Bruce Burgess

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

JUL 0 1 1983

MEMORANDUM FOR: J. A. Hind
C. E. Norelius
R. L. Spessard
T. N. Tambling
R. J. Cook
B. L. Burgess
D. Hood
E. Adensam
R. Gardner
R. Landsman
J. Harrison

FROM: R. F. Warnick, Director, Office of Special Cases

SUBJECT: REVIEW OF SALP III DRAFT FOR MIDLAND

Please review the attached draft SALP report in preparation for the SALP Board meeting scheduled for:

Date: July 6, 1983
Time: 9:30 a.m.
Place: Conference Room C

R. L. Warnick, Director
Office of Special Cases

Enclosure: As Stated

DRAFT

Docket No. 50-329

Docket No. 50-330

Consumers Power Company

ATTN: Mr. James W. Cook

Vice President

Midland Project

1945 West Parnall Road

Jackson, MI 49201

Gentlemen:

This refers to our scheduled meeting on , 1983, at to discuss the NRC's Systematic Assessment of Licensee Performance (SALP) for the Midland Nuclear Plant, Units 1 and 2, for the period July 1, 1981 through March 31, 1983.

Mr. James G. Keppler and members of the NRC staff will present the observations and findings of the SALP Board. The more significant SALP Board findings are summarized in Enclosure 1. The enclosed SALP Report which documents the analyses, conclusions and recommendations of the SALP Board is for your review prior to the meeting.

Since this meeting is intended to be a forum for the mutual understanding of the issues and findings, you are encouraged to have appropriate representation at the meeting. As a minimum we would suggest you, Mr. J. D. Selby,

President, the Site Manager, Site QA Manager, and managers for the various functional areas where problems have been identified attend the meeting. Any comments you may have regarding the SALP Report, as well as the SALP process, may be discussed at the meeting. Additionally, you may provide written comments within 20 days after the meeting.

Following our meeting and receipt of your written response, if any, the enclosed report will be issued. The letter issuing the report will provide you a characterization of your overall safety performance along with any appropriate supplemental information regarding the report.

In accordance with Section 2.790 of the NRC's "Rules of Practice" Part 2, Title 10, Code of Federal Regulations, a copy of this letter, the SALP Report, and your comments, if any, will be placed in the NRC's Public Document Room when the SALP Report is issued.

If you have any questions concerning the SALP Report we will be happy to discuss them with you.

Sincerely,

J. A. Hind, Chairman
Region III SALP Board
Director, Division of Radiological
and Materials Safety Program

Enclosures:
1. Summary of Significant
Findings (5 cys)
2. Preliminary SALP Report
(5 cys)

cc w/encls:
Director, OIE
Resident Inspector, RIII
Project Manager, NRR
PAO, Region III

RIII	RIII	RIII	RIII	RIII	RIII
Landsman/jp	Gardner	Harrison	Warnick	Tambling	Hind
06/30/83					

Enclosure 1

Significant SALP Report Findings for the Midland Nuclear Generating Station Units 1 and 2

General Observations

Followup inspections were conducted in March and April 1982 to evaluate the significance of the quality control (QC) inspection deficiencies identified during the special team inspection of May 1981. These followup inspections indicated that QC inspections were not properly identifying deficiencies in the installation of ~~safety-related components~~ equipment. As a result of these deficiencies and due to recurring problems in the licensee's remedial soils work activities, increased NRC inspection effort was initiated through the formation of a special Midland Section comprised of inspectors dedicated solely to the Midland plant. Added onsite engineering contract personnel for additional assistance

To aid in the evaluation of the as-built condition of the plant, ~~the Midland Section conducted a~~ was conducted special inspection of the Diesel Generator Building during the period of October 12 through November 25, 1982. This inspection identified significant violations which demonstrated a breakdown in the implementation of the licensee's Quality Assurance (QA) program. In addition, it resulted in the licensee's decision to suspend some safety-related work activities (December 2, 1982) and to formulate a construction completion program to provide assurance that safety-related structures and

systems were constructed as designed. Due to the significant violations, the NRC imposed a civil penalty of $120,000.

In view
~~As a result~~ of the suspension of portions of safety-related work activities and the licensee's proposed construction completion program, the Region III Regional Administrator determined that the SALP 3 appraisal for Midland would address only ~~the~~ areas where work activities ~~involving remed~~ continued, normally ial soils (Soils and Foundations), the ~~Babcock and Wilcox~~ NSSS Supplier (Safety-Related Components), and the Heating, Ventilating, and Air Conditioning (HVAC) (Support Systems), and licensing Activities.

Functional Areas

1. Soils and Foundations

Overall performance in this functional area has continued to indicate a declining trend and remains an area of concern. The decline was due to the continued lack of attention to detail and the continuing inability on the part of the licensee to properly implement the requirements of the Midland QA program.

2. Safety-Related Components

Should go to Board comments

Performance in this functional area remains adequate. However, there are indications that unidentified quality problems may exist in this area. The NRC plans to conduct a special inspection to evaluate this area in the near future.

3. Support Systems

from Cat 1 to Cat 2.

Performance in this functional area has declined. The decline was due to the lack of management attention to identified problems and the lack of timely corrective action to resolve these problems.

4. Licensing Activities

DRAFT

Enclosure 2

SALP 3

Preliminary

U. S. Nuclear Regulatory Commission

Region III

Systematic Assessment of Licensee Performance

Consumers Power Company

Midland Nuclear Generating Station, Units 1 and 2

Docket Nos. 50-329; 50-330

Report Nos. 50-329/83- ; 50-330/83-

Assessment Period

July 1, 1981 through March 31, 1983

CONTENTS

I. INTRODUCTION

The NRC has established a program for the Systematic Assessment of Licensee Performance (SALP). The SALP is an integrated NRC Staff effort to collect available observations and data on a periodic basis and evaluate licensee performance based upon those observations. SALP is supplemental to normal regulatory processes used to insure compliance to the rules and regulations. SALP is intended primarily from a historical point to be sufficiently diagnostic to provide a rational basis for allocating future NRC resources and to provide meaningful guidance to the licensee's management to promote quality and safety of plant construction and operation.

An NRC SALP Board, composed of the staff members listed below, met on , 1983, to review the collection of performance observations and data to assess the licensee performance in accordance with the guidance in NRC Manual Chapter 0516, Systematic Assessment of Licensee Performance. A summary of the guidance and evaluation criteria is provided in Section II of this report.

This report is the SALP Board's assessment of the licensee[15] safety performance at Midland Nuclear Station, Units 1 and 2, from July 1, 1981 through March 31, 1983.

The results of the SALP Board assessments in the selected functional areas were presented to the licensee at a meeting held on , 1983.

SALP Board for Midland Nuclear Station:

J. A. Hind, Chairman, Director, Division of Radiological and Materials Safety Programs

C. E. Norelius, Director, Division of Project and Resident Programs

R. L. Spessard, Director, Division of Engineering

R. N. Tambling, Chief, Program Support Section

II. CRITERIA

The licensee performance is assessed in selected functional areas depending upon whether the facility is in a construction, pre-operational or operating phase. Each functional area normally represents areas significant to nuclear safety and the environment, and are normal programmatic areas. Some functional areas may not be assessed because of little or no licensee activities or lack of meaningful observations. Special areas may be added to highlight significant observation.

One or more of the following evaluation criteria were used to assess each functional area.

1. Management involvement in assuring quality

2. Approach to resolution of technical issues from safety standpoint

3. Responsiveness to NRC initiatives

4. Enforcement history

5. Reporting and analysis of reportable events

6. Staffing (including management)

7. Training effectiveness and qualification

However, the SALP Board is not limited to these criteria and others may have been used where appropriate.

Based upon the SALP Board assessment, each functional area evaluated is classified into one of three performance categories. The definition of these performance categories is:

Category 1: Reduced NRC attention may be appropriate. Licensee management attention and involvement are aggressive and oriented toward nuclear safety; licensee resources are ample and effectively used such that a high level of performance with respect to operational safety or construction is being achieved.

Category 2: NRC attention should be maintained at normal levels. Licensee management attention and involvement are evident and are concerned with nuclear safety; licensee resources are adequate and are reasonably effective such that satisfactory performance with respect to operational safety or construction is being achieved.

Category 3: Both NRC and licensee attention should be increased. Licensee management attention or involvement is acceptable and considers nuclear safety, but weaknesses are evident; licensee resources appear to be strained or not effectively used such that minimally satisfactory performance with respect to operational safety or construction is being achieved.

III SUMMARY OF RESULTS

Functional Area Assessment	Category 1	Category 2	Category 3
1. Soils and Foundations			X
2. Containment and other Safety Related Structures	NOT ADDRESSED IN THIS REPORT*		
3. Piping Systems and Supports	NOT ADDRESSED IN THIS REPORT*		
4. Safety Related Components		X	
5. Support Systems		X	
6. Electrical Power Supply and Distribution	NOT ADDRESSED IN THIS REPORT*		
7. Instrumentation and Control Systems	NOT ADDRESSED IN THIS REPORT*		
8. Licensing Activities		X	
9. Quality Assurance	NOT ADDRESSED IN THIS REPORT*		
10. Preoperational Testing	NOT ADDRESSED IN THIS REPORT*		

Functional Area Assessment	Category 1	Category 2	Category 3
11. Radiological Controls		NOT ADDRESSED IN THIS REPORT	
12. Environmental Protection and Independent Measures		NOT ADDRESSED IN THIS REPORT	

deleted

*The licensee is rated Category 3 in this area, only because of the NRC/CPCo Work Authorization Procedure, the CPCo/Bechtel Excavation Permit System, the independent third party overview, and continued scrutiny by the NRC staff.

IV. Performance Analyses

1. Soils and Foundations

a. Analysis

During this SALP period the licensee finalized and initiated steps to implement the Remedial Soils measures necessary to correct previously identified soils deficiencies. The NRC's review and approval of the design of the Remedial Soils measures is documented in Supplement No. 2 to the Midland Safety Evaluation Report issued in October 1982. The steps taken by the licensee to implement the Remedial Soils measures during the SALP period include the following:

- The excavation of the excess shafts to elevation 609
- The installation of six temporary underpinning piers
- Preparatory work for the Service Water Pump Structure underpinning
- Initiation of temporary dewatering system for the Service Water Pump Structure

- Initiation of probing for buried utilities adjacent to the Service Water Pump Structure

- The installation of the permanent dewatering system wells

- The installation of the auxiliary building underpinning instrumentation system

Thirteen inspections (or portions of inspections) were performed in this area. During this SALP period ~~a total of~~ nine noncompliances and two deviations with NRC requirements were identified as follows:

(1) Severity Level IV - examples of failure to follow procedures and failure to develop adequate procedures (329/82-03; 330/82-03)

(a) Failure to revise design drawings according to site procedural requirements

(b) Failure to develop an adequate excavation procedure

(c) Failure to assure design verification according to site procedural requirements

why?

(2) Severity Level IV - examples of failure to develop adequate procedures (329/82-05; 330/82-05)

(a) Access shaft work was initiated without having a reviewed and approved procedure

(b) Failure to develop adequate procedures to control specification design changes

(c) Failure to develop adequate specification for permanent dewatering wells

(d) Failure to develop an adequate procedure to prepare or implement overinspection plans

(3) Deviation - failure to provide a qualified civil QA staff (329/82-05; 330/82-05)

(4) Severity Level IV - failure to establish a QA program which provided controls over the underpinning monitoring system (329/82-06; 330/82-06). This finding resulted in the issuance of a Confirmatory Action Letter of March 31, 1982

(5) Severity Level V - failure to install anchor bolts in accordance with site procedures (329/82-11; 330/82-11)

(6) Deviation - failure to use approved installation/coordination forms to document the installation of underpinning monitoring instrumentation (329/82-11; 330/82-11)

(7) Severity Level IV - failure of specifications to identify the location of well sampling points (329/82-18; 330/82-18)

(8) Severity Level IV - failure to assure that the slope layback at the Auxiliary Building access shaft was constructed in accordance with design (329/82-18; 330/82-18)

(9) Severity Level IV - examples of failure to establish measures to control the issuance of documents (329/82-21; 330/82-21)

(a) failure to use a controlled copy of a Project Quality Control Instruction (PQCI) to prepare a QC recertification exam. This finding resulted in the issuance of a CAL on September 24, 1982

(b) Failure to control QC manuals

(10) Severity Level III - failure to translate applicable regulatory requirements concerning the purchase of armor stone for a "Q" portion of the perimeter dike into appropriate specifications and design documents (329/82-22; 330/82-22)

(11) Severity Level III - failure to maintain current remedial soils drawings (329/83-03; 330/83-03)

As a result of noncompliance item (4) an investigation was performed by ~~OI~~ NRC to determine whether material false statements had been made by the licensee's staff in regards to the installation status of the auxiliary building underpinning monitoring instrumentation. The investigation ~~report~~ (~~Reports No. 50-329/82-13(EIS); 50-330/82-13(EIS)~~) failed to provide conclusive evidence that a material false statement had been made. ~~In~~ addition, a separate investigation by ~~OI~~ NRC was being conducted during this evaluation period to determine whether the licensee violated the April 30, 1982, Atomic Safety and Licensing Board (ASLB) Order which suspended all remedial soils activities on "Q" soils for which the licensee did not have proper explicit NRC approval. This investigation ~~is ongoing~~ which is continuing focuses on the licensee digging below the "deep Q duct bank" apparently without NRC approval. A management meeting was held at the site on August 11, 1982, to discuss ~~the~~ this potential ~~Board Order~~ violation of the board order. A CAL was issued ~~in regards to this~~ on this matter on August 12, 1982.

Remedial soils work is being accomplished in conjunction with a work authorization procedure instituted as a result of the ASLB order. Additionally, the licensee has instituted an excavation permit system for soils work and an independent

third party (Stone and Webster) is overviewing the soils work making simultaneous reports to the NRC and the licensee.

b. Conclusions

The licensee is rated Category 3 in this area. Although this is the same rating as the previous assessment period, the licensee's overall performance in this functional area has continued to indicate a declining trend. NRC findings during this assessment period indicate the continued lack of attention to detail by the licensee and the continuing inability on the part of the licensee to properly implement the requirements of the Midland QA program. The licensee is rated Category 3 in this area only because of the NRC/CPCo Work Authorization Procedure, the CPCo/Bechtel Excavation Permit System, the independent third party overview, and continued scrutiny by the NRC staff.

c. Board Recommendations

The Board recommends that the licensee thoroughly review the construction, engineering, and Quality Assurance management in this area. The implementation of measures to provide closer attention to detail in remedial soils work activities and to provide assurance that future remedial soils work will conform to the requirements of the Midland QA program should be a continuing management goal.

2. Safety-Related Components

a. Analysis

Ten inspections were performed in this area during the evaluation period. Three of the ten inspections were performed by two Argonne National Laboratory personnel retained under contract to the NRC to provide increased inspection attention in this area. The ten inspections involved the observation of large and small bore hanger installations (including snubbers and restraints), receipt and installation records, modification of the reactor pressure vessel supports, auxiliary feedwater internal header modification, and containment structural steel welding. Within the scope of this effort one item of noncompliance was identified as follows:

- Severity Level V - Failure to follow procedures regarding the tagging of a valve located in the welding fabrication area (329/83-01; 330/83-01).

In this area the licensee resources appear adequate, however, Region III inspectors have indications that quality problems exist which have not, to date, been identified. Higher priority work requirements have prevented increased inspection attention.

b. Conclusion

The licensee is rated Category 2 in this area. This is the same rating as the previous assessment period.

c. Board Recommendations

NRC inspection activities should be increased with emphasis placed on assuring that installed items meet the design and regulatory requirements; schedule a special NRC team inspection to take place early in the SALP IV period.

3. Support Systems

a. Analysis

Portions of four inspections were performed covering Heating, Ventilation, and Air Conditioning (HVAC) welder certifications, welder procedure qualification, and material traceability. No items of noncompliance or deviations were identified during these inspections.

As a result of a licensee audit of Photon Testing, Inc., the licensee suspended welding of safety-related HVAC work. Photon Testing, Inc. had previously been contracted by the licensee to qualify welding procedures and certify welders

for HVAC fabrication and installation. The cumulative audit findings made the credibility of some of the certifications of previously certified welders, as well as the adequacy of some of the welding procedures, indeterminate. Due to the audit findings, the NRC imposed a hold point for the restart of safety-related HVAC welding.

A subsequent attempt by the licensee to demonstrate to the NRC that affected HVAC welding procedures had been qualified and were ready for implementation demonstrated that the welding procedures were still inadequate. As a result, the NRC did not authorize the licensee to restart safety-related HVAC welding.

b. Conclusion

The licensee is rated Category 2 in this area. This is a lower rating than the previous assessment due to the lack of management attention regarding difficulties in developing adequate HVAC welding procedures and the lack of timely corrective action to resolve those problems.

c. Board Recommendations

Licensee management involvement should be increased in the area of ensuring proper and timely followup to correcting identified deficiencies.

4. Licensing Activities

a. Analysis

For the licensing activities evaluated, there appeared to be appropriate management attention with decision making taking place at adequate levels. During numerous audits conducted by NRR, including audits relating to the soils issue, emergency planning, instrumentation and control systems, fire protection and equipment qualification, the records maintained by the licensee were generally complete, well maintained and available. In almost every area, the appropriate level of management participated in meetings with the NRC on safety, technical, and licensing issues and demonstrated knowledge on the meeting's subject matter. In the soils and structures area, however, management involvement was less than desirable since some of the information given to the NRC at meetings on that subject was later determined to be inaccurate or misleading. Also, an exception to adequate management control occurred when the licensee proceeded with an excavation prior to fulfilling NRC conditions previously established.

