a certain number of wells. Total system redundancy would not be required because there would be a time lag from the cessation of pumping before water in an area could rise to a critical level. It would probably be a good idea to have some standby (non-Q) power available for the pumps. To be practical, all power block areas should be dewatered whether problems are known or not. It was noted that Regulatory Guides overlooked the pumping of fines, however, this was thought to be key point and wells generally should be kept 30' minimum from structures on the permanent dewatering system. Continuous sand zones in till would be advantageous for drainage,

however, that condition cannot be assured. Mr. Loughney stated that we should put a ring of wells around the power block. The wells should extend to the clay till. Some of the temporary dewatering wells should be made permanent to allow draining of any crown water (rain, etc). It was again noted that the water would take a week or two to return to the power block area if the system stopped pumping. Since we would have time to make repairs or shut the plant down, only the piezometers need to be Q-listed. Mr. Loughney estimated that the wells should be at about 12' centers with sand vertical drains possibly to help drain crown and perched water tables and some wells in the middle for balance (critical area). The designer would have to plan his systems so as to prevent fines extraction (proper screens and/or distance). For an area of 600' x 500', Mr. Loughney estimated that 250 to 300 wells maximum with submersible pumps would be required on the perimeter. They could be of the type that has heavy wall plastic well screen which would be good for about 40 years. The pumps would normally have a five-year life and cost about $300 each. It could be assumed that about 20 to 30 pumps would go out each year. Timers would be required for the pumps and 440V would be the best voltage. The total well cost would be approximately $3,000 per well. Added to that would have to be the piezometers (Q-listed) and temporary or observations wells. Non-Q standby generators, if desired, could be purchased and installed for about $40,000. The cost of that, the piping and the electrical should be around $2 Million. It was estimated that $25,000 to $35,000 a year maintenance cost would be required after, say, 25 wells go out, and to take care of acid treatment of the wells at three-month intervals. A chemical grout curtain in sand around some pipes could be considered at a later date. However, this should not be a problem. If local clay areas are encountered, the wells should still remain at 12' intervals. The additional settlement due to the dewatering would be in the range of 0-1/2". The design changes required for a wet versus dry fill would be primarily administrative in nature in the FSAR below Elevation 618'. The bearing capacity and sliding friction would be enhanced. The settlement calculations have to be revised in any event. Wells should extend down to till. It was noted that the wells would be much more positive than grouting to prevent liquefaction. It would not be possible to ensure the grouting effectiveness. Dewatering totally eliminates the liquefaction problem.

Removal of Surcharge

The consultants noted that it would take approximately eight weeks of accurate readings prior to removal of the surcharge to obtain required evidence, even though an accurate prediction could probably be made at this time by bracketing the residual settlement expected. Although rebound is independent of long-term settlement, the data will be useful. The consultants need to see the trend on the settlement first Dewatering of the Auxiliary Building would change the trend conditions slightly. That would be the earliest time (present schedule) to remove the surcharge with dependable information. It was noted that about 0.032" has been the maximum deflection in the last three weeks, however, all of the data needs to have temperature corrections applied. Goldberg-Zoino-Dunnicliff are working on correcting the data for temperature. It was also noted that due to long-term settlement, some flexibility in the utilities may have to be designed into the connections based on the settlement predictions which could include differential settlement.

Chemical Grouting

Art Arnold noted that because of verification problems with chemical grout, it would not be necessary unless a very permeable trench was encountered during dewatering. Silica grout in the sand may be acceptable for that situation. It can be deleted as a remedial action from the responses because it is too much of a problem to prove to everyone's satisfaction that adequate grouting has been performed.

Need for Removal of Loose Sands Under the Diesel-Generator Structures

This requirement disappears with Option 5, however, settlement of sand due to vibration has to be calculated. The diesel generator should be started as soon as possible to induce the maximum settlement due to vibration. It is expected that this will be in the range 1/2 to 1" and take place in a few weeks. It would be better for predicting long-term settlement if the water table was not lowered. No other vibratory means approach the use of the diesel generator for pre-vibrating the foundations. Mr. Davisson noted that he needed the diesel generator rpm for his information. Mr. Afifi noted that the running of the generators would also help the seismic calculations. The exact amount of settlement will be determined at a later date based on refined data. At present, a refined calculation is needed because old calculations were based on saturated sand. Mr. Davisson noted that we should look hard at connections of utilities to the diesel generator and the building and that allowance should be made for a maximum of one-foot movement in any direction. This allowance would be over kill for any potential problems. The problem was further complicated because of the fact that there is sand on the north side of the foundation and clay on the south side of the foundation. The pre-load would predict an additional long-term settlement of the clay, then after the diesel generator run, any settlement due to vibration could be determined. We could then add seismic settlement of sand from the earthquake motion and dewatering settlement.

Need for Removal of Loose Sands and/or Soft Clays under Electrical Penetration Areas of FW Valve Pits

B. Dhar summarized the Auxiliary Building electrical penetration areas analysis. He included static and dynamic loads, horizontal and torsional loads. Mr. Dhar noted that the horizontal shear of approximately 1,200 to 1,300 Kips would be transferred to the soil and possibly through the soil to the Turbine Building and/or Containment Building which are analyzed as separate structures. It was noted that the upper floors of the Auxiliary Building wingwalls have a two-inch styrofoam cushion between the two floors and the Containment Building. The shear modulus is calculated from a composite 1,200 foot per second shear wave velocity. The cantilever portion of the structure is probably resting partially on the till and some load is being taken up by the structure. Based on preliminary analysis, a deflection of 1/4" to 1/2" is anticipated based on an uncracked section and ACI 381 "E" Value. The steel would reach a tensile stress of 50 KSI. 1,500 Kips vertical support at the end of wingwall would eliminate any serious cracking problem. This assumes that the soil would be taking zero load. If the structure is required to take the total moment load, two areas would be over-stressed. One would be the wall framing at the southwest area of the control tower and the other would be at the diaphram wall. At 3,000

Kips, there would be zero deflection in the structure (3,000 Kips vertical support applied at the end of the wingwall). A detailed analysis is in progress which will take approximately two to three weeks. The wingwalls could be tied to the Turbine Building slab for the horizontal support. We would also have to change the Auxiliary Building seismic analysis model to some extent. Chuck Gould then outlined the options for taking care of the Auxiliary Building electrical penetration areas problem as follows:

a. Temporary support of valve pit

b. Possible sky hook for the 1,500 Kip load contingent on further structure analysis

c. Excavate 7' beyond the bottom of the slab

d. Grout the loose sand to stabilize the working face

e. Start temporary Turbine Building slab support

f. After stabilizing, start work on five 4' diameter jacking caissons

g. Transfer the load from the sky hook and move to Unit 2

h. Install the remaining caissons for the 3,000 Kip load

i. Possibly drift east and soldier pile to support the excavation when the mass is removed (also serves as bearing support for the Turbine Building)

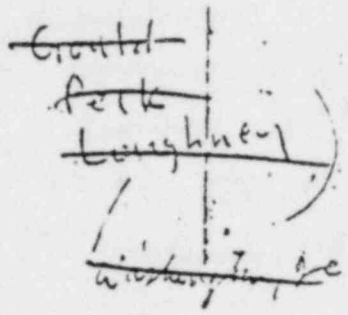
j. Excavate the fill

k. Fill the material back with lean concrete and then dry pack or grout afterwards. The maximum depth of lean concrete would be about 29'. It would take a long time to dry pack. The possibility of caissons settling would be discussed.