Clear lines of responsibility were established in support of the staff's safety evaluation and subsequent issuance of the Safety Evaluation Report. Priorities established by licensee

management were generally consistent with and supportive of those priorities established by the staff. Commitments made to incorporate resolutions into FSAR revisions were kept and were generally timely. The licensee also made an objective and extensive effort to track open issues related to the safety evaluation. One issue which involved implementation of a TMI Action Plan Item (Item I.B.1.2) reached an apparent impasse between the staff and applicant. However, when the proper level of management attention was focused on the issue by both NRC & the licensee, both sides were able to reach an acceptable resolution.

Generally, licensee personnel involved in resolution of technical questions were knowledgeable and clearly understood the issues. During the appraisal period, the licensee's technical submittals by the licensee was usually complete and conservative. ~~in technical submittals to the NRC~~. Resolution of two technical issues during the safety evaluation required elevation to the Division Director appeals level. In one of these issues, relief was given to the licensee. In the other, the licensee was required to commit to installation of a third auxiliary feedwater pump. In both cases, however, the licensee prepared reasonable technical justification for their position. In addition, the licensee's response once the appeals decision on the auxiliary feedwater pump had been made was excellent. ~~Licensing activities for which this criterion was rated a Category 1 include the area~~

of seismic equipment qualifications, where a clear understanding of equipment qualification requirements against design basis and seismic margin earthquakes was demonstrated. The licensing area of soils and structures needs improvement insofar as the approach to technical issues. In the absence of NRC requirements, there was reluctance by the licensee to perform certain soils remedial work utilizing accepted quality assurance procedures until ordered by the NRC. In regards to the buried piping issue, the licensee Consumers appeared to lack a thorough understanding of the safety issues involved.

Improvement in the soils area over the appraisal period has been evidenced by more specific and clearer submittals to the NRC.

b. Conclusion

The licensee is rated Category 2 in this area.

Generally, in licensing activities, the licensee expressed a willingness to respond to NRC initiatives. Submittals were usually timely and thorough. Conversely, although improvement in the soils areas has been seen during this appraisal period, aspects remain weak such as technical response and management control.

c. Board Recommendations

A high level of Licensee management attention should be ~~increased~~ continued in resolving the adequacy of responses to technical issues and improvement of management controls in this area with particular attention given to the remedial soils and underpinning activities.

V. Supporting Data and Summaries

A. Noncompliance Data

Facility Name: Midland, Unit 1 Docket No. 50-329

Inspections: No. 81-14 through 83-05

	Noncompliance and Deviation Severity Levels					
Functional Area Assessment	I	II	III	IV	V	Dev
1. Soils and Foundations			(2)	(6)	(1)	(2)
2. Containment and Other Safety-Related Structures	NOT ADDRESSED IN THIS REPORT					
3. Piping Systems and Supports	NOT ADDRESSED IN THIS REPORT					
4. Safety-Related Components					(1)	
5. Support Systems						
6. Electrical Power Supply and Distribution	NOT ADDRESSED IN THIS REPORT					

Functional Area Assessment	Noncompliance and Deviation Severity Levels					
	I	II	III	IV	V	Dev
7. Instrumentation and Control Systems	NOT ADDRESSED IN THIS REPORT					
8. Licensing Activities						
9. Quality Assurance	NOT ADDRESSED IN THIS REPORT					
10. Preoperational Testing	NOT ADDRESSED IN THIS REPORT					
11. Radiological Controls	NOT ADDRESSED IN THIS REPORT					
12. Environmental Protection and Independent Measurements	NOT ADDRESSED IN THIS REPORT					
TOTALS	0	0	2	6	2	2

( ) Indicates items common to both Units 1 and 2.

Facility Name: Midland, Unit 2 Docket No. 50-330

Inspections: No. 81-14 through 83-05

Functional Area Assessment	Noncompliance and Deviation Severity Levels					
	I	II	III	IV	V	Dev
1. Soils and Foundations			(2)	(6)	(1)	(2)
2. Containment and Other Safety-Related Structures	NOT ADDRESSED IN THIS REPORT					
3. Piping Systems and Supports	NOT ADDRESSED IN THIS REPORT					
4. Safety-Related Components					(1)	
5. Support Systems						
6. Electrical Power Supply and Distribution	NOT ADDRESSED IN THIS REPORT					
7. Instrumentation and Control Systems	NOT ADDRESSED IN THIS REPORT					
8. Licensing Activities						

Functional Area Assessment	Noncompliance and Deviation Severity Levels I	II	III	IV	V	Dev
9. Quality Assurance	NOT ADDRESSED IN THIS REPORT					
10. Preoperational Testing	NOT ADDRESSED IN THIS REPORT					
11. Radiological Controls	NOT ADDRESSED IN THIS REPORT					
12. Environmental Protection and Independent Measurements	NOT ADDRESSED IN THIS REPORT					
TOTALS	0	0	2	6	2	2

( ) Indicates items common to both Units 1 and 2.

B. Report Data

1. Construction Deficiency Reports (CDR)

During this SALP period, 19 CDR's were submitted by the licensee under the requirements of 10 CFR 50.55(e). and are addressed in their report for information only and do not relate to the functional areas provided ~~therefore there is no monitoring provided~~

a. Operating procedures must be modified to require at least one reactor cavity cooling fan in service during normal plant operation.

b. For certain control circuits, a voltage below the limits for proper operation of the motor control center starter coils was calculated. This line voltage drop is a direct result of currents passing through long control cables.

c. The design of electrical components associated with the main steam isolation valves does not conform to the channel separation criteria in Reg. Guide 1.75; also, satisfactory seismic qualification reports have not been submitted.

d. Rodent damage has occurred in electrical penetration wiring and cables.

e. The auxiliary feedwater level control valves are fed from Class 1E instrument control power instead of Class 1E preferred power supplies as specified in the FSAR.

f. The existing design of the auxiliary feedwater system pump turbine driver steam admission valve interlock system would block steam entry and prevent proper operation.

g. It has been determined that instrument string error in the steam generator level circuits, under accident conditions exceeds that allowed to establish steam generator ECCS control setpoints.

h. Recent inspections at three operating B&W plants indicated damage to the internal auxiliary feedwater header assemblies. New external headers will provide all functional requirements.

i. During an engineering review it was discovered that some Q-related equipment is located in the auxiliary building that is cooled by a non-safety grade HVAC system. During an accident, this could result in some Q-equipment being lost.

j. B&W supplied non-seismically qualified transmitter mounting brackets for transmitters forming part of the reactor coolant pressure boundary.

k. Approximately 80% of the radiation monitoring modules, manufactured by Victoreen, Inc. were found to be nonconforming. This was due to a significant QA breakdown at the supplier.

l. During field modifications of 460V Class 1E motor control centers supplied by ITE-Gould it was discovered that some of the control power transformers were undersized.

m. Class 1E power cables were pulled and installed, ~~as~~ the wrong size.

n. ACI 349, Appendix B, issued August 1979 specifies that shear lugs in embedment designs shall be considered effective only in compression zones. Some Midland embedment designs which were completed and installed prior to this date, do not meet this new criterion.

o. No specific features to mitigate frazil ice formation on the service water intake structure are contained in the design of the service water intake structure.

p. The design of the suction piping for the auxiliary feedwater system did not include overpressurization protection.

q. Unacceptable workmanship conditions have been identified on electrical control panels and cabinets supplied by various suppliers.

r. Bailey Controls Company NI/RPS and ECCAS cabinets have terminal blocks which are fastened to the termination panels by Tinnerman Nuts. These nuts could become loose.

s. Class 1E electrical control cabinets appear to have insufficient clearances from adjacent equipment or walls.

2. Part 21 Reports

The licensee issued no Part 21 reports during the reporting period.

C. Licensee Activities

The main construction areas during the evaluation period were NSSS work, electrical equipment, conduits, cable trays, cables, HVAC, remedial soils work, small and large bore piping, pipe hangers and snubbers. As a result of the diesel generator building inspection the licensee halted, on December 2, 1982, safety-related work with

the exception of the following: system layup, hanger and cable reinspections, post system turnover work, HVAC work, NSSS B&W work, remedial soils work, and ~~Bechtel~~ design engineering. Preoperational testing was conducted on the Component Cooling Water System, the Decay Heat Removal System and the Fuel Transfer System.

Units 1 and 2 were reported by the licensee in the April 83 Construction Status Report to be 79% complete. Fuel load dates are estimated to be February 1985 and October 1984, respectively. ~~The NRC feels that these fuel load dates are very optimistic.~~

D. Inspection Activities

The routine inspection effort by the NRC consisted of 39 inspections during the evaluation period.

In addition, a special team inspection (329/82-22; 330/82-22) was conducted to assess the adequacy of implementation of the quality assurance program. This assessment was done for the most part in the diesel generator building where the majority of work was performed subsuequent to 1980. This inspection resulted in the licensee suspending some safety-related work on December 2, 1982.

E. Investigations and Allegations Review

1. An investigation was conducted to determine whether material false statements had been made by the licensee's staff in regards to the

installation status of the auxiliary building monitoring instrumentation. The investigation report (Reference 82-13) failed to provide conclusive evidence that a material false statement had been made.

2. An investigation was being conducted during this SALP period to determine whether the licensee violated the April 30, 1982, ASLB order which suspended all remedial soils activities on "Q" soils for which the licensee did not have prior explicit NRC approval. The report was not issued during this SALP period.

3. A number of allegations were received during this SALP period regarding deficiencies in the implementation of the CPCo QA/QC program. These allegations included affidavits supplied by the Government Accountability Project (GAP). Investigations to resolve the issues identified within these allegations were initiated during this SALP period.

F. Escalated Enforcement Action

1. Civil Penalties

A Civil Penalty for $120,000 was issued during this evaluation period in regards to the adverse findings identified during the diesel generator building inspection (reference 329/82-22; 330/82-22). The licensee has asked for mitigation of the amount which is under review by the NRC staff.

2. Orders

The ASLB issued an order on April 30, 1982, which suspended all remedial soils activities on "Q" soils for which the licensee did not have prior explicit NRC approval. The ASLB issued a subsequent clarifying order on May 7, 1982.

G. Administrative Actions

1. Corrective Action Letters

a. A letter of understanding was issued by the licensee on March 31, 1982, in response to deficiencies observed during the inspection of the auxiliary building monitoring instrumentation. (reference 329/82-06; 330/82-06). This matter is also discussed in Section V.E.1. of this report.

b. A confirmatory Action Letter (CAL) was issued on August 12, 1982, in response to a potential ASLB order violation (reference 329/82-18; 330/82-18). This matter is also discussed in Sections IV.1.a and V.E.2 of this report. Resolution of these concerns was still under investigation at the end of the SALP period.

c. A CAL was issued on September 24, 1982, in response to deficiencies observed during the inspection of remedial soils QC inspectors recertifications (reference 329/82-21; 330/82-21).

d. A letter of understanding was issued on December 30, 1982, in response to deficiencies observed during the diesel generator building inspection (reference 329/82-22; 330/82-22). This matter is also discussed in Sections V.C and V.F.1 of this report.

2. Management Conferences

During this SALP period eighteen conferences were held between NRC and licensee management:

a. On July 24, 1982, a management meeting was held to discuss inspection findings pertaining to irregularities in control and review of small bore piping system design packages.

b. On January 12, 1982, a management meeting was held to review and discuss recent changes to the Midland QA organization and the QA program for the remedial soils work.

c. On March 30, 1982, a management meeting was held to discuss NRC findings in the installation of underpinning monitoring instrumentation.

d. On April 26, 1982, a meeting was held to present to CPCo management the SALP 2 findings.

e. On May 14, 1982, a meeting was held during which the licensee presented a preliminary report of the results of the electrical cable reinspections.

f. On June 21, 1982, a meeting was held to discuss CPCo's response to SALP 2.

g. On August 5, 1982, a meeting was held to further discuss CPCo's responses to SALP 2.

h. On August 11, 1982, a management meeting was held to discuss a potential violation of the ASLB order of April 30, 1982.

i. On August 26, 1982, a management meeting was held to discuss Midland QA problems.

j. On September 2, 1982, a management meeting was held to discuss the Quality Improvement Plan.

k. On September 29, 1982, a management meeting was held to discuss the integration of QC activities into MPQAD.

l. On October 5, 1982, a meeting was held to discuss the CPCo-TERA proposal concerning the IDVP.

m. On October 29, 1982, a meeting was held to discuss Bechtel performance/problems.

n. On November 5, 1982, a meeting was held to discuss S&W qualifications for performance of remedial soils third party overview.

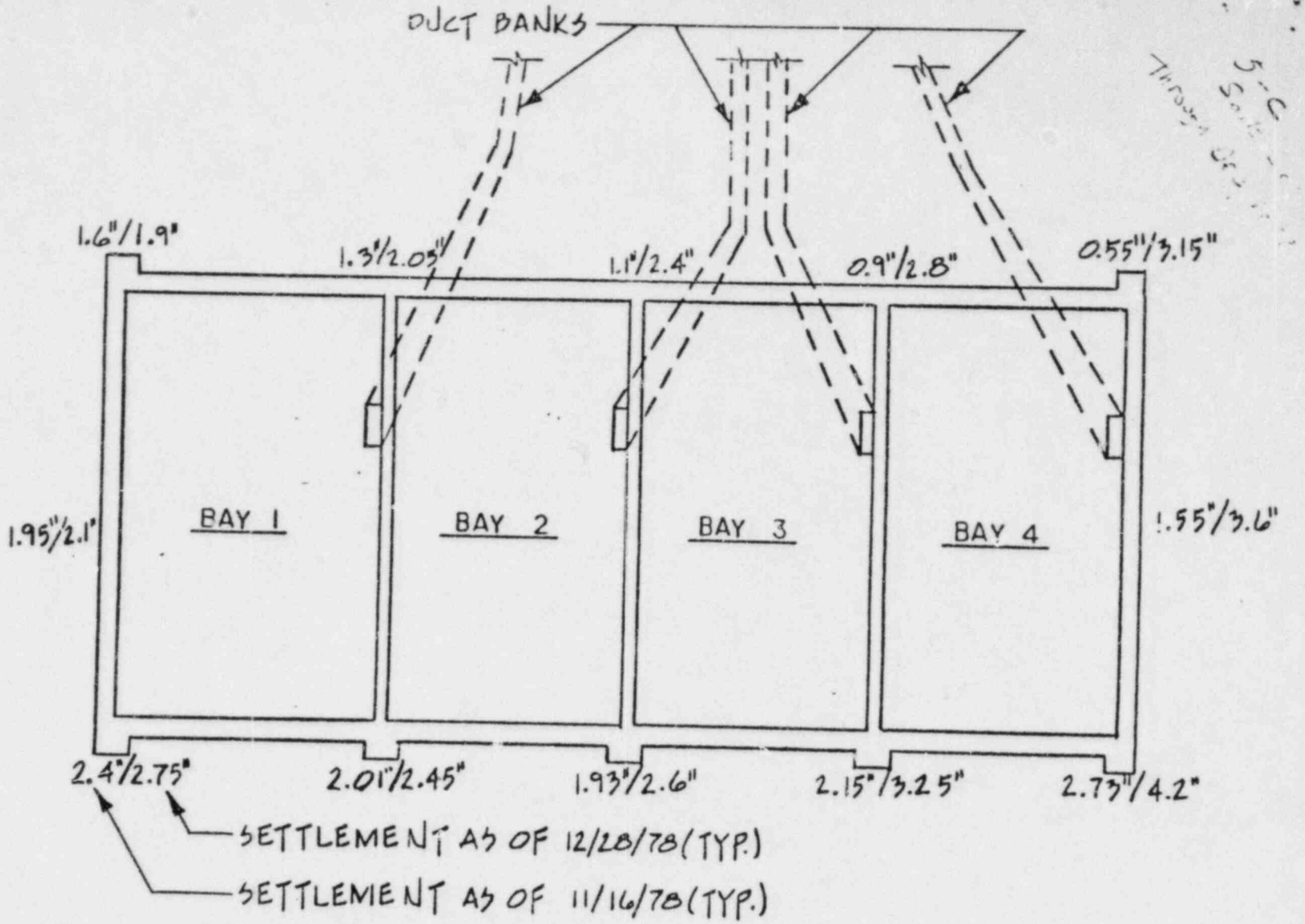
o. On January 18, 1983, an enforcement conference was held to discuss the diesel generator building findings.

p. On February 8, 1983, a management meeting was held to discuss the CCP and the IDCVP as well as CPCo and Bechtel performance and desire to take proper corrective action. In addition, the NRC announced the imposition of a $120,000 fine due to diesel generator building findings.