It was noted that the work could stop at Step h. Davisson then discussed some other options to include using the valve pit for access, removal of the soil under the valve pit to the till, and a tie to the electrical penetration area for horizontal shear. Possibly tying into the access gallery or mining valve pit fill, filling with concrete and tying in for horizontal loads would be a way to proceed. It was decided that we should install the caissons and transfer the horizontal load to the valve pit or Turbine Building slab with mining the balance of material under the electrical penetration area only if required by analysis.

The meeting then broke to allow the consultants time to write their preliminary report, a copy of which is attached. This report was briefly discussed following the break.

pp



28 June 1979

Re: Midland Units 1 and 2

The following comments are made by the consultants with respect to items of the agenda discussed today. The ~~items~~ numbers of the headings corresponding to the agenda items

cc: T.E. Johnson
V.C. Hinz
B. Dhar
R.L. Rinford
K. Wiedner
P.A. Martinez
R.L. Castleberry
P.K. Chan
W.R. Ferris
T. C. Cook (CPCo.)
T. Thiruvengadam (CPCo.)

~~Permanent Dewatering System Preliminary~~

An exterior deepwell dewatering system can be used to dewater the plant site, with a top dewatering system being used to remove the crown of the ground water within the dewatered area.

Sufficient redundancy can be provided to assure that the ground water will remain within the desired levels in the event of a disruption or failure of any part of the system.

It is anticipated that after the dewatering system has been operational for over six months that the system could be down from 1 to 2 weeks without the ground water rising above critical level.

The nature of the site, existing soil and backfilled soil is such that after the initial dewatering of the site, the quantity of flow entering into the dewatered area would be ~~about~~ less than ~~500~~ 300 gpm.

As determined ~~by~~ during the initial dewatering installation the spacing of the dewatering wells ~~would~~ be adapted to compensate for any unforseen soil conditions encountered and or any sources of recharge from the backfill placed around pipe lines extending to the pond and or any [illegible] water [illegible]

operational pipes located at critical points

Any equipment used to mop up the water within the exterior dewatering system would be left in place.

The required observation wells would be installed with the necessary controls at the proper locations to ascertain that the ~~drawdown~~ desired dewatered conditions are being obtained. The observational system would be required, and because of the built-in conservatism, the dewatering system would not

~~Daily~~ frequent monitoring of the ground water levels and the operating deep wells would be scheduled.

Repair, or replacement of non functioning pumps would be done when sufficient pumps are down.

Scheduled cleaning of the well screens would be performed about every 3 to 6 month period

Assuming a perimeter of 3000 feet the rough estimated cost of an exterior deepwell system complete with the ~~n~~ necessary discharge, electrical controls and wiring and standby generators would be about $1,200000. This assumes 250-300 deepwells.

To this should be added the cost of the interior mopup system, the observation wells and their controls, (probably $20,000) and the yearly maintenance cost.

The estimated yearly ~~re~~maintenance cost for treating the wells and repairing and or replacing the deepwell pumps is about $55,000.

To the above the cost of the monitoring should be added.

~~Attachment~~

2) Liquefaction Potential

Liquefaction analyses have been conducted by Bechtel, on the basis of Standard Penetration Tests, of the saturated sands below the Diesel Generator Building and various portions of the Auxiliary Building. These analyses have shown that the sands are not dense but do have a Factor of Safety against liquefaction of about 1.5 for an SSE with a maximum ground acceleration of 0.12g. Nevertheless, due to the erratic nature of the backfill, there is the possibility that some more pockets could liquefy under the

SSE (of 0.12g) and if the SSE were raised to a higher level, ~~0.20g~~, then liquefaction of much of the sand backfill would be a problem.

General areal dewatering is recommended to eliminate the liquefaction potential. The goal would be to lower the piezometric levels from the present ones to somewhere near the top of the till. Dewatering is a more positive fix than chemical grouting because the former can be positively monitored by piezometers whereas it may never be possible to positively prove the beneficial effects of grouting.

Even though liquefaction of loose sands is eliminated by densifying, the seismic shakedown will result in some residual settlement after an earthquake. The magnitude of these settlements should be estimated by Barkan, and should account for the effect of impeding stresses due to free water surface.

(1/4)

Memo Re: Agenda Item # 5

Support of Auxiliary Building

Date: 28 June 1979 Denver Holiday Inn Airport

By: M. T. Davisson — C. H. Gould

Information furnished (approximate) to consultants is listed below:

1. Containment analyzed as though free of other structures
2. Auxiliary " " " " " " "
3. Turbine " " " " " " "
4. Peak surge amplitude of auxiliary structure at cg is 0.38 in. for 0.12 g.
5. Auxiliary wings figure OK on uncracked section, but steel stress is 40 ksi on cracked section
6. 1500K at E & W ends of wings relieves overstress
7. 3000K " " " " " " restores original zero deflection
8. Horizontal force in each wing is 1250K

Methods of fix considered by consultants are:

A. Remove unsuitable material (and replace with mass conc) under valve pits and wings and permanently support R line of Turbine building on jack piles. Temporary support of wings with caissons at E & W ends

up to 3000 kips each.

B. Permanent support by caissons of E & W ends of wings with 3000 kips each end. Remove unsuitable material under valve pit and replace with mass concrete. Support K-line of Turbine Building with jack piles as required. Options are:

(1) Tie auxiliary building to Turbine mat for lateral seismic resestance

(2) Tie auxiliary building to valve pit and the concrete fill beneath it. Option is:

(a) Also tie valve pit to buttress access shafts for additional lateral resistance.

Construction procedures for jacked caissons have been thoroughly reviewed ~~by~~ in prior meetings. However, concept B above calls for permanent category I caissons; jack piles are not recommended. ~~The following items are pertinent to Category I jacked caissons~~ do jacked caissons:

1. Steel casing is ignored for permanent load carrying.

2. Concrete is now Q

3. Till is the supporting material.

4. Design pressure on till is twice that under the PSAR commitment. This is offset by following advantages:

   a. Proof load test to 1.5 times working load greatly exceeds the 1.12 (perhaps more 1.20) times working load in a seismic event. Analysis shows bearing value has adequate factor of safety, exceeding 2.5.

   b. Procedure calls for regacking piles to assure proper load sharing, as with temporary caissons.

We feel that solution B(1) above represents sound engineering. However, if NRC requirements dictate solution B(2) involves upgrading Category I to Category I.

~~Question~~ The consultants request the answers to the following:

1. Static deflection configuration of auxiliary wings under full cantilever treatment, cracked and uncracked.

2. Seismic analysis of auxiliary building with deflection configuration, accelerations at each floor level, edge forces due to rocking, horizontal forces to be resisted and locations.

3. Analysis of auxiliary wing stresses and deflections with 1500K and 3000K each at E and W ends.

~~4. [illegible] time history analysis of~~

M.T. Davisson
C.H. Gould
A.J. Hendron, Jr
R. Loughney
R.B. Peck

3. Diesel Generator Building

Removal of Surcharge. The longer the full surcharge can remain on the area, the more reliable will be the prediction of the clay-seated portion of the long-time settlement. For this reason, we would prefer to maintain constant conditions as long as ~~possible~~ practicable. We realize, however, that practical considerations do not permit an indefinite delay in surcharge removal. If a suitable means for making reliable temperature corrections to the readings of the piezometer gages, and be is unsuccessful we believe that removal could, if necessary, begin ~~by~~ in August. ¶ To this end, we suggest the fabrication and use of possibly four dummy gages, each consisting of a pair of rods in a casing of the same type as that in the actual gages. One rod of each pair would be of identical size and material to that in the ~~not~~ actual gages, and the other of invar of the same dimensions. Each assembly would terminate in a block of concrete placed on top of the fill ~~adjacent to~~ inside the building, adjacent to an active gage. The locations would be selected to

(over)

provide a range in length of dummy gages corresponding to the maximum range of the actual gages in the building.

In addition, ~~no doubt~~ all readings should be interpreted carefully and corrected for thermal effects. To the extent possible, readings should be made under constant conditions, as in the early morning.

Loose sands beneath the building will not compromise the static bearing capacity or lead to settlement under static loads applied after surcharge removal. Some settlement must be expected due to vibration of the ~~gas~~ diesel engines; this should preferably be induced by operating the machines before general dewatering of the area, whereupon the settlement will be correspondingly reduced during use of the machines in the future. Earthquake-induced settlements are discussed under Liquefaction Potential.

5) Need for Removal of Soft Sandy Under-
Diesel Generator Structure

If general, pinnacle bearing
is adopted, there is no need to excavate
the loose sandy soils the diesel generator
building. Their static stiffness and
bearing capacity is fully adequate for the
static and dynamic bearing pressure. The
connection of pipes and the building
equipment with the building must
be capable of taking the differential settlements
arising from the fact that the sands on
the north side of the Diesel generator
building will undergo more seismic
induced settlement than the sands

side of the structure supported on alluvial backfill is not likely to settle significantly under the seismic loading."

(-1) ~~Fair from liquefaction potential; problem disappears if permanent dewatering is adopted.~~

7. <u>Service Water Structure</u>

(-2) Service water structure underpinning with driven piles and a corbel is a positive solution. Even if liquefaction occurs, the piles maintain their buckling load as a minimum. The analysis of the structure should treat ~~the~~ piles in the normal manner; if the buckling load is ~~[illegible]~~ lower bound, the analysis should treat the piles as applying an upward load equal to the buckling load to the structure. The horizontal forces due to

main portion of the structure.

MAR 2 7 1980

Consumers Power Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • (517) 788-0550

March 27, 1980

Mr J A Rutgers
Project Manager
Bechtel Power Corporation
PO Box 1000
Ann Arbor, MI 48106

MIDLAND PROJECT -
50.54(f) MONTHLY STATUS REPORTS - SOILS
FILE 0485.16 UFI 00234(S); 71*01 SERIAL 8548

We require a more comprehensive listing of action items than currently given in the monthly reports. In addition to response written commitments listed in the reports, we believe it necessary to have all actior items related to and derived from the 50.54(f) responses.

Per your Mr Rixford, we understand that other action items or implied commitments are being inputted for the purpose of tracking progress. This information would be useful to us to access the impact of 50.54(f) questions.

To supplement your list we have attached three letters from T C Cooke which deal with 50.54(f) responses. Please review same and input appropriately to your system of tracking and statusing.

Additionally, please add action items as follows:

1. Project Engineering is to provide a document which will prohibit final connecting piping until December 31, 1981 in accordance with the response to Question 27.

2. Consumers Power Company will advise Bechtel when underpinning and dewatering activities are to commence.

3. Resolve previous decision to the effect that by the end of 1979 all settlement readings can be compared to some criteria for indication of excessive settlement prior to exceeding total allowable settlement.

G C Keeley
Project Manager

CFK/TCC/RWS/cd

BCC DBMiller, Midland (3)
TCCooke, Midland
TRThiruvengadam, P-14-212

Comments from TRT — SOILS 50.54(f)

① Piezometer plots, description and table need a short descriptive Note tying all of them into one coherent presentation.

② Piezometers 1 to 16 (Total of 16) do not have the soil condition (types) recorded. Is it possible that Bechtel could go through bore hole data and identify the soil conditions.

③ Out of total 48 piezometers, 16 have no data, 19 are placed in sand and 13 are placed in clay. With the available data, 13 is not a large ~~a~~ proportion. Piezometers in sand are of no help in evaluating consolidation of clay.

④ The Criteria for location of observation wells ~~is~~ does not answer the question asked. The information provided only relates how the piezometers came to be placed at their location. What NRC wanted is what is the criteria used to locate the wells (design criteria.)

⑤ Not clear as to why Table 4-1C is here.

⑥ Consultants Summary - ~~How~~ There are two summaries from RR Peak. Should be tied together

T1/+

Bechtel Power Corporation
777 East Eisenhower Parkway
Ann Arbor, Michigan
Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

July 31, 1979

BLC-7953

Consumers Power Company
Mr. G. S. Keeley
Project Manager
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
SUMMARIES of PRESENTATIONS
to the NRC on JULY 18, 1979
Files 1605/2801

Dear Mr. Keeley:

Attached are summaries of the presentations made by Bechtel personnel and consultants at the meeting with the NRC in Bethesda on July 18, 1979.

Agenda Item No.	Presenter
3.6	C. Gould
3.7	S. Afifi
3.8	R. Loughney
4.1, 4.2, 4.3	T. E. Johnson
4.4	S. Afifi
5.0	R. Peck
7.0	P. A. Martinez

These attachments are for use in preparing a meeting summary for the NRC. As agreed, we will be available for discussion on this summary or possible reworking of the material submitted as soon as you have had a chance to review it.