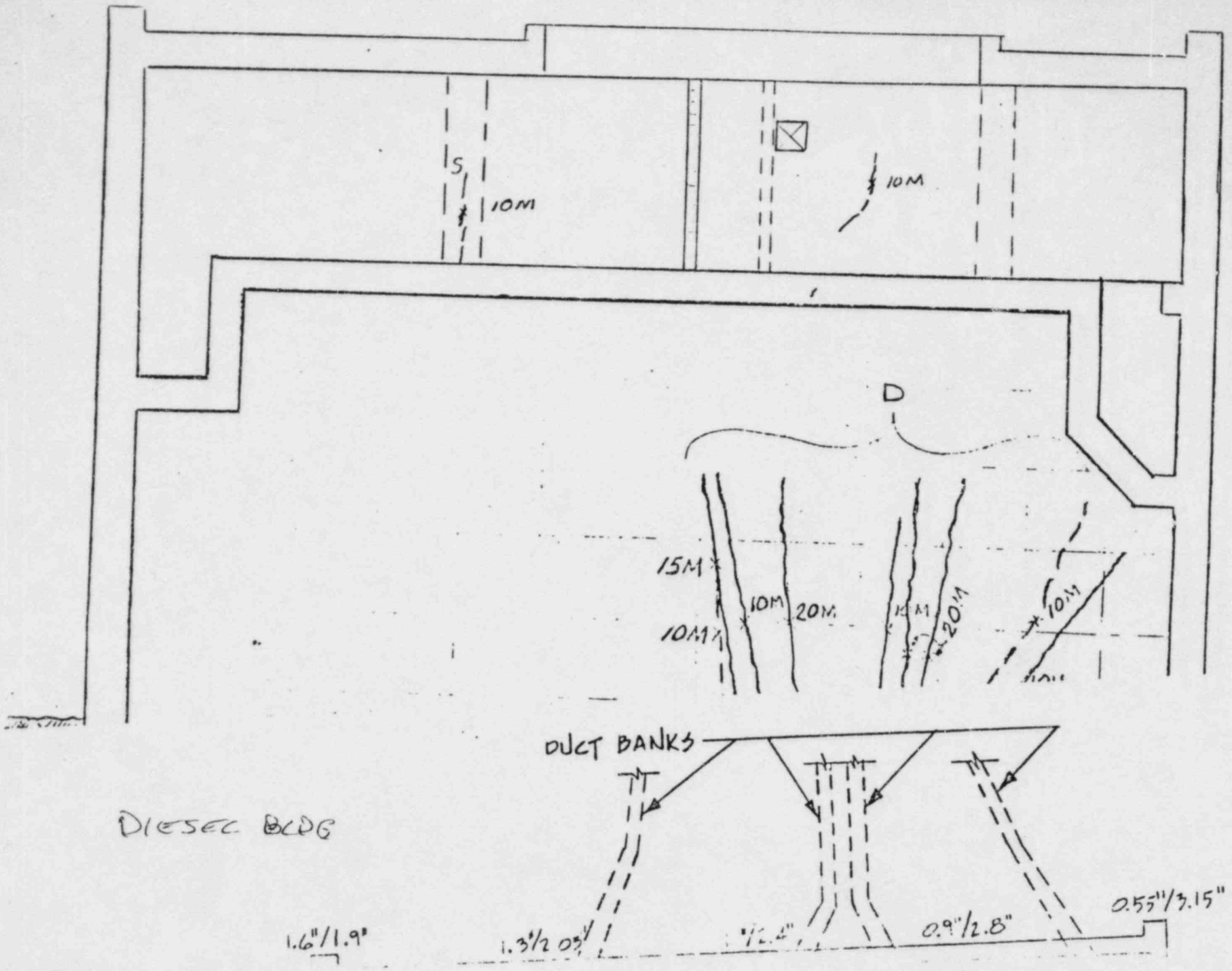
q. On March 7, 1983, a meeting was held to further discuss the CCP.

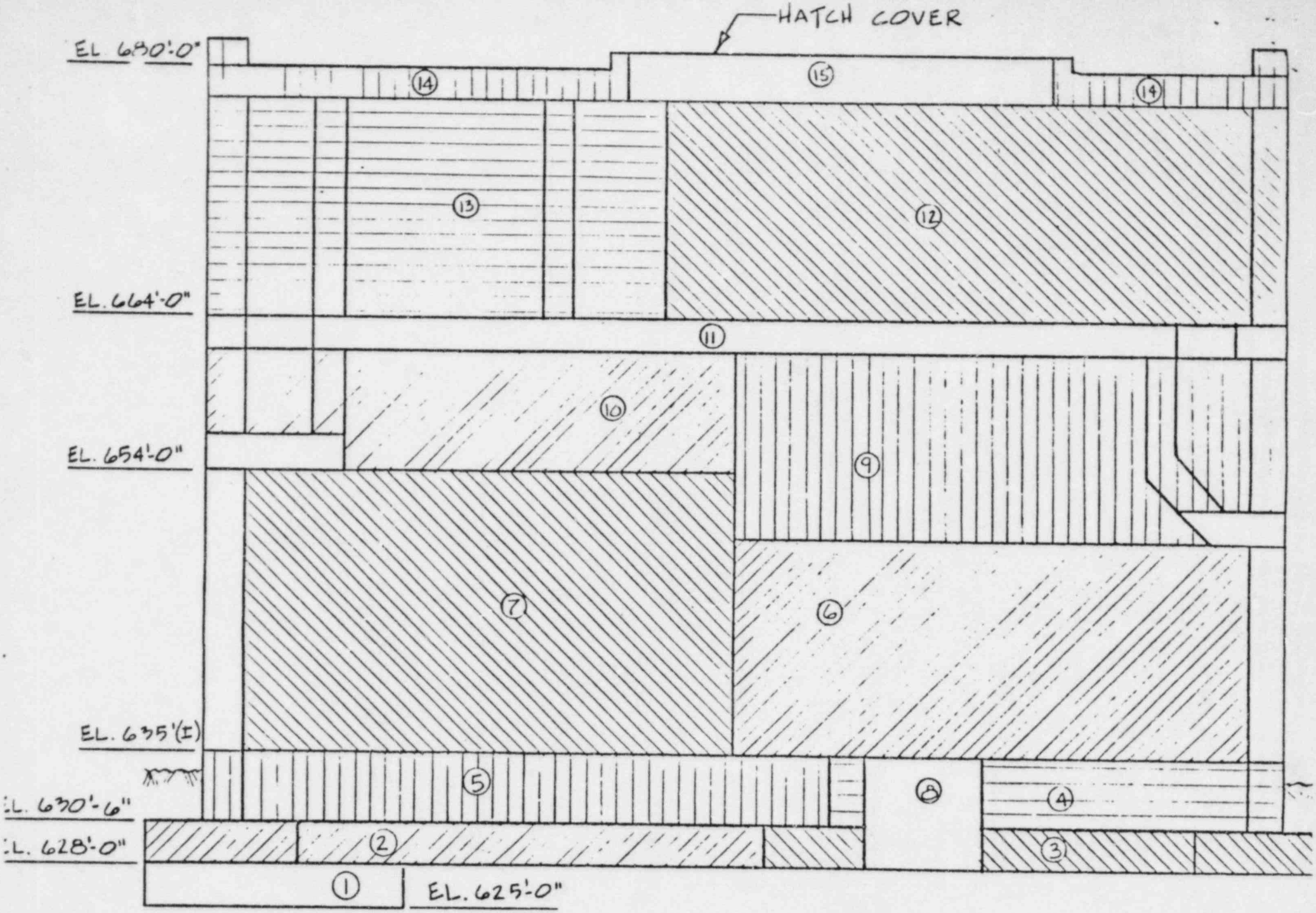
r. On March 15, 1983, a meeting was held to discuss the INPO Self Imposed Evaluation results.

#3 Construction Permit Amendments.

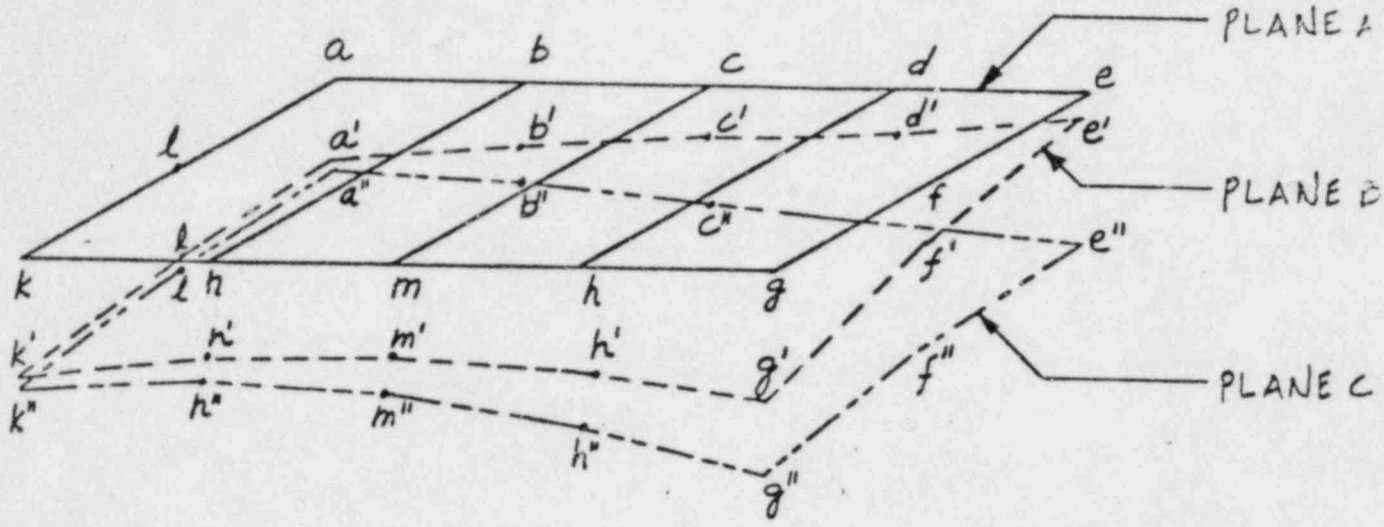


DIE[illegible]ATING BLDG


S
10M
10M
D
15M
10M
10M
20M
20M
10M
DUCT BANKS
DIESEL BLDG
1.6"/1.9"
1.3"/2.0"
0.9"/2.8"
0.55"/3.15"


HATCH COVER
EL 690'-0"
EL. 664'-0"
EL. 654'-0"
EL. 635'(I)
EL. 630'-6"
EL. 628'-0"
EL. 625'-0"
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

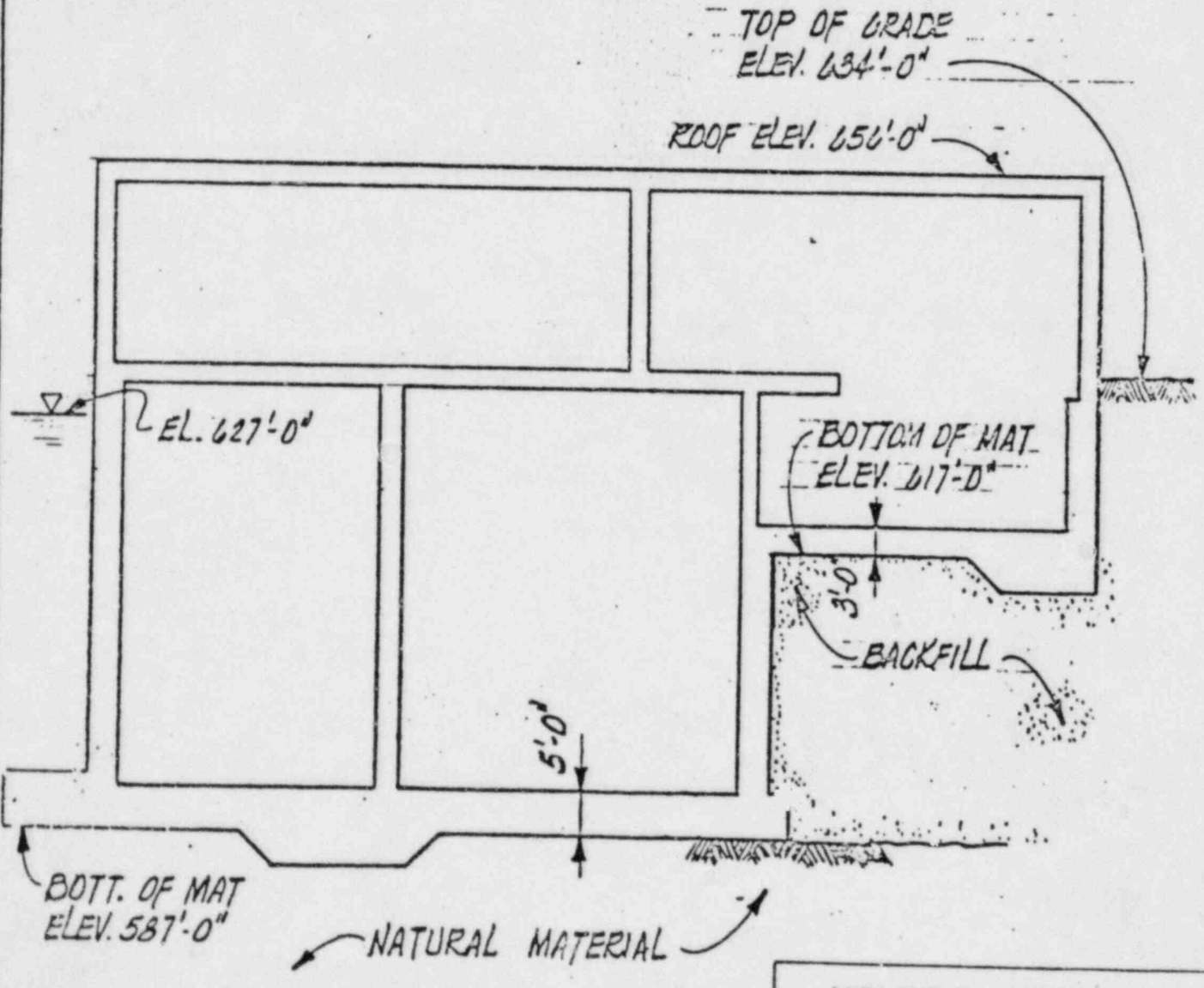
DIESEL BLDG.



NOTE:

PLANE A —— REFERENCE PLANE
PLANE B —— SETTLEMENT PLOT AS OF 11/16/78
BEFORE CUTTING DUCTBANKS LOOSE.
PLANE C —— SETTLEMENT PLOT AS OF 12/28/78
APPROX. A MONTH AFTER CUTTING DUCTBANKS

DIESER BLOG.

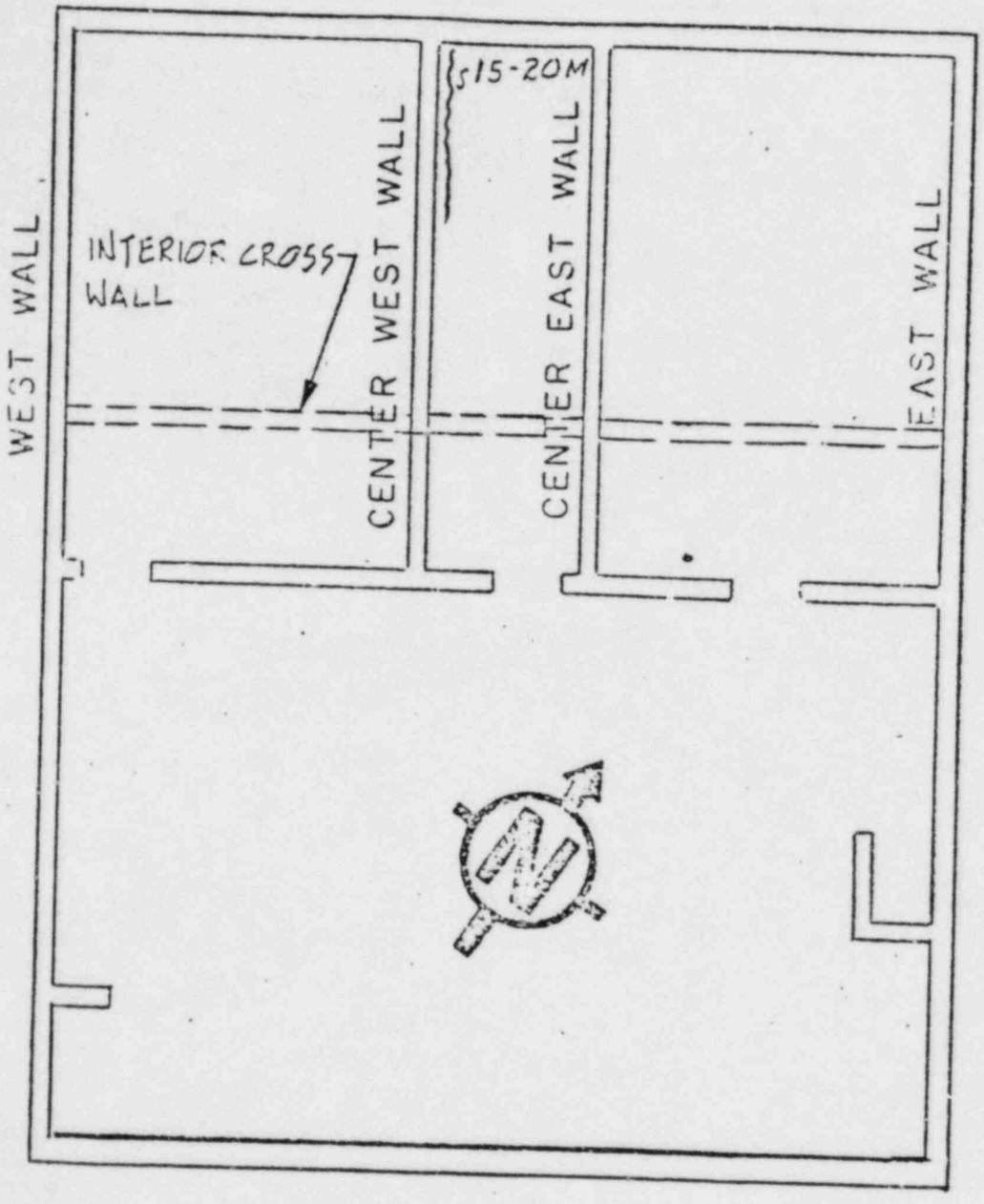


TYPICAL SECTION
(LOOKING WEST)
SERVICE WATER STRUCTURE

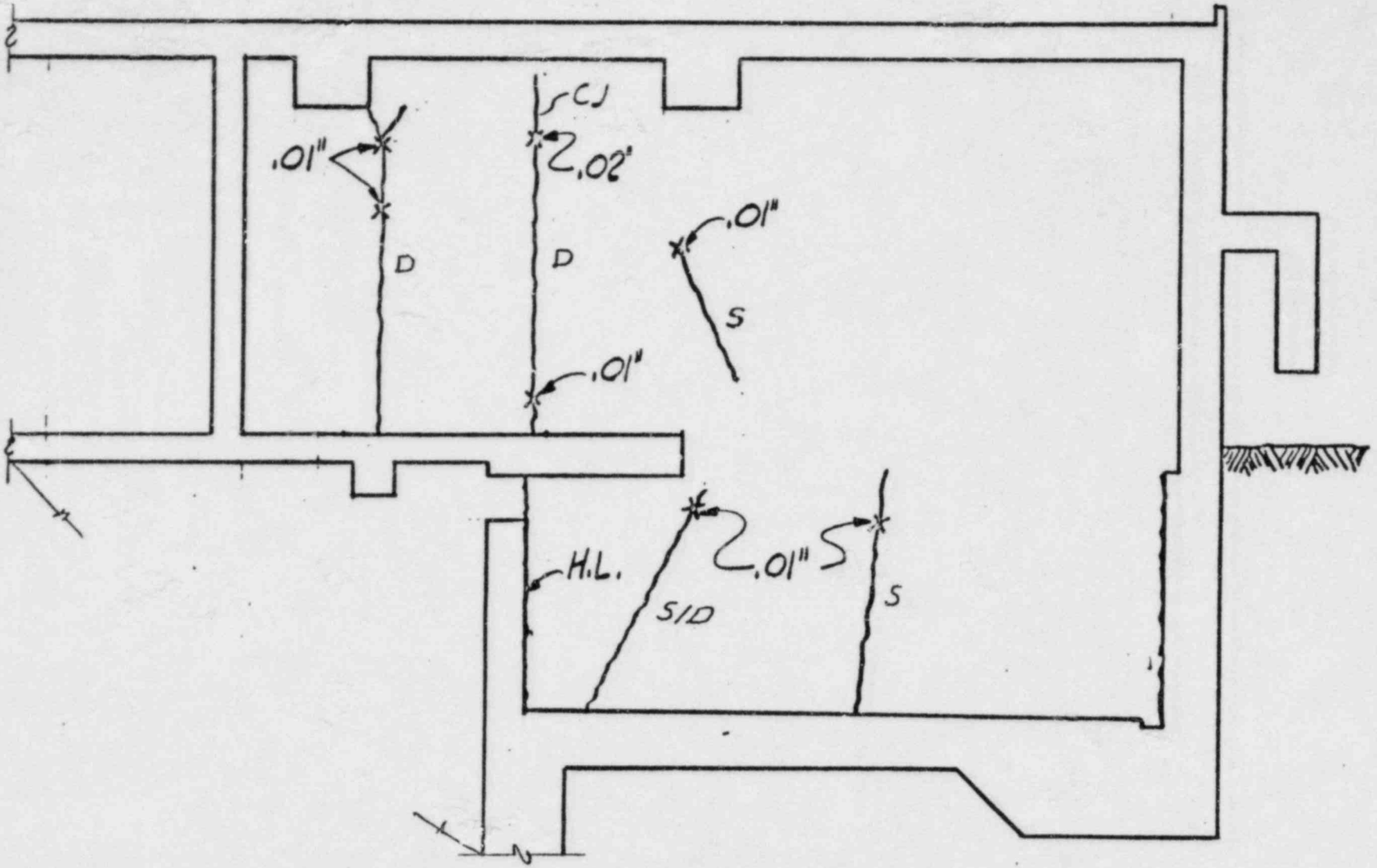
MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

SERVICE WATER PUMP STRUCTURE TYPICAL SECTION

FIGURE 81 REV. 6

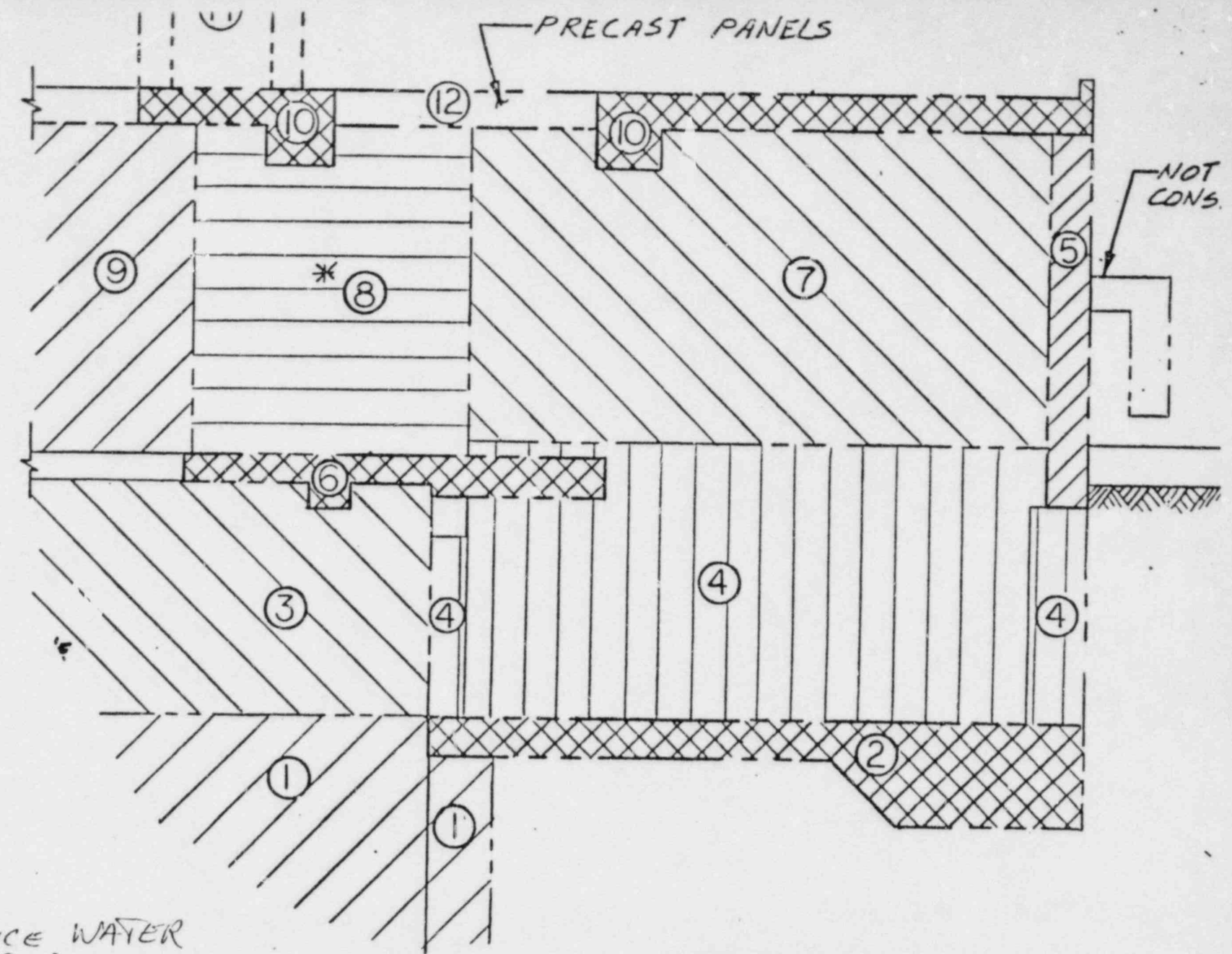

WEST WALL
INTERIOR CROSS WALL
CENTER WEST WALL
15-20M
CENTER EAST WALL
EAST WALL
SERVICE WATER BDS

KEY PLAN



SERVICE WATER BLDG

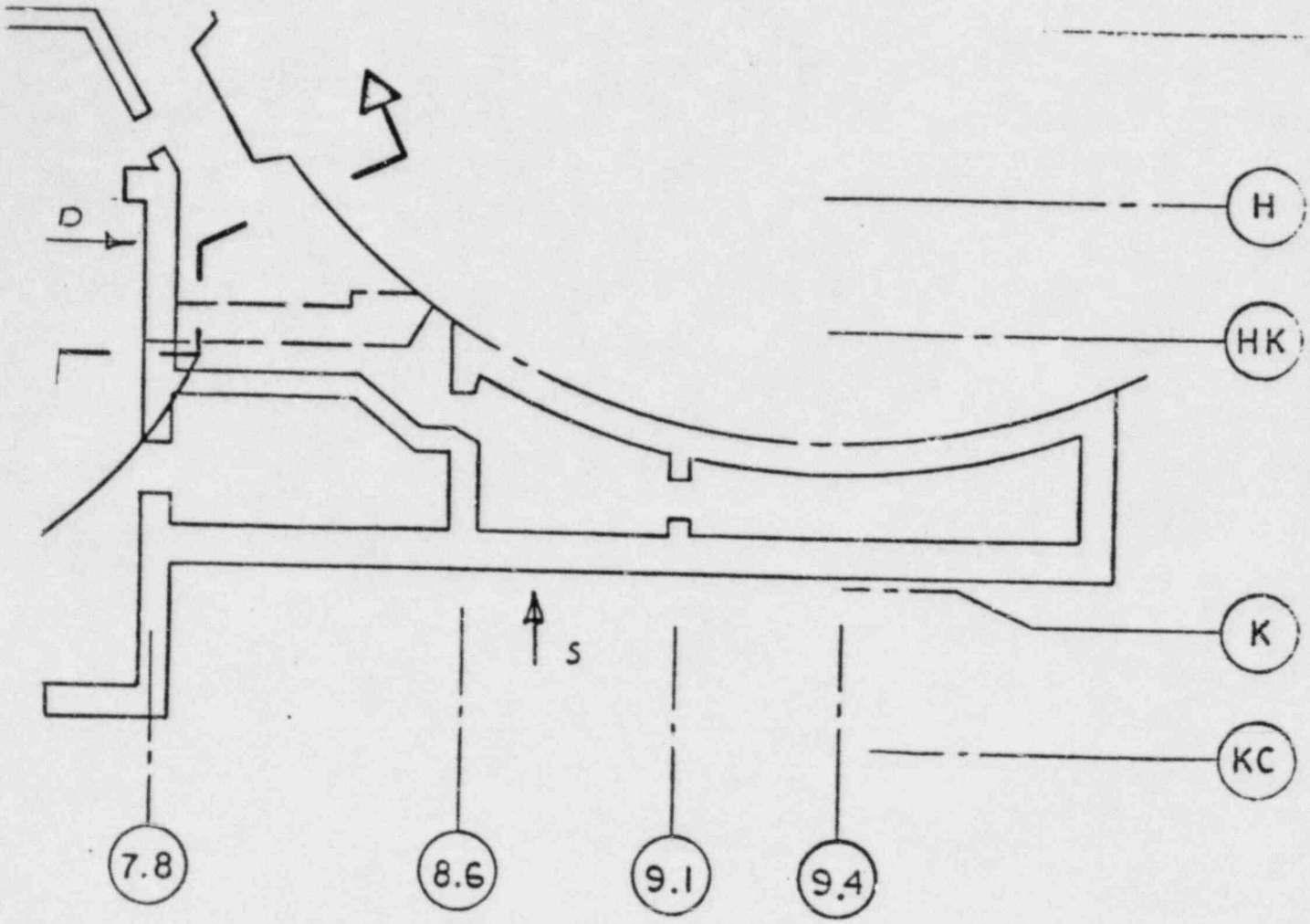
WEST WALL-EAST FACE
LOOKING WEST



SERVICE WATER BLDG.