Very truly yours,

P. A. Martinez
Project Manager

PAM/RCR/pp
Attachments 7

AUG 1 1979
PROJECT MANAGEMENT

Agenda
Item 3.6

C. H. GOULD, P.E.
1165 Bardstown Trail
Ann Arbor, Mi 48105
313/663-5028

GEOTECH
ANN ARBOR
DISTRIBUTION

DISC	ACT	INFO	W/A	INIT
MGR		1		
ADMIN				
DRFT				
SOILS		2		
		3		
		4		
		5		
Primary				
Primary	X			

JOB 7220 FILE 2140
REC'D OCT 24 1979 3130

July 23, 1979

Bechtel Associates Professional Corporation
777 East Eisenhower Parkway
P. O. Box 1000
Ann Arbor, Michigan 48106

Attention: Dr. S. Afifi

Reference: Meeting with NRC, July 18, 1979

Dear Sherif:

Enclosed is an outline summary of my presentation at the referenced meeting. The outline correlates to the overhead slide sequence previously furnished the NRC.

Yours very truly,

C H Gould

C. H. Gould, P.E.
State of New York

CHG/nm
Enclosure

C. H. GOULD, P.E.

1. Chuck Gould, private consultant to Bechtel on underpinning.

2. Remedial measures for "Wings"

   A. Locate on plan
   B. Explain 1/2 plan and symetry.
   C. Electrical penetration area of auxillary building equals "wings"

3. Design of Remedial Measure

   A. Area to be supported equal crosshatched area
   B. Underpinning design

      1) Permanent, positive and tested support

         a. Passing thru fill
         b. Founded in undisturbed till.

      2) Provide installation procedure capable of

         a. Passing thru

            (1) Loose sands
            (2) Soft clays
            (3) Dewatered state
            (4) Man-made (concrete) obstructions
            (5) Highly compacted sand and/or clay

         b. Minimizing loss of ground

         c. Jacked caissons

            (1) Push thru loose and soft materials without excavation
            (2) Man-size access for derolition of obstructions and excavation of compacted soils.

4. Plan of Attack

   A. Temporary support of valve pit at ground surface.

      1) Bearing on turbine foundation walls and buttress access shaft

   B. Excavate access shaft
   C Mine drift under valve pit
   D. Install permanent caissons under end of wing

      1) Control settlement to 1/2 inch
      2) Stress, test and transfer load.

   E. Install temp support caissons and tangent caissons in vicinity of isolation valve pit.
   F. Mass excavate all fill under isolation valve pit down to till
   G. Fill excavation and drift under wing with concrete
   H. Transfer valve pit to mass concrete

5. Questions

NOTE: For the record Dr. R. Peck stated that a group load test to 1.5 times design load* would be performed on the caissons which support the wing. I communicated to both Dr. Peck and Lyman Heller that it was our intention to load test each caisson individually to 1.5 times design load and group test to 1.0 times design load or a maximum upward vertical movement** of the structure not to exceed 1/4"; whichever occurrs first.

* Design load = calculated dead and line load.
** Movement = distance travelled during the test period of time.

Agenda Item 3.7

DRAFT

SUMMARY OF PRESENTATION MADE TO THE NRC ON 7/18/79 IN WASHINGTON D.C.

This is the input required by S. S. Afifi into the summary requested by the NRC. Consultants R. D. Peck, W. Loughney are planning to submit summaries for the portions for the presentation. C. H. Gould already gave us his portion of the summary.

Item 3.7

LIQUEFACTION

Figure 1 presents a summary of the predominant fill condition (material type and density) below various category I structures supported on plant area fill. The figure shows the fill under all category I structures supported on plant fill consists of both sand and clay except for the borated water and diesel fuel tanks where the fill is predominantly clay. Liquefaction evaluations were made for the auxiliary building-control tower area, auxiliary building-railroad bay and the diesel generator building. No liquefaction analyses were made for other areas. Liquefaction evaluation was based on experience at sites where liquefaction did or did not occur and access to pertinent information regarding earthquake magnitude, distance from the source, ground surface acceleration were either known or possible to estimate.

Figure 2 is plot of the cyclic shear stress ratio causing liquefaction versus the standard penetration blowcount corrected to an equivalent overburden pressure of 2,000 pounds per square foot. The figure correlates the shear stress causing liquefaction in the field and the penetration resistance of the sand. Utilizing this figure, if the standard penetration resistance is known at a certain site along with other pertinent information regarding the soil column, the strucutre and ground surface acceleration, a point can

be plotted on this graph. The horizontal coordinate of this point will be the standard penetration resistance after correction to an equivalent overburden pressure of 2,000 psf and the vertical coordinate will be the shear stress ratio induced during the earthquake. If the point falls below the line, this will indicate liquefaction would not occur. On the other hand, if the point plots above the line, this would indicate that liquefaction is possible. This can be illustrated in terms of factor safety as follows.

$$\text{Factor of safety} = \frac{\text{cyclic shear stress causing liquefaction}}{\text{induced cyclic shear stress}}$$

The liquefaction evaluation was based on ground water table at elevation 627 and ground surface acceleration of 0.12g and did account for surcharge from the structure. It is noted that figure 2 is based on data for magnitude 7.5 earthquake which constitutes a very conservative basis for evaluation of liquefaction at Midland.

Utilizing this information the line representing a safety factor of 1.5 has been calculated and superimposed upon the standard penetration blowcount versus depth for the norhtwest and northeast areas of the diesel generator building as shown in Figure 3 and 4. The figure also shows the line representing a factor of safety of 1.1. It is seen from Figure 3 that a good number of the standard penetration blow counts are less than there required for the acceptable factor safety of 1.5. Evaluation of the sands in the northwest area of the building indicates that some of these loose sands may be connected. Figure 4 shows that the great majority of the penetration tests indicate a safety factor well in access of 1.5 with the exception of three cases below 1.5.

Figure 5 is a similar plot for the auxiliary building railroad bay showing that all except a few of the standard penetrations values are well in excess of the required safety factor of 1.5. Some blowcounts in borings AX-1 and AX-10 between elevations (619-623) show a factor of safety slightly below 1.5, but these occur within a limited thickness and the neighboring boring AX-2 indicate much higher factors of safety within the same depth range.

Figure 6 illustrates that the standard penetration blowcounts from boring AX-9, AX-6 and AX-18 under the control tower indicate a factor of safety in excess of the required 1.5 in all cases.

In conclusion, liquefaction analyses show that there could be a liquefaction problem at the diesel generator building. Borings also indicate liquefaction is very unlikely in the railroad bay and that there is no liquefaction problem in the control tower area.

In order to eliminate liquefaction questions any where at the site in Midland a general dewatering scheme has been adopted. In this scheme the ground water talble will be lowered to the approximate elevation of 600.

Item 3.7

SETTLEMENT DUE TO EARTHQUAKE SHAKING

With elimination of liquefaction potential the remaining factor to be considered is settlement of sand due to ground shaking. Analysis was conducted on the basis of studies by Seed and Silver (1972) and Finn and Byrne (1975) which considered relative density , number of earthquake cycles, ground surface acceleration level, thickness of the sand, effects of multi-directional shaking, and the presence of the structures. Relative density was evaluated on the basis of Gibbs and Holtz relationships. The number of earthquake

cycles were taken as 10 in the Seed and Silver analysis. Finn and Byrne analysis was based on the recorded El-Centro earthquake. Acceleration level was taken as 0.12g for the SSE and 0.06g for the OBE. Thickness of the sands were based on the soil borings. Multi-directional shaking effects were counted for by multiplying the calculated uni-directional settlements by a factor of 2.5. The structure was accounted for as if it was a uniform surcharge.

Preliminary analysis based on these parameters indicated a settlement range of 1/2 inch to 1 inch for the diesel generator building area. It is noted that these estimates are conservative since they are based on the assumption that the sand is dry. Because the sand will be moist, the presence of capillary force will reduce actual settlements below those predicted.

SOILS SUMMARY

The diesel generator building settlement noted in August of 1978 were larger than expected. An exploration program was initiated to investigate the seat of the settlement and Drs. Peck and Hendron were consulted to discuss the evaluations and corrective actions required. Based on the exploration and the consultants recommendations it was decided to surcharge the building and surrounding area with a load exceeding the operating load. Instrumentation was installed to evaluate rate of soil consolidation and settlements of the structure and supporting soils. The preload was completed to a height of 20 feet by late March 1979.

Figures 7 through 10 illustrate locations of the various instruments associated with the preload program. Figure 7 shows the locations of building survey

STRUCTURES	SUPPORTING SOIL TYPE
A. AUXILIARY BUILDING	
1). CONTROL TOWER	Medium dense to very dense sand.
2). UNIT 1 ELECTRICAL PENETRATION AREA	Dense to very dense sand with layers of loose sand and soft clay
3). UNIT 2 ELECTRICAL PENETRATION AREA	Medium dense to dense sand with medium stiff clay layers.
4). RAILROAD BAY	Medium to very dense sand.
B. FEEDWATER ISOLATION VALVE PITS	
1). UNIT 1	Loose to dense sand and medium stiff to very stiff clay.
2). UNIT 2	As UNIT 1.
C. SERVICE WATER PUMP STRUCTURES	Soft to very stiff clay and loose to very dense sand.
D. BORATED WATER TANKS	Medium to stiff sandy clay to clay.
E. DIESEL FUEL TANKS	Medium to stiff sandy clay to clay.
F. DIESEL GENERATOR BUILDING	Soft to stiff clay and loose to dense sand.

FIGURE 1 - SUMMARY OF PREDOMINANT FILL TYPE AND CONDITION BELOW VARIOUS CATEGORY I STRUCTURES SUPPORTED ON PLANT AREA FILL

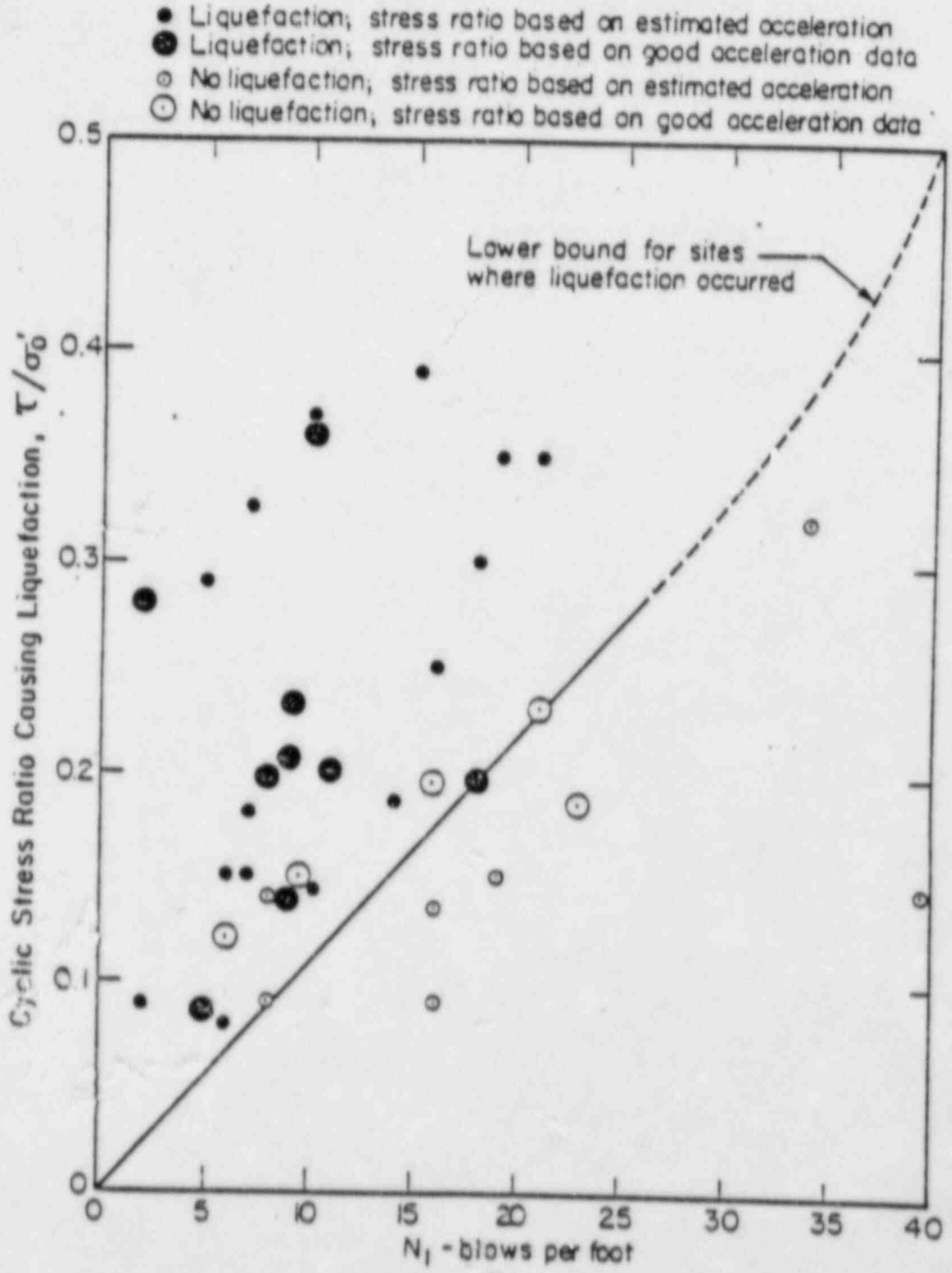


Fig. 2 CORRELATION BETWEEN STRESS RATIO CAUSING LIQUEFACTION IN THE FIELD AND PENETRATION RESISTANCE OF SAND. (after Seed et al.)