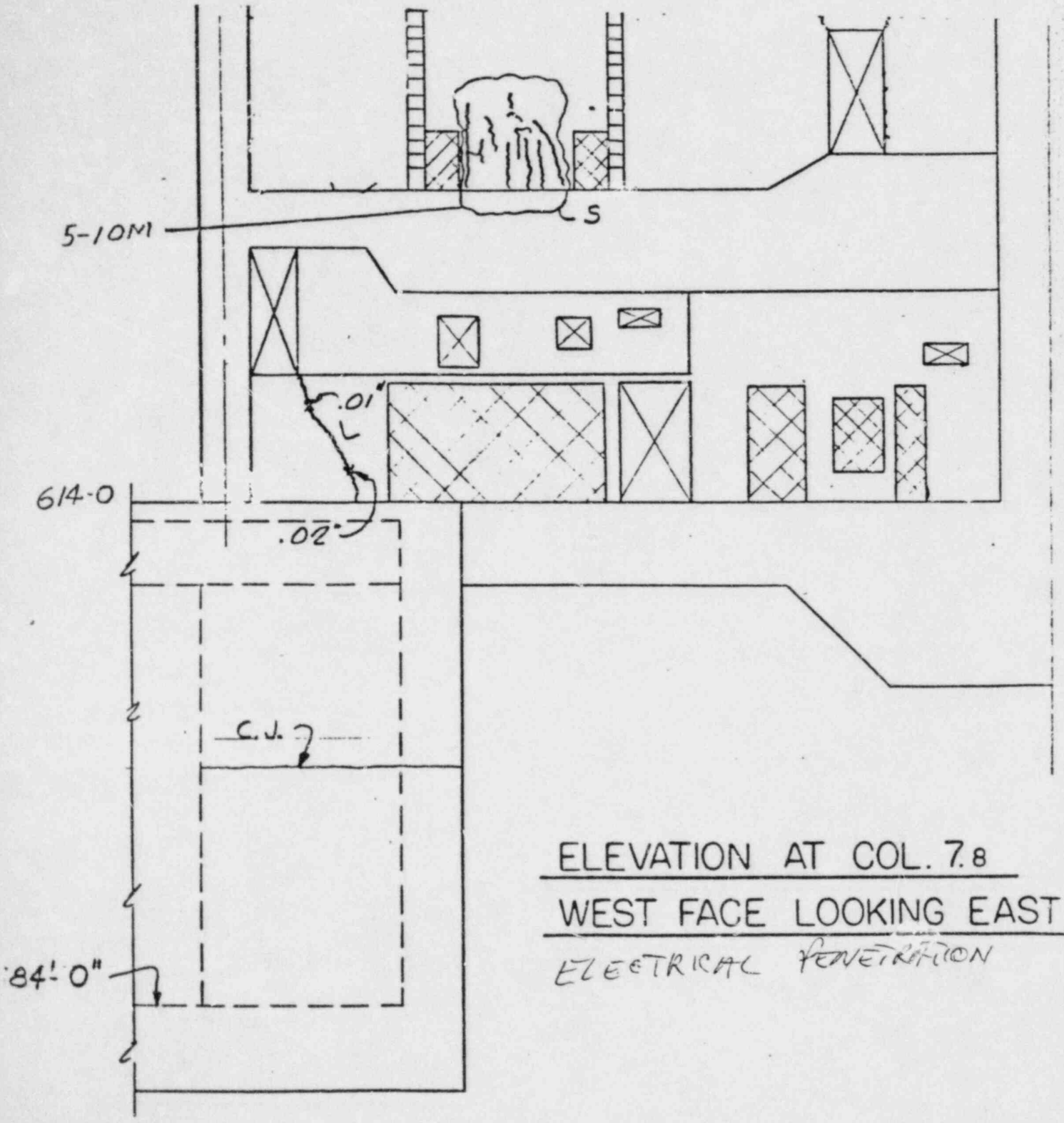
TYP CONSTRUCTION SEQUENCE

AT NORTH END



KEY PLAN

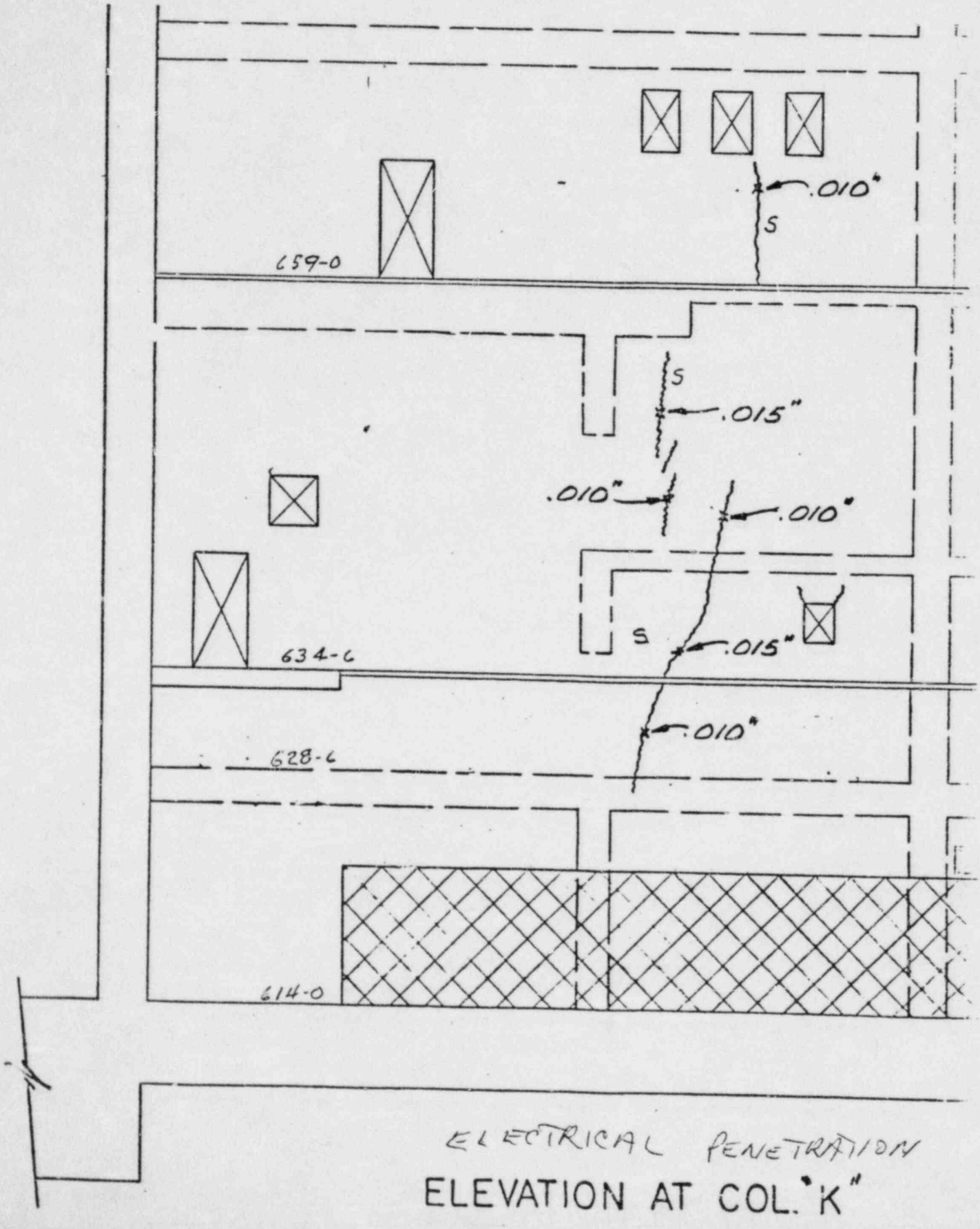
ELECTRICAL PENETRATION



ELEVATION AT COL. 7.8

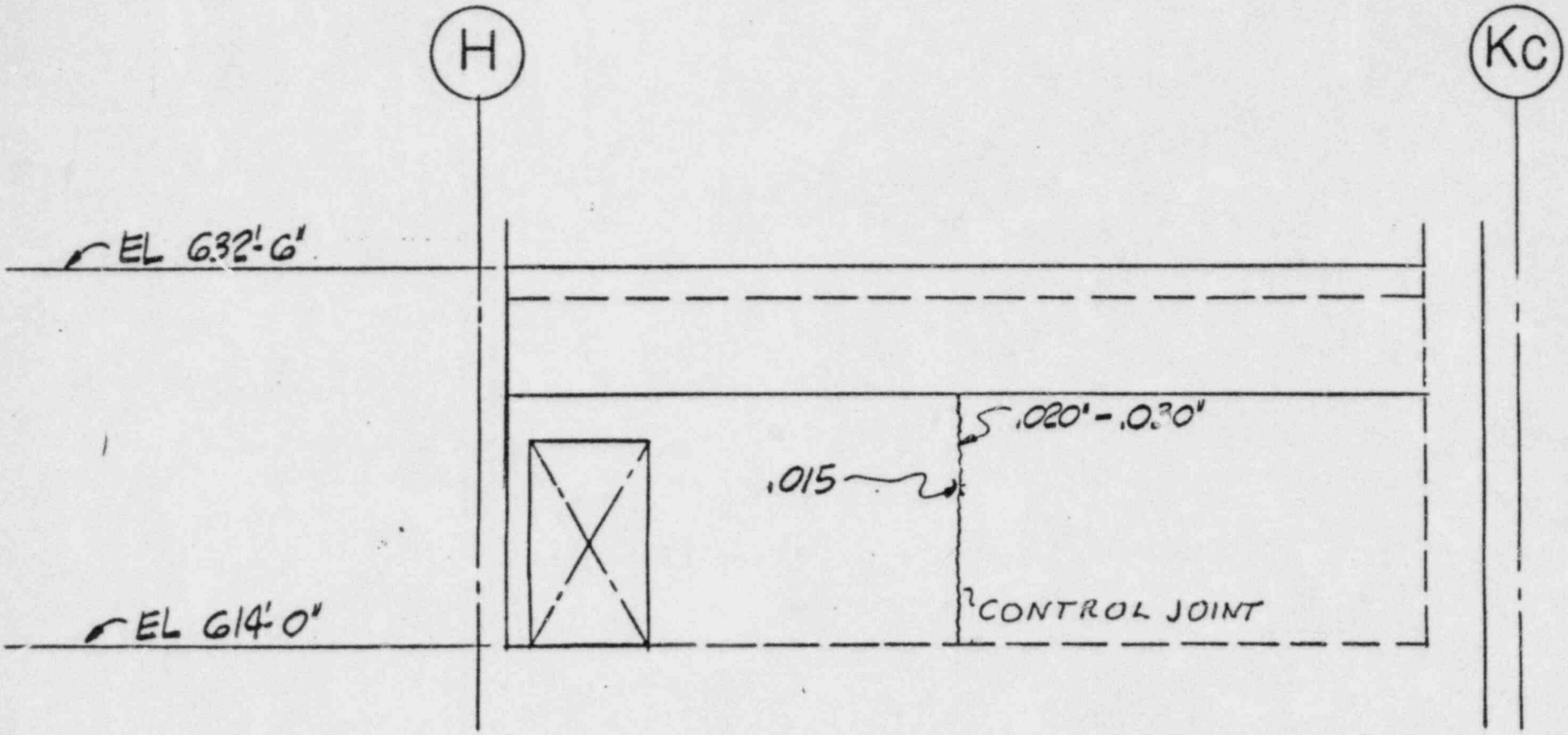
WEST FACE LOOKING EAST

ELECTRICAL PENETRATION



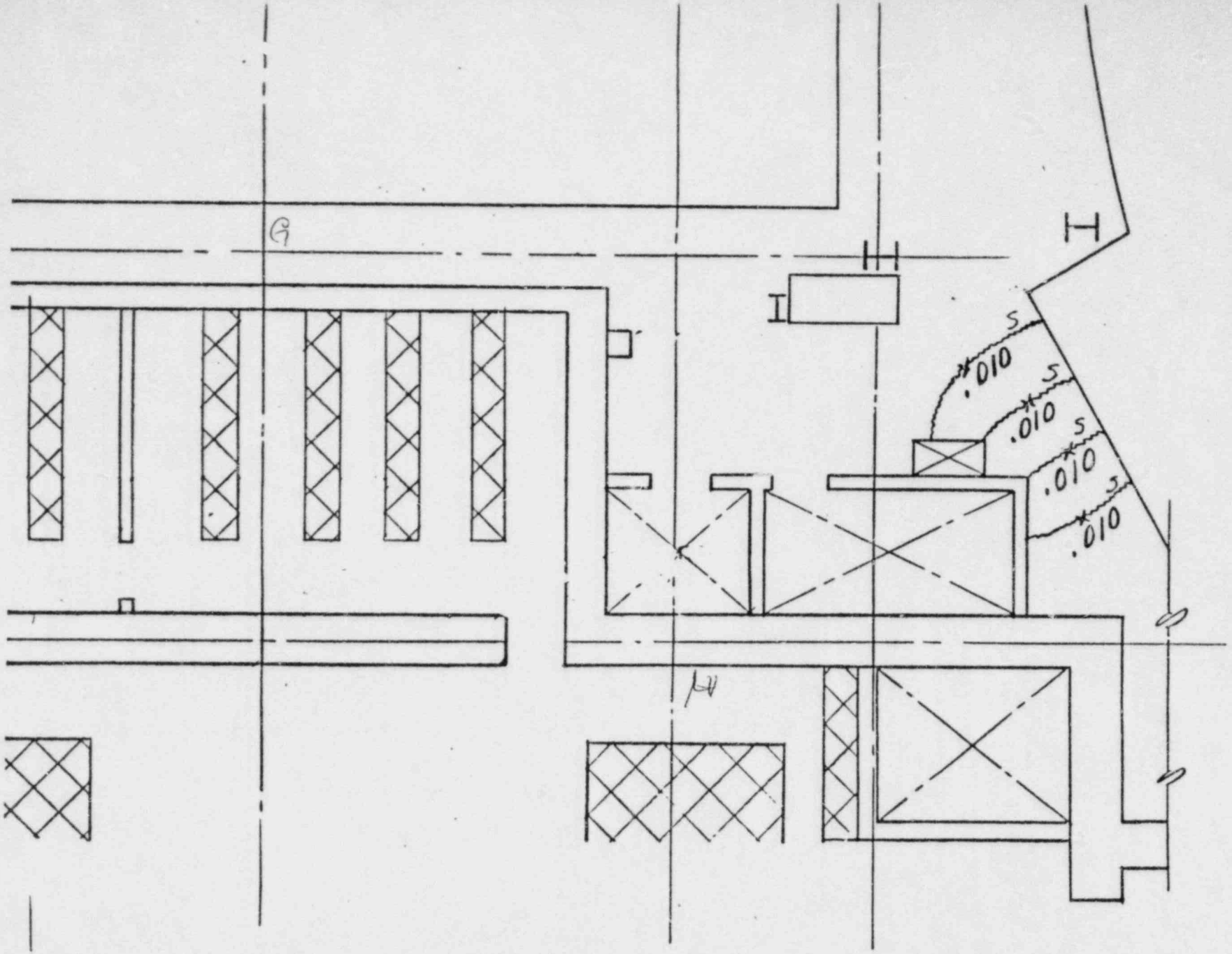
ELECTRICAL PENETRATION

ELEVATION AT COL. "K"



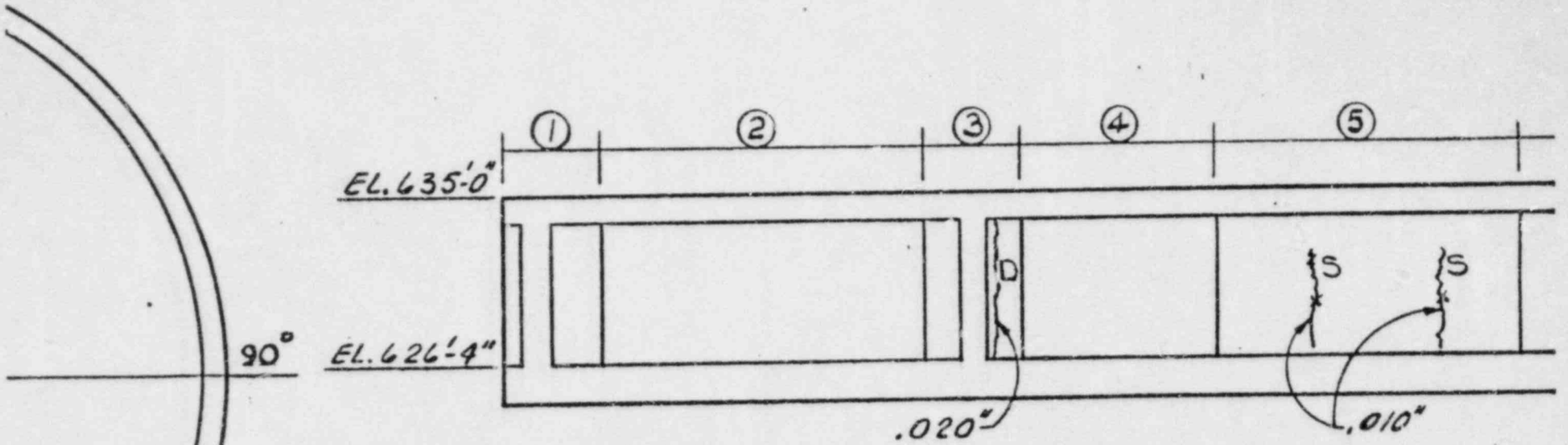
CONTROL ROOM

ELEVATION AT COL "6.6"
EAST FACE LOOKING EAST



PLAN AT EL 659'-0"