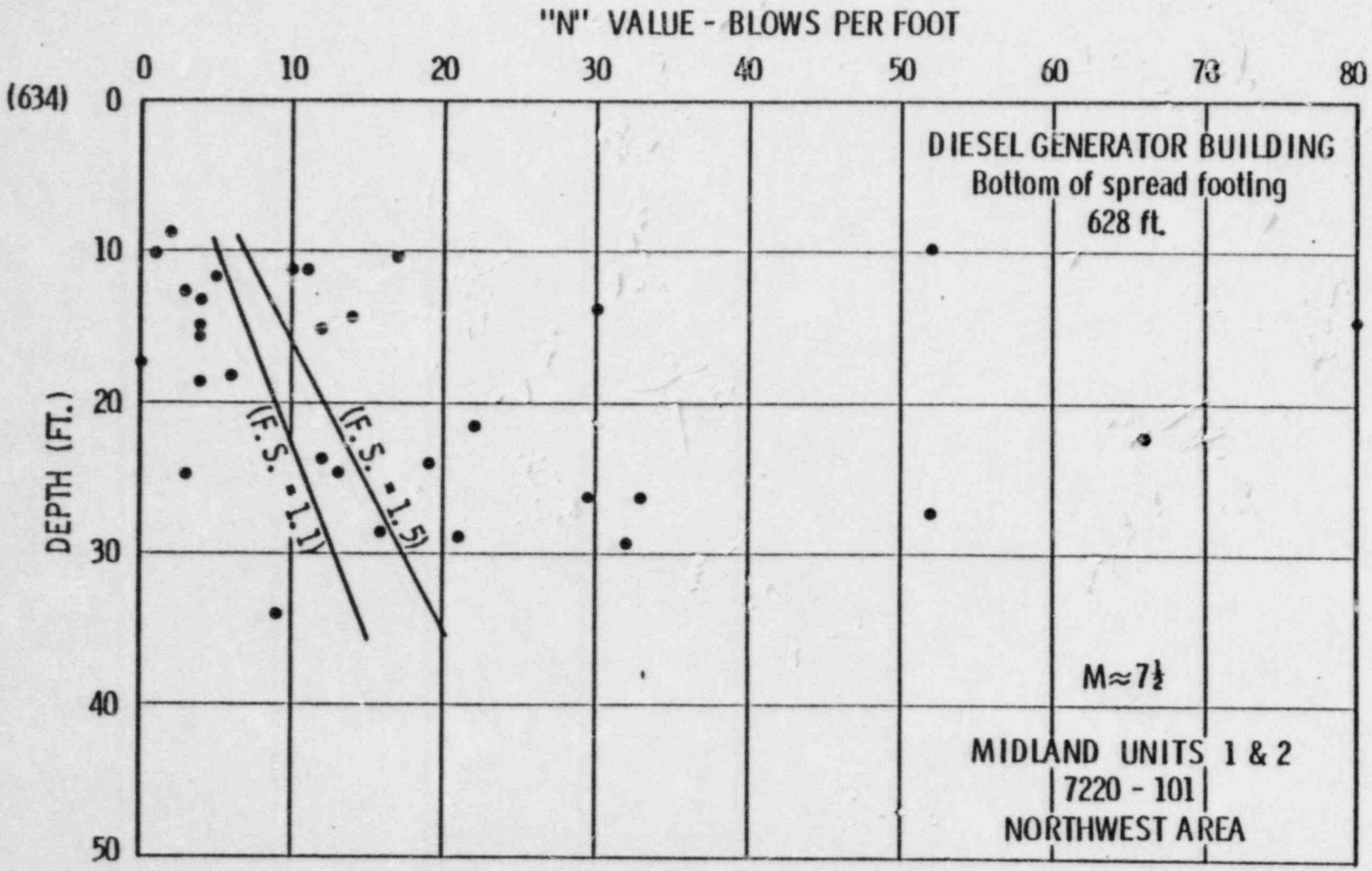


FIGURE 3 - STANDARD PENETRATION RESISTANCE VERSUS DEPTH FOR THE NORTHWEST AREA OF THE DIESEL GENERATOR BUILDING

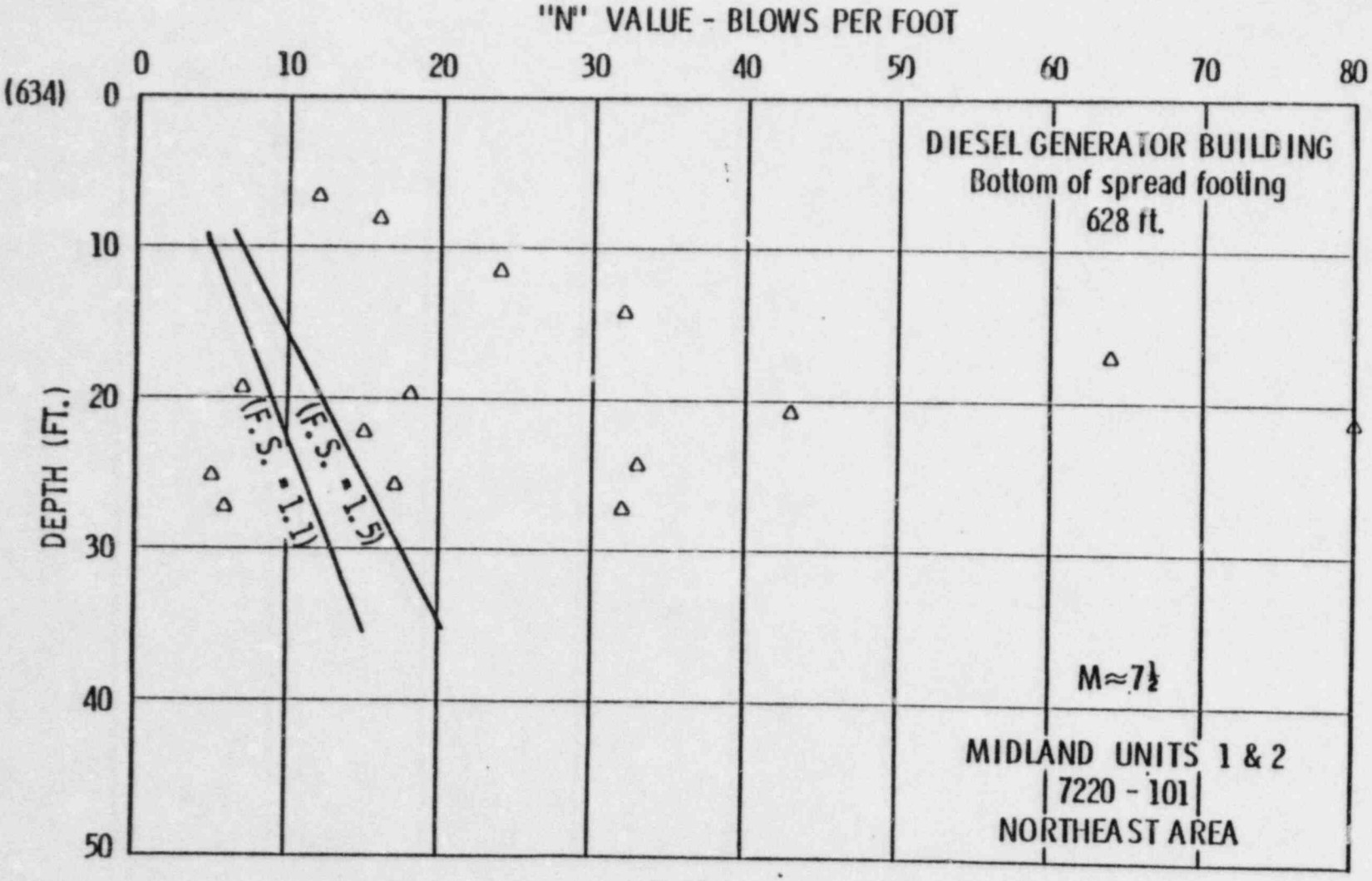


FIGURE 4 - STANDARD PENETRATION RESISTANCE VERSUS DEPTH FOR THE NORTHEAST AREA OF THE DIESEL GENERATOR BUILDING

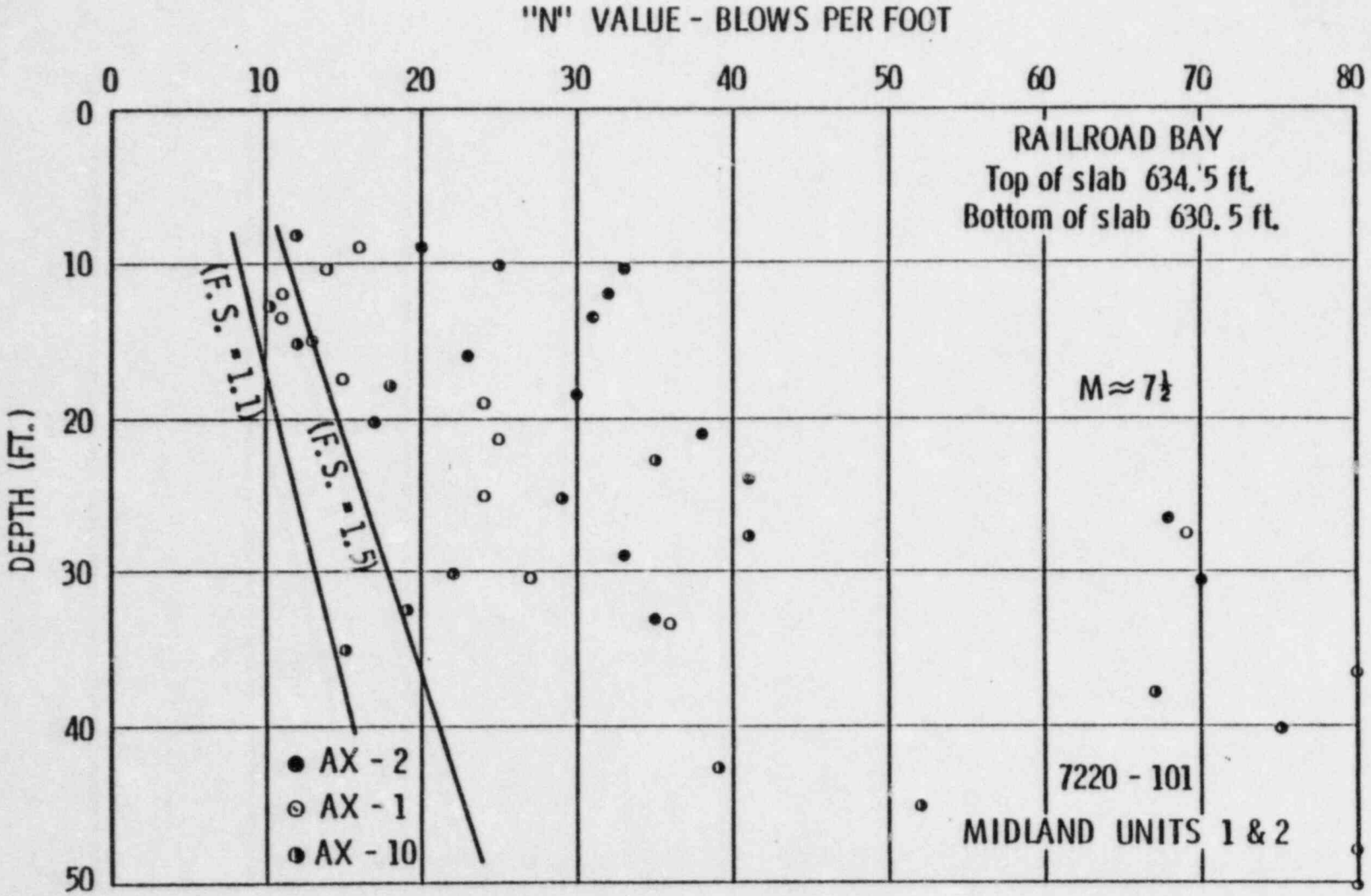


FIGURE 5 - STANDARD PENETRATION RESISTANCE VERSUS DEPTH FOR THE AUXILIARY BUILDING RAILROAD BAY

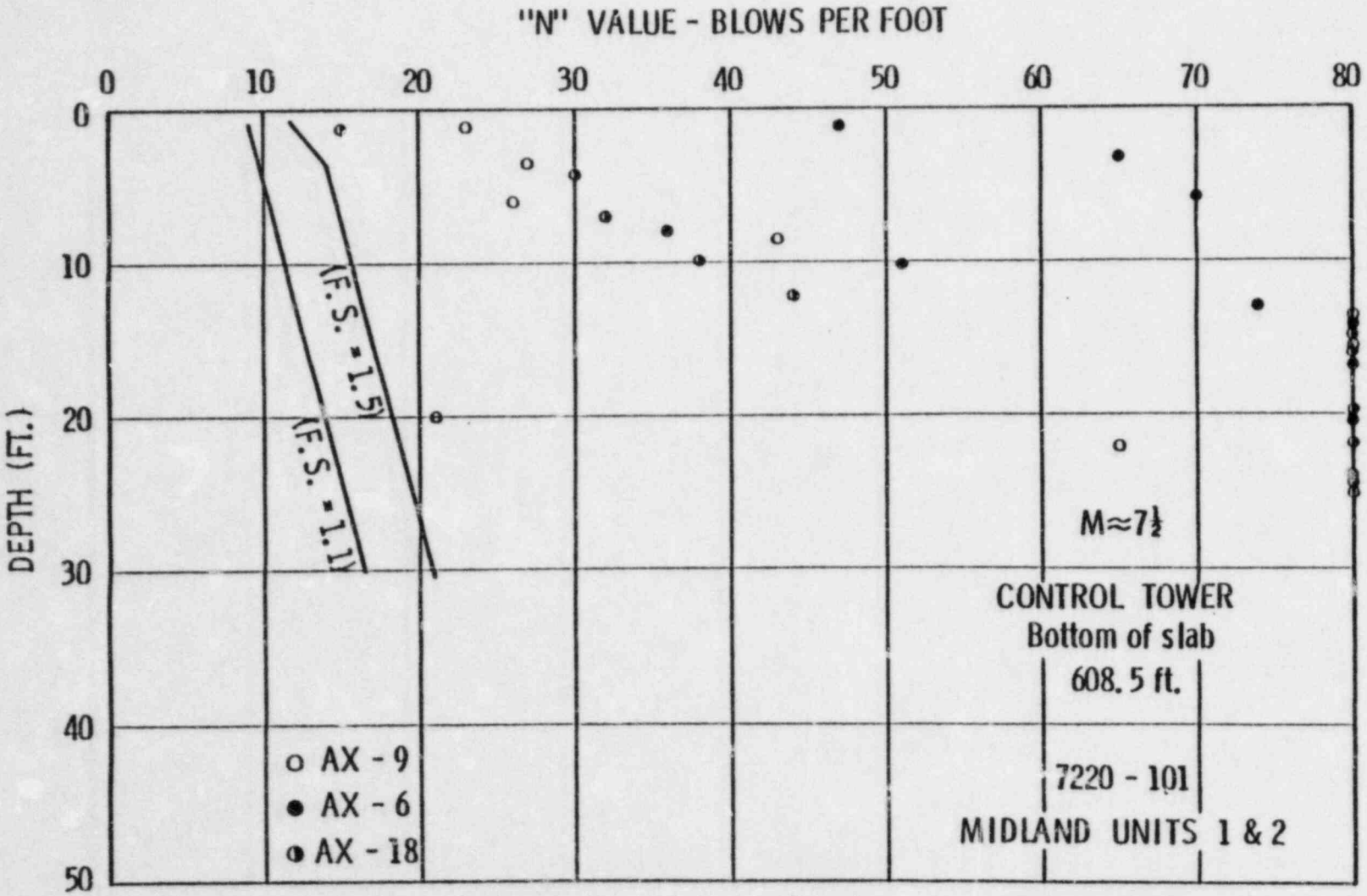


FIGURE 6 - STANDARD PENETRATION BLOWCOUNT VERSUS DEPTH FOR AUXILIARY BUILDING CONTROL TOWER

Agenda
Item 3.2

Bob Rixford

LOUGHNEY DEWATERING INC.

Dewatering and Soil Stabilization Services and Systems

P. O. BOX 1366, ANN ARBOR, MICHIGAN 48106
313-761-3481

2260 GRAND AVENUE
BALDWIN, N. Y. 11510
516-223-9500

July 26, 1979

Bechtel Associates Professional Corp.
P.O. Box 1000
777 E. Eisenhower Parkway
Ann Arbor, Michigan 48106

Attention: Mr. Sherif S. Afifi, P.E. Re: Midland Power Plant
Permanent Dewatering System

Dear Sir:

Per your request attached please find a written description of the slide presentation of the proposed Permanent Dewatering System for the Midland Power Plant that was presented at the N.R.C. meeting, July 18, 1979.

We trust that this is sufficient for your present needs. Please call should any part require further clarification.

Very truly yours,
LOUGHNEY DEWATERING INC.

Richard W. Loughney
President

RWL/rr
Attachment

LOUGHNEY DEWATERING INC.

PRESENTATION AT N.R.C. MEETING JULY 18, 1979

MIDLAND POWER PLANT

Slide 1 - Plan View of Area Dewatering System. The soil as described before by others generally consists of sand and or clay fill placed on the original sand or clay strata. The original sand generally extends from elevation 570 to elevation 600 with clay beneath the sand - though in a few areas the underlying clay extends to the original ground surface.

The present ground water level is about elevation 627 - the cooling pond level.

An impervious cut off wall has been constructed around the West, North and East sides of the area. The cut off wall, a slurry trench or clay core, extends into the original clay till. The source of recharge for ground water within the Q listed area is rainfall and the cooling pond water from the South side of the area, and some minor seepage through the cut off wall.

The coefficient permeability of the soil as determined from the initial pumping test conduct in Auxiliary Building area is less than 0.007 feet per minute. Additional data about the permeability of the soil and total yield will be obtained during temporary dewatering of the Valve Pits and Electrical Penetration Rooms. Also there are considerable grain size data available from the extensive boring program that has been carried out at the site.

The present conception is to enclose the Q listed area with a permanent exterior dewatering system. The dewatering system would consist of submersible deepwells that would extend to the original clay till. Approximately 200 to 300 deepwells would be installed. The number required to maintain the ground water at the desired level would be operated and the remainder would be redundant. There would be sufficient redundancy to provide for interruption of parts of the system, also 100 percent standby diesel powered generators would be provided.

The pumps would be wired electrically such that they are staggared and sectioned so that one interruption does not affect a continuous length of the dewatering system.

The permanent interior dewatering system would be used to mop up ground water remaining within the area enclosed by the perimeter dewatering system. The wells would be pumped as required to remove ground water that collects within the exterior perimeter system because of the recharge from rain, shut down etc.

The ground water removed would be monitored to assure that no fine lines are being removed from the soil.