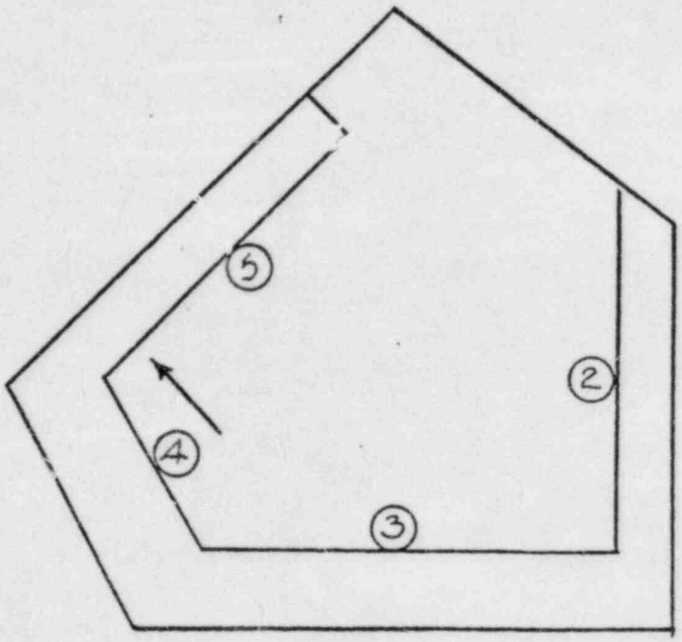
CONTROL TOWER



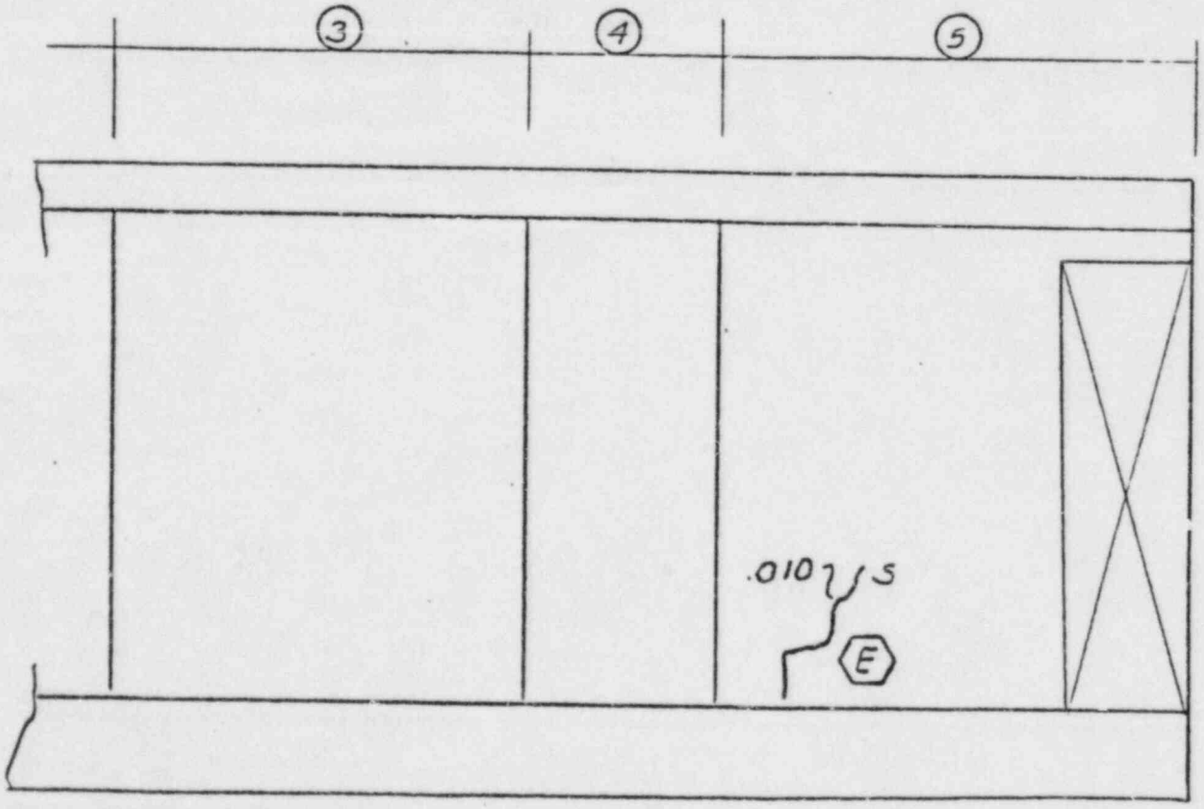
VALVE PIT – INSIDE WALLS

VALVE PIT – OUTSIDE WALLS

BORATED STORAGE TANK



PLAN



INSIDE ELEV

FW 150 VALVE CHAMBER

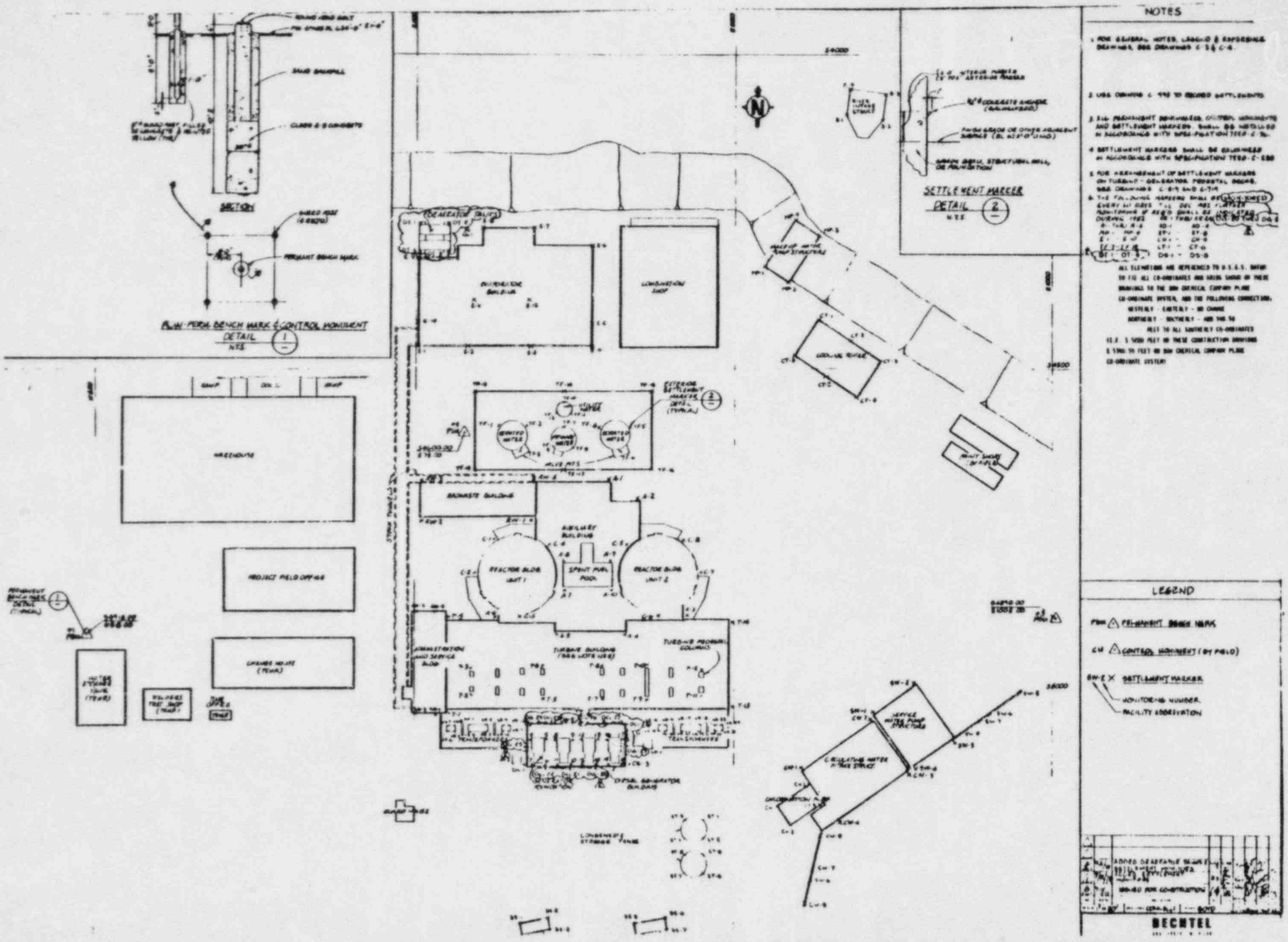
MAX. CRACK SIZE AS MEASURED PRIOR TO JUNE 1979

STRUCTURE	MAXIMUM CRACK SIZE (IN)
A) DIESEL GENERATOR BUILDING	0.028
B) SERVICE WATER PUMP STRUCTURE	0.020
C) AUXILIARY BUILDING	
RAILROAD BAY	0.010
ELECTRICAL PENETRATION AREAS	0.020
CONTROL TOWER	0.030 (2 LOCATIONS)
D) FEEDWATER ISOLATION VALVE CHAMBERS	0.010
E) BORATED WATER STORAGE TANK AND VALVE PITS	0.020

MAX. CRACK SIZE AS MEASURED ON JANUARY 4, 1980

STRUCTURE	MAXIMUM CRACK SIZE (IN)
A) DIESEL GENERATOR BUILDING	0.010
B) SERVICE WATER PUMP STRUCTURE	0.020
C) AUXILIARY BUILDING	
RAILROAD BAY	0.010
ELECTRICAL PENETRATION AREAS	0.020
CONTROL TOWER	0.020
D) FEEDWATER ISOLATION VALVE CHAMBERS	0.010
E) BORATED WATER STORAGE TANK AND VALVE PITS	0.015

I-


NOTES
SECTION
DETAIL 1
SETTLEMENT MARKER
DETAIL 2
WAREHOUSE
PROJECT FIELD OFFICE
RADWASTE BUILDING
AUXILIARY BUILDING
REACTOR BLDG UNIT 1
REACTOR BLDG UNIT 2
SPENT FUEL POOL
TURBINE BUILDING
LEGEND
SETTLEMENT MARKER
BECHTEL

SEISMIC ANALYSIS

GENERAL

(1) RESPONSE SPECTRA PRESENTED IN FSAR

(2) STICK MASS MODELS WITH FOUNDATION SPRINGS

(3) MATERIAL DAMPING VALUES PRESENTED IN FSAR (MODAL DAMPING LIMITED TO 10% EXCEPT RIGID BODY MODES)

(4) SPECTRUM RESPONSE AND TIME HISTORY MODAL ANALYSES

DIESEL GENERATOR BUILDING

(1) ORIGINAL (V_s = 1360 FPS) - ONE ANALYSIS EQUIPMENT SPECTRA WIDENED BY ± 15%

(2) NEW (V_s = 500 FPS) - NEW SPECTRA WILL ENVELOP BOTH V_s = 500 FPS AND 1360 FPS

SEISMIC ANALYSIS

SERVICE WATER BUILDING

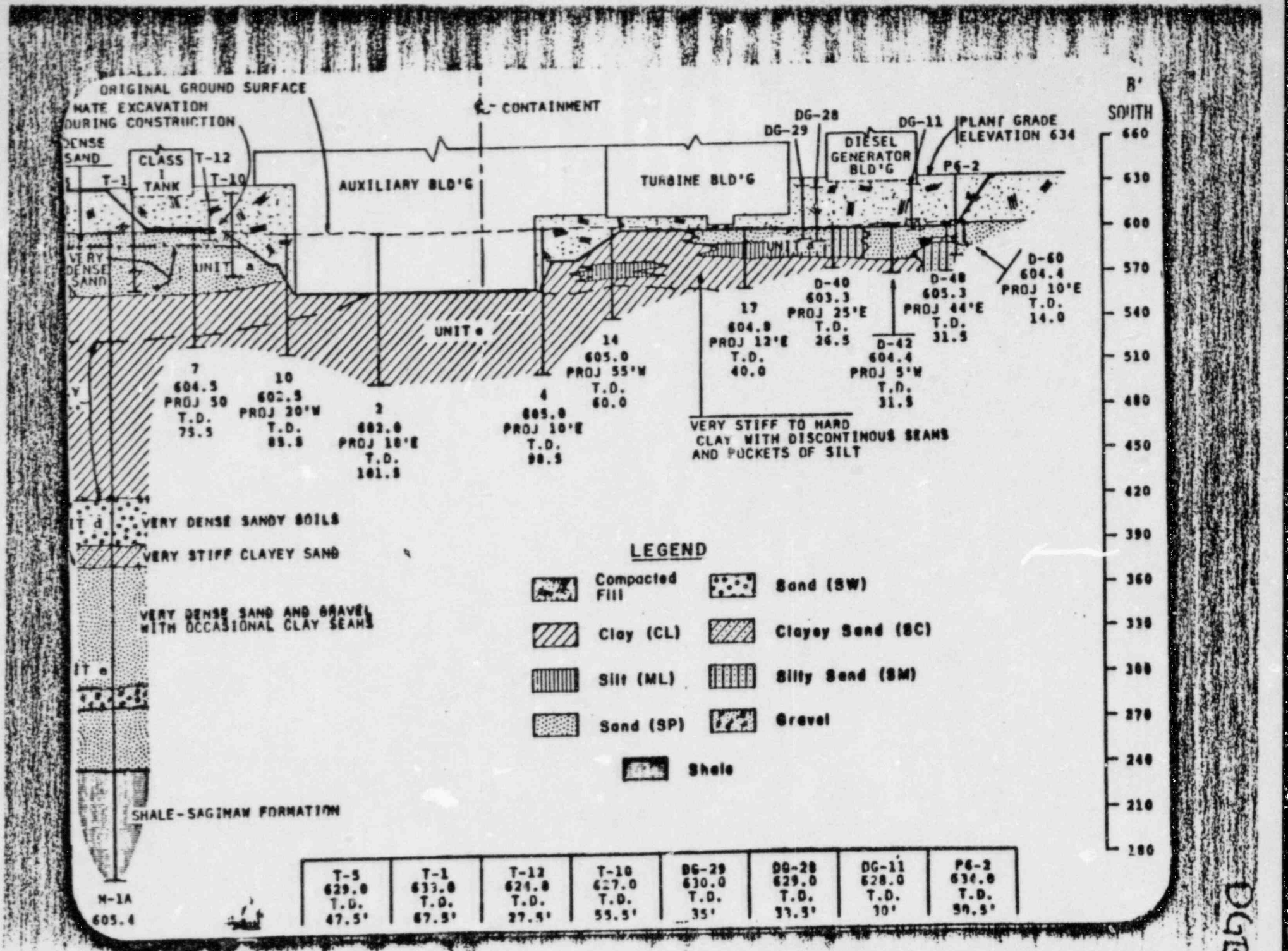
(1) ORIGINAL (V_s = 1360 FPS BASE CASE) THEN G VARIED BY ± 50% - EQUIPMENT SPECTRA ENVELOP

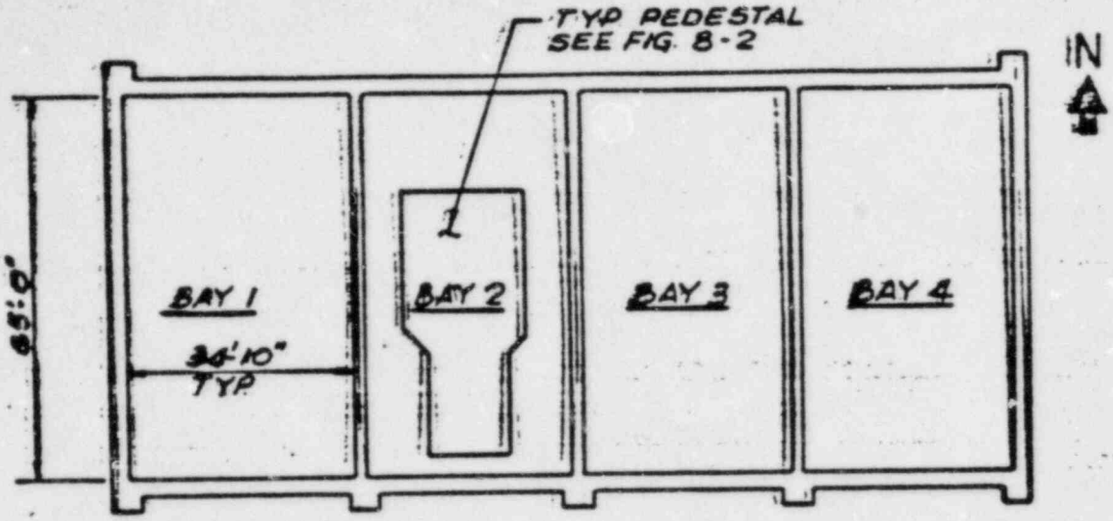
(2) NEW (V_s = 1360 FPS) - PILING IS MODELLED FOR VERTICAL DIRECTION AND TORSION IS CONSIDERED

AUXILIARY BUILDING (INCLUDE CONTROL TOWER AND ELECTRICAL PENETRATION AREAS

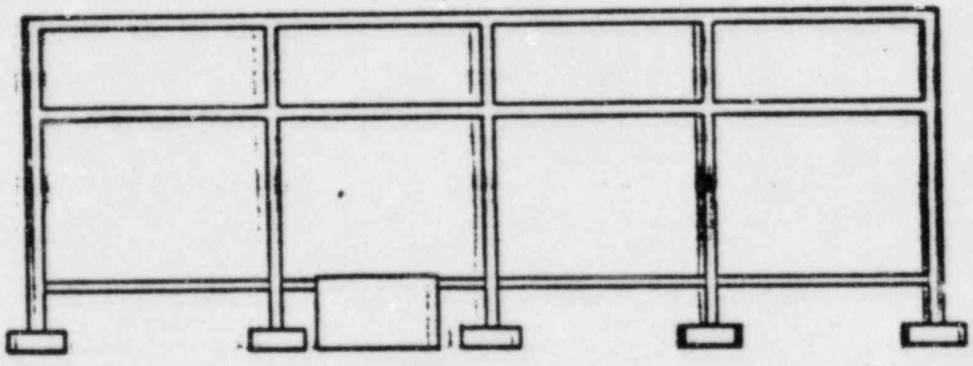
(1) ORIGINAL - ONE ANALYSIS USING COMPOSITE FOUNDATION SPRINGS WITH EQUIPMENT RESPONSE SPECTRA WIDENED BY ± 15%

(2) NEW - ONE ANALYSIS INCLUDING CAISSONS UNDER ELECTRICAL PENETRATION AREAS, EQUIPMENT RESPONSE SPECTRA WIDENED BY ± 15%

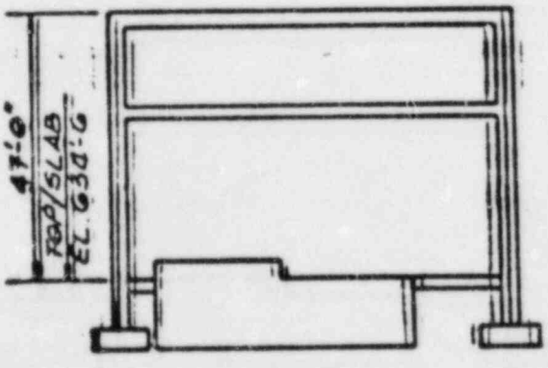

ORIGINAL GROUND SURFACE
MATE EXCAVATION
DURING CONSTRUCTION
DENSE
SAND
CLASS
I
TANK
T-12
T-10
T-1
AUXILIARY BLD'G
CONTAINMENT
TURBINE BLD'G
DG-29
DG-28
DG-11
DIESEL
GENERATOR
BLD'G
PLANT GRADE
ELEVATION 634
P6-2
R'
SOUTH
660
630
600
570
540
510
480
450
420
390
360
330
300
270
240
210
180
VERY
DENSE
SAND
UNIT a
UNIT c
UNIT d
UNIT e
7
604.5
PROJ 50
T.D.
75.5
10
602.5
PROJ 20'W
T.D.
89.5
2
602.0
PROJ 18'E
T.D.
101.5
4
605.0
PROJ 10'E
T.D.
98.5
14
605.0
PROJ 55'W
T.D.
60.0
17
604.8
PROJ 12'E
T.D.
40.0
D-40
603.3
PROJ 25'E
T.D.
26.5
D-42
604.4
PROJ 5'W
T.D.
31.5
D-48
605.3
PROJ 44'E
T.D.
31.5
D-60
604.4
PROJ 10'E
T.D.
14.0
VERY STIFF TO HARD
CLAY WITH DISCONTINOUS SEAMS
AND POCKETS OF SILT
VERY DENSE SANDY SOILS
VERY STIFF CLAYEY SAND
VERY DENSE SAND AND GRAVEL
WITH OCCASIONAL CLAY SEAMS
SHALE-SAGINAW FORMATION
LEGEND
Compacted Fill
Sand (SW)
Clay (CL)
Clayey Sand (SC)
Silt (ML)
Silty Sand (SM)
Sand (SP)
Gravel
Shale
M-1A
605.4
T-5
629.0
T.D.
47.5'
T-1
633.0
T.D.
67.5'
T-12
624.8
T.D.
27.5'
T-10
627.0
T.D.
55.5'
DG-29
630.0
T.D.
35'
DG-28
629.0
T.D.
33.5'
DG-11
628.0
T.D.
30'
P6-2
634.0
T.D.
50.5'