After an initial pumping period of about six months the basin that is dewatered should be large enough that the permanent dewatering system could be down completely from one to two weeks before a significant rise in the water level within the dewatered area would occur. The principal source of recharge is the cooling pond and the rate the ground water flows through the soil from the pond is low.

Piezometers would be located at key points to monitor the ground water level and alert the plant when the ground water has risen above a predetermined elevation.

Slide 2 - A N-S section through the area to be dewatered. The deepwells would extend to the original clay till, they would be spaced close enough to cut off the flow of water into and remove the water from within the Q listed area.

Slide 3 - The dewatering system would be buried below the frost depth. The necessary disconnections would be provided to permit screening the deepwells. In area of heavy traffic a manhole would be provided for access to the deepwells.

The capacities of the well screens (6" diameter) are considerably in excess of the anticipated equilibrium flow of 1 to 10 gpm per well. The well screen diameter, 6 inches, is necessary to provide the clearance required for the submersible pump.

The well screens would extend the full depth of the soil to be dewatered and they would be encased in a select sand filter for their full depths.

Slide 4 - For areas where there is no objection to having a slight protrusion above the ground surface, pitless adaptors would be used to provide access to the wells and pumps instead of manholes.

Slide 5 - A sketch of an interior permanent deepwell. Smaller diameter wells would be used to remove the water perched within the Q listed area. These wells would be pumped initially and occasionally therefore as required.

In my judgment the system would be fool proof.