PLAN



SECTION
LOOKING NORTH

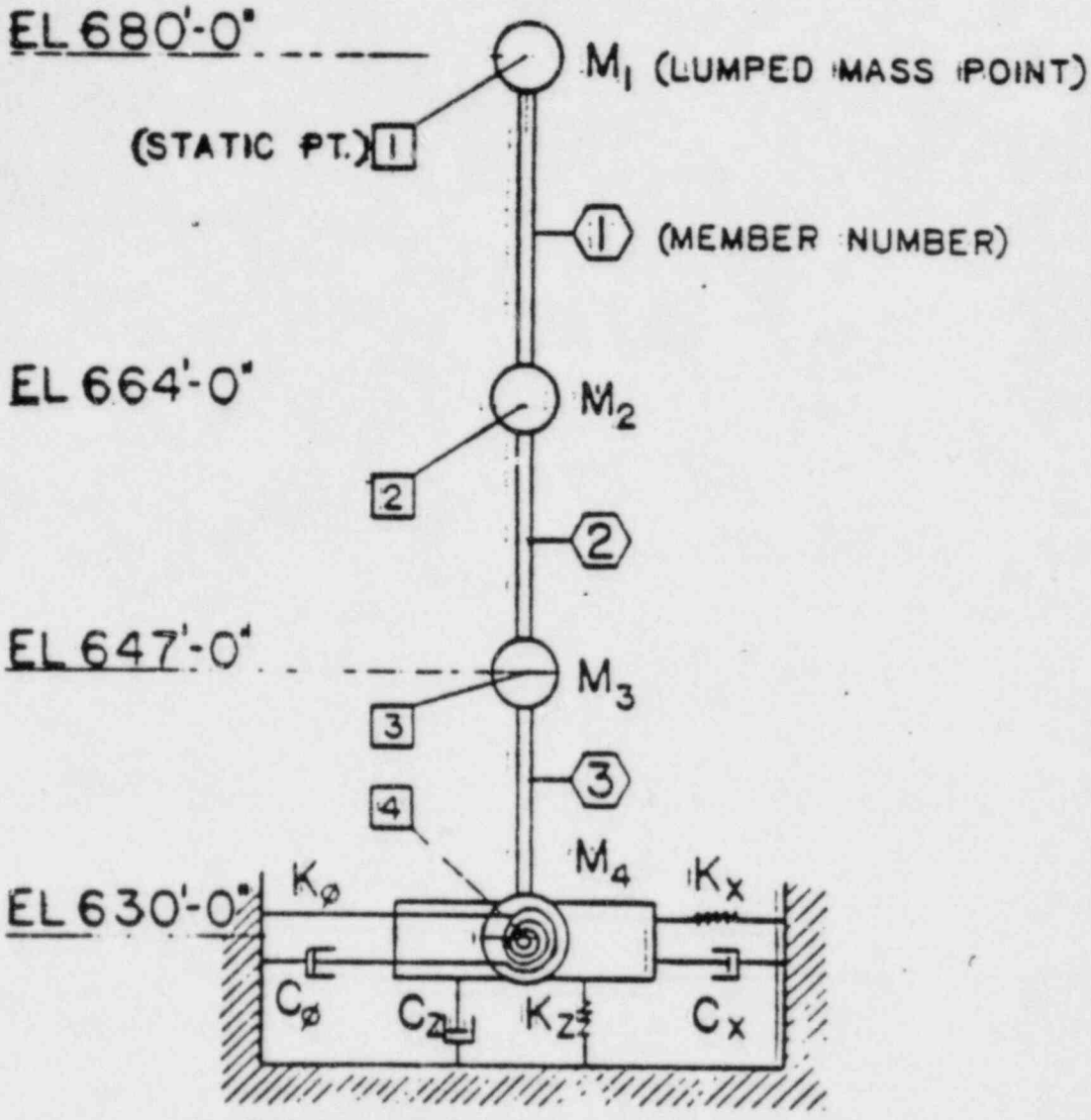


SECTION
LOOKING WEST

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

EXTERNAL CONTAINMENT BUILDING
PLAN & SECTIONS

FIGURE 2.5-9 DATE: 4/24/78



DIESEL GENERATOR BLDG.
SEISMIC MODEL

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

DIESEL GENERATOR BLDG
SEISMIC MODEL

FIGURE 13-1 DATE. 4/24/79

CONSUMERS POWER COMPANY
MIDLAND UNITS 1 & 2 - JOB 7220

DIESEL GENERATOR BUILDING

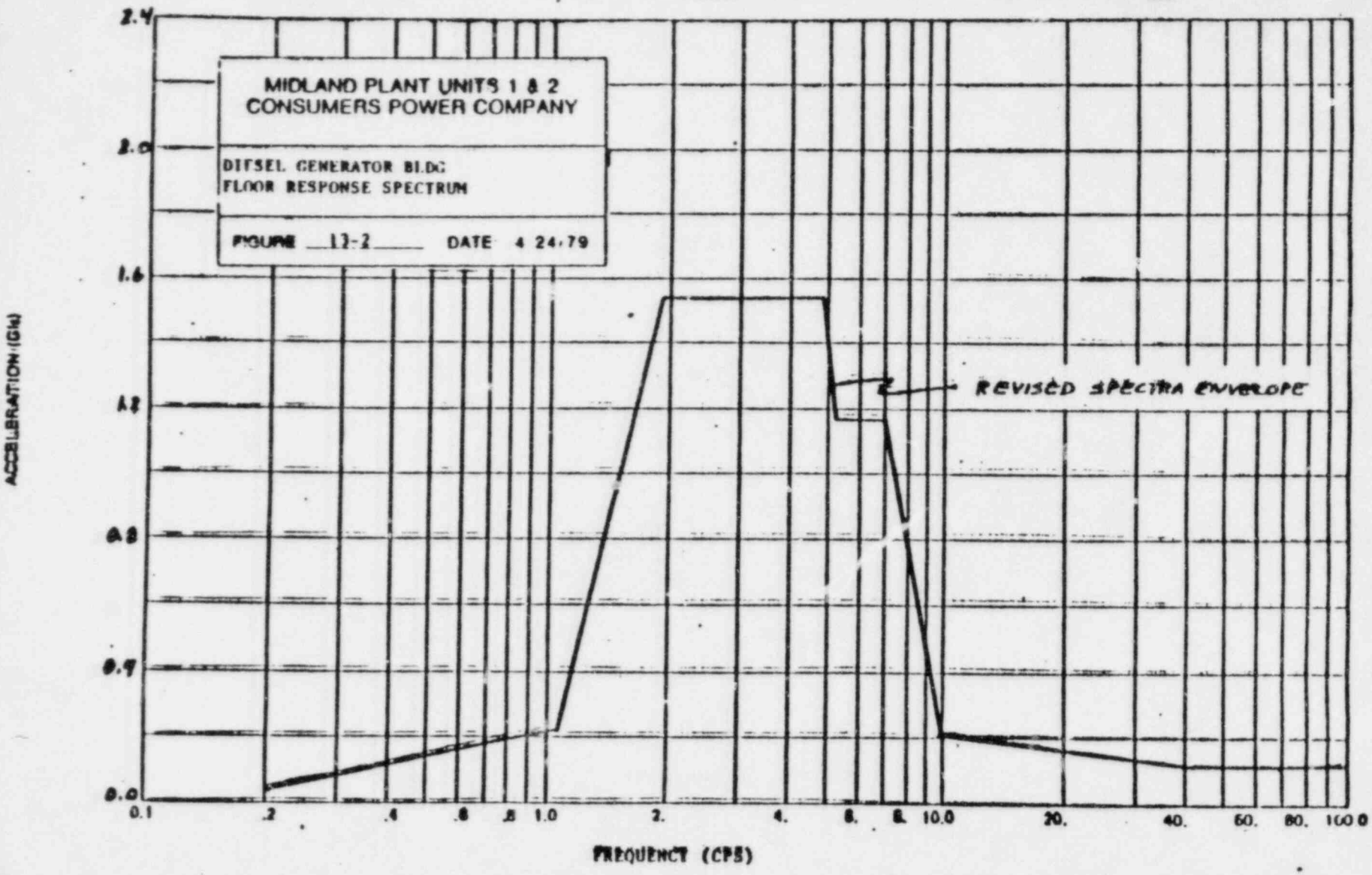
- ORIGINAL ANALYSIS
  - Elastic Modulus (ksf) 22,000
  - Poisson Ratio 0.42
  - Unit Weight (pcf) 135
  - Shear Wave Velocity (f/s) 1,359
- NEW ANALYSIS
  - Based on a Lower Bound Shear Wave Velocity of 500 ft/sec. The Design Forces and Floor Responses will Envelope the Original and New Analysis
  - Elastic Modulus (eff) (ksf) 2,646
  - Poisson Ratio 0.42
  - Unit Weight (pcf) 120
  - Shear Wave Velocity (f/s) 500

G-1038 01

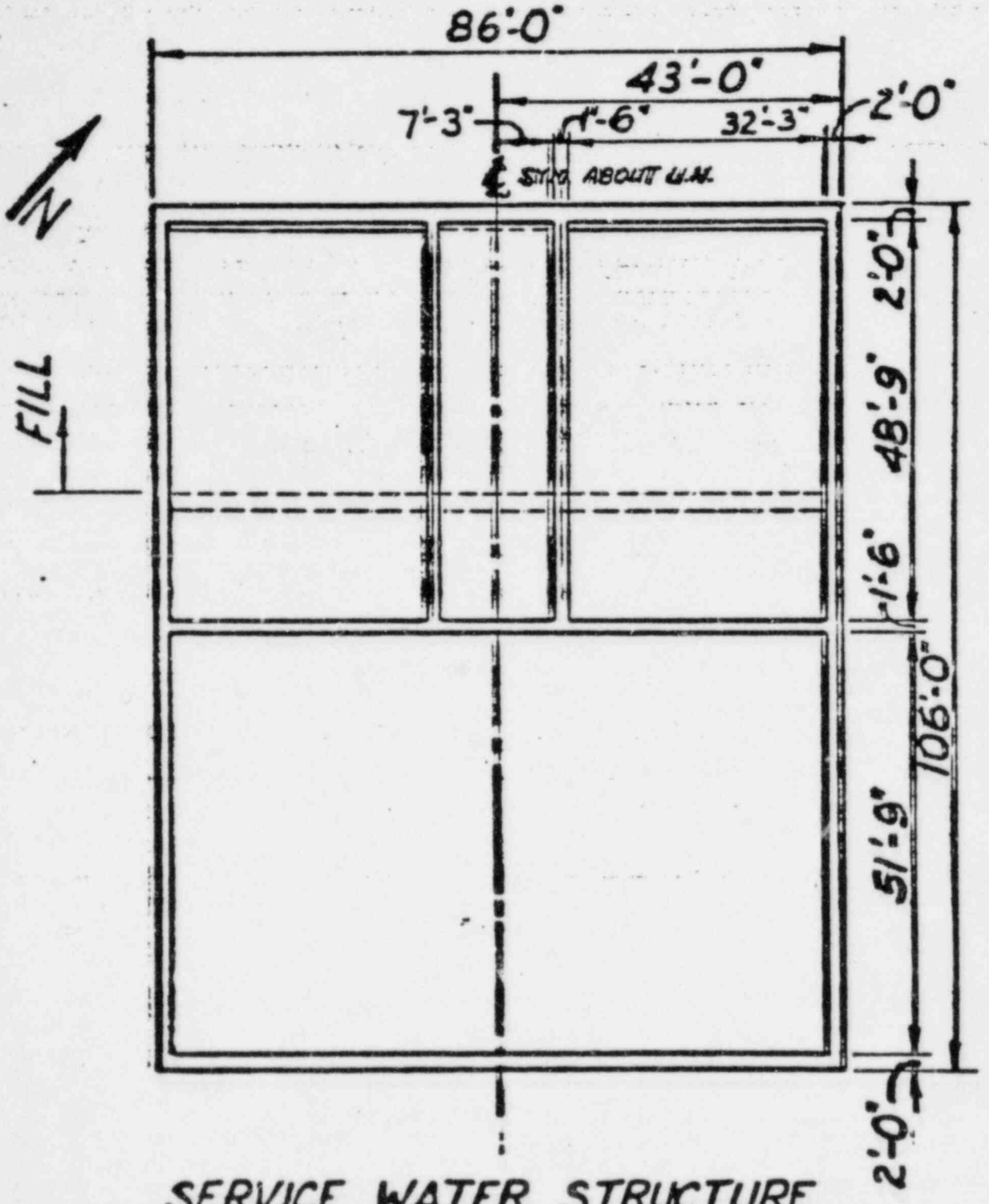
MIDLAND PLANT UNITS 1 & 2
JOB NO. 7220
DIESEL GENERATOR BLDG.

FLOOR RESPONSE SPECTRUM
MASS POINT 1 AT ELEV. 680'0"
NORTH-SOUTH DIRECTION

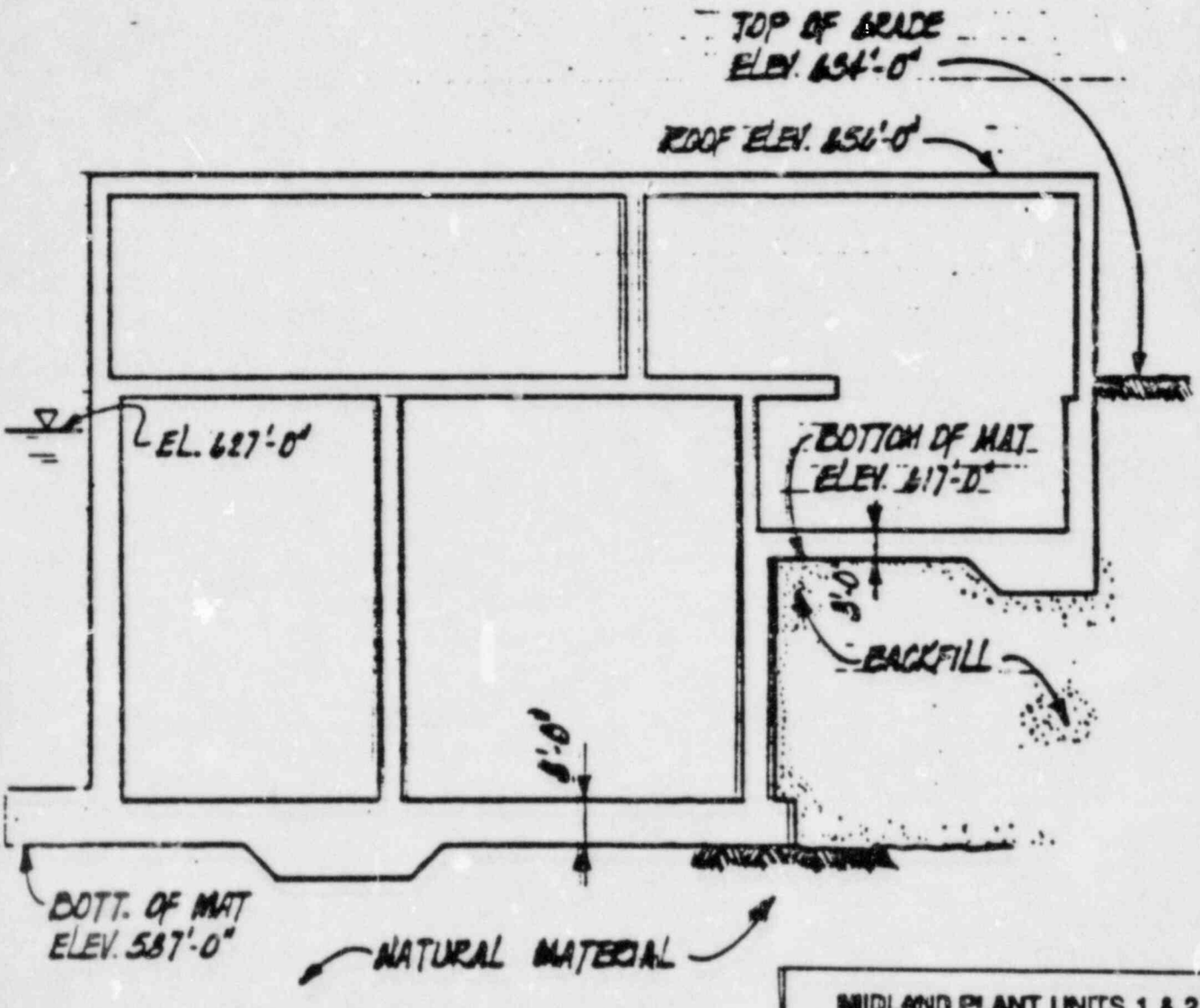
OBE & ½G GROUND ACCELERATION
(SSE OBE MULTIPLIER OF 2)
DAMPING RATIO: 1.0%



4-7-71



SERVICE WATER STRUCTURE
PLAN AT EL. 634'-6"

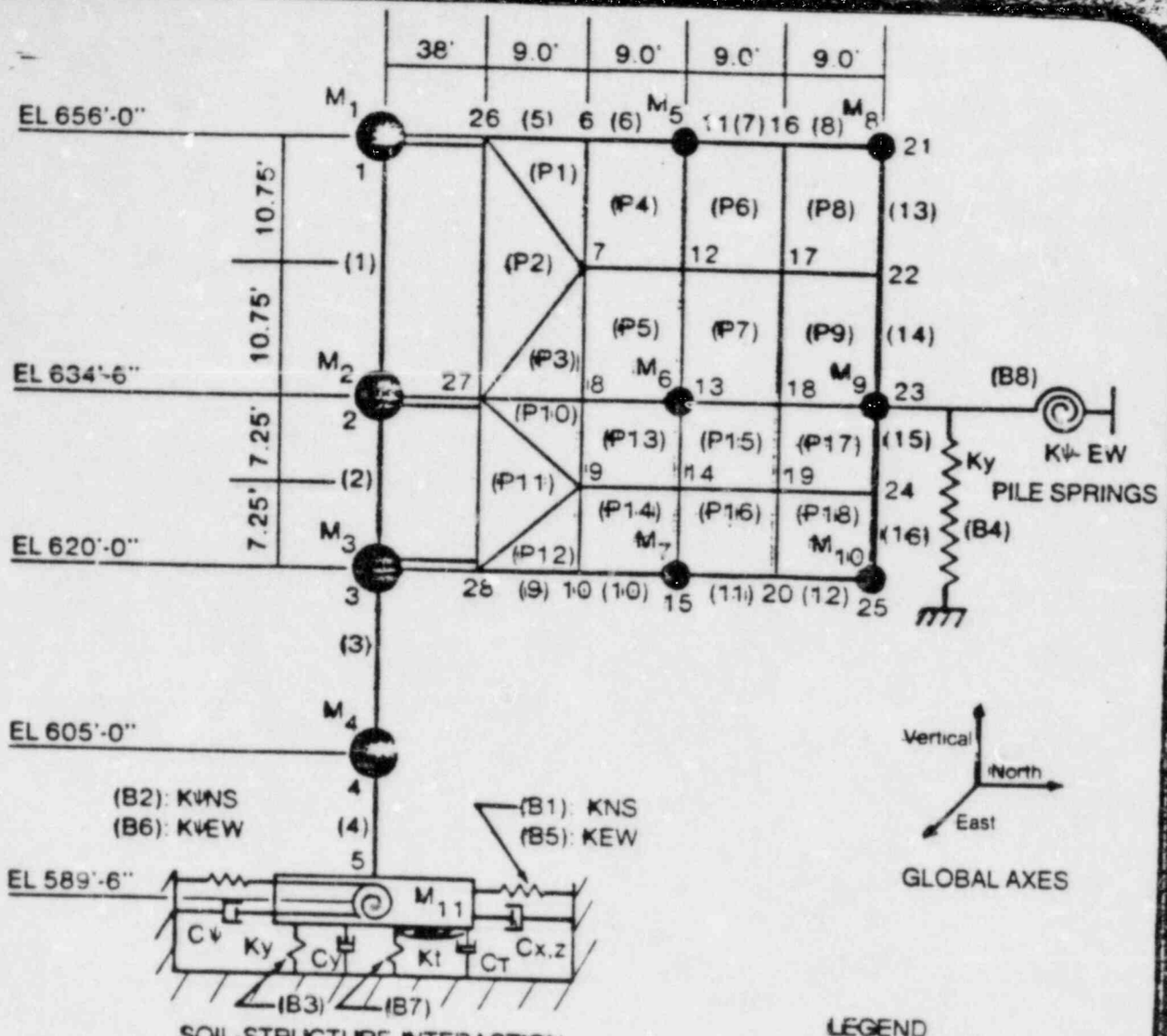


TYPICAL SECTION
(LOOKING WEST)
SERVICE WATER STRUCTURE

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

SERVICE WATER PUMP STRUCTURE TYPICAL SECTION

FIGURE 31 REV.



CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

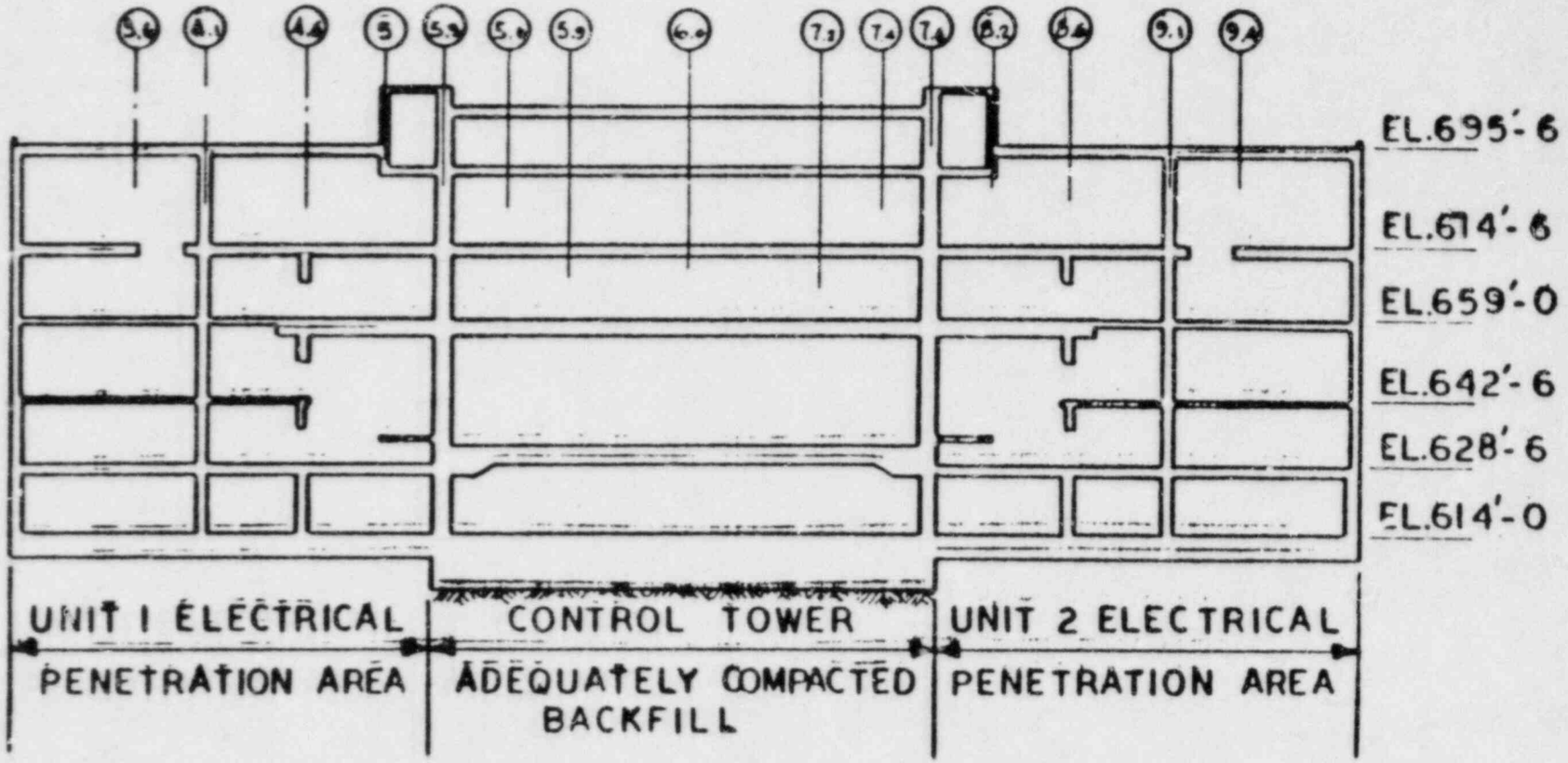
Mathematical Model for
Service Water Pump
Structure Seismic Analysis

CONSUMERS POWER COMPANY
MIDLAND UNITS 1 & 2 - JOB 7220

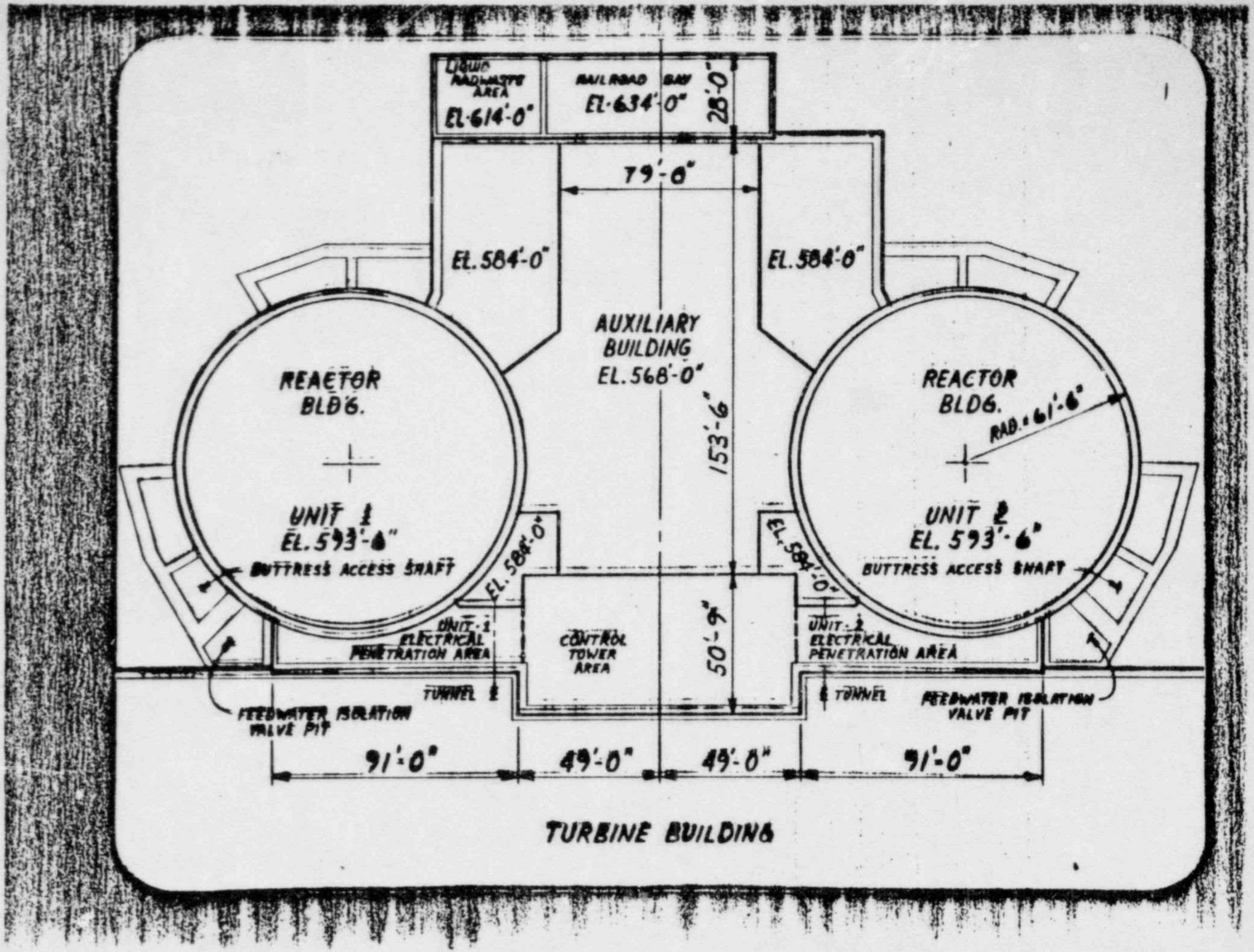
SERVICE WATER STRUCTURE

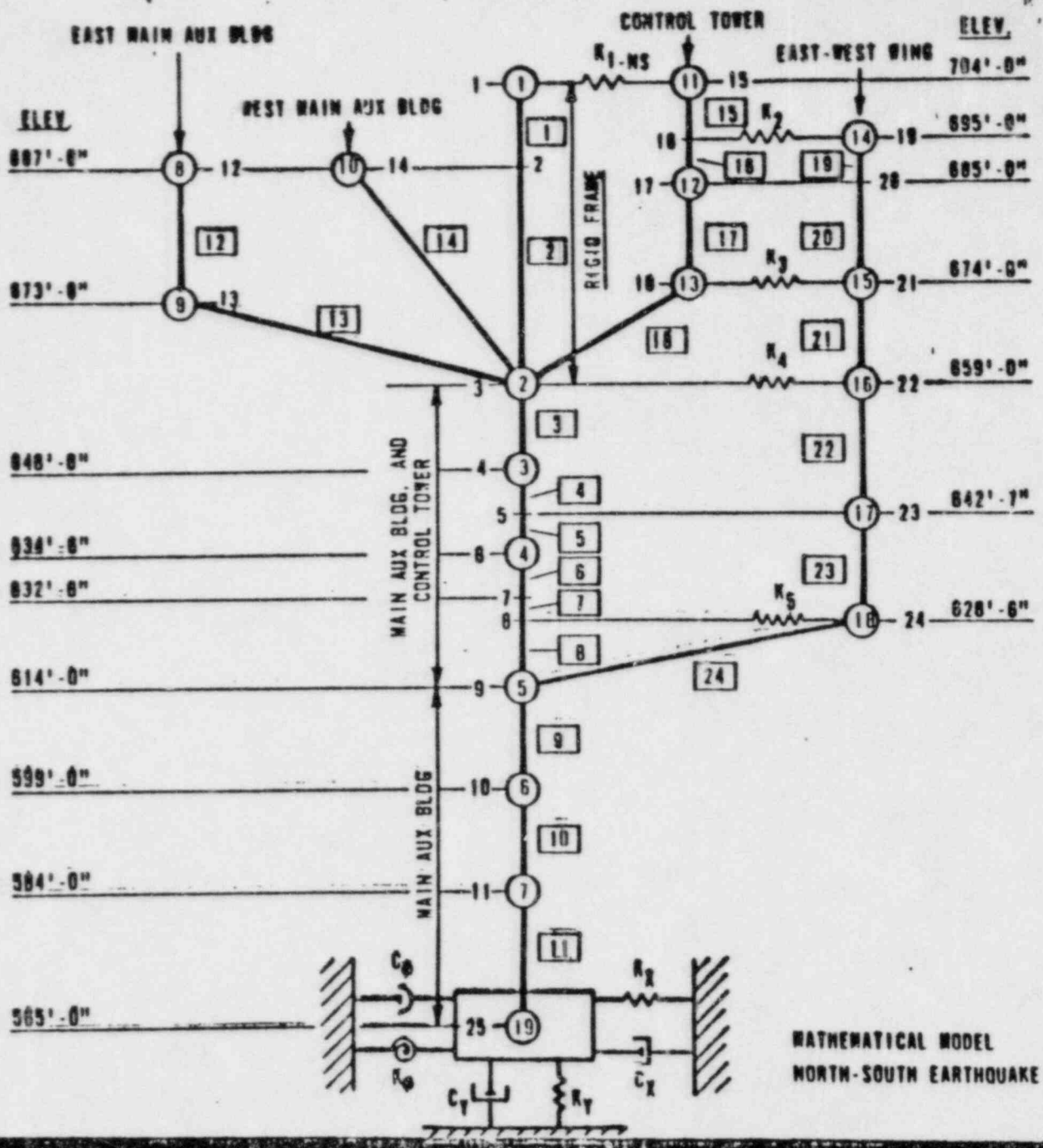
- ORIGINAL ANALYSIS
  - Elastic Modulus (ksf) 22,000 ± 50%
  - Poisson Ratio 0.42
  - Unit Weight (pcf) 135
  - Shear Wave Velocity (f/s) 1,359
- NEW ANALYSIS
  - Elastic Modulus (ksf) 22,000
  - Poisson Ratio 0.42
  - Unit Weight (pcf) 135
  - Shear Wave Velocity (f/s) 1,359
  - Fnd Area 74 ft x 90 ft
  - Vetical Stiffness 30,000 k/ft/pile
  - E-W Rocking Pile Stiffness 25,000 k/ft/pile

G-1038-02


EL.695'-6
EL.674'-6
EL.659'-0
EL.642'-6
EL.628'-6
EL.614'-0
UNIT 1 ELECTRICAL PENETRATION AREA
CONTROL TOWER ADEQUATELY COMPACTED BACKFILL
UNIT 2 ELECTRICAL PENETRATION AREA

SECTION B-B


LIQUID RADWASTE AREA
EL. 614'-0"
RAILROAD BAY
EL. 634'-0"
28'-0"
79'-0"
EL. 584'-0"
EL. 584'-0"
AUXILIARY BUILDING
EL. 568'-0"
153'-6"
REACTOR BLDG.
UNIT 1
EL. 593'-6"
BUTTRESS ACCESS SHAFT
REACTOR BLDG.
RAD. = 61'-6"
UNIT 2
EL. 593'-6"
BUTTRESS ACCESS SHAFT
EL. 584'-0"
EL. 584'-0"
UNIT-1 ELECTRICAL PENETRATION AREA
CONTROL TOWER AREA
50'-9"
UNIT-2 ELECTRICAL PENETRATION AREA
TUNNEL
TUNNEL
FEEDWATER ISOLATION VALVE PIT
FEEDWATER ISOLATION VALVE PIT
91'-0"
49'-0"
49'-0"
91'-0"
TURBINE BUILDING


EAST MAIN AUX BLDG
WEST MAIN AUX BLDG
CONTROL TOWER
EAST-WEST WING
ELEV.
ELEV.
887'-8"
873'-8"
848'-8"
834'-8"
832'-8"
814'-0"
599'-0"
584'-0"
565'-0"
704'-0"
695'-0"
685'-0"
674'-0"
659'-0"
642'-1"
628'-6"
RIGID FRAME
MAIN AUX BLDG. AND CONTROL TOWER
MAIN AUX BLDG
MATHEMATICAL MODEL
NORTH-SOUTH EARTHQUAKE

CONSUMERS POWER COMPANY
MIDLAND UNITS 1 & 2 - JOB 7220

AUXILIARY BUILDING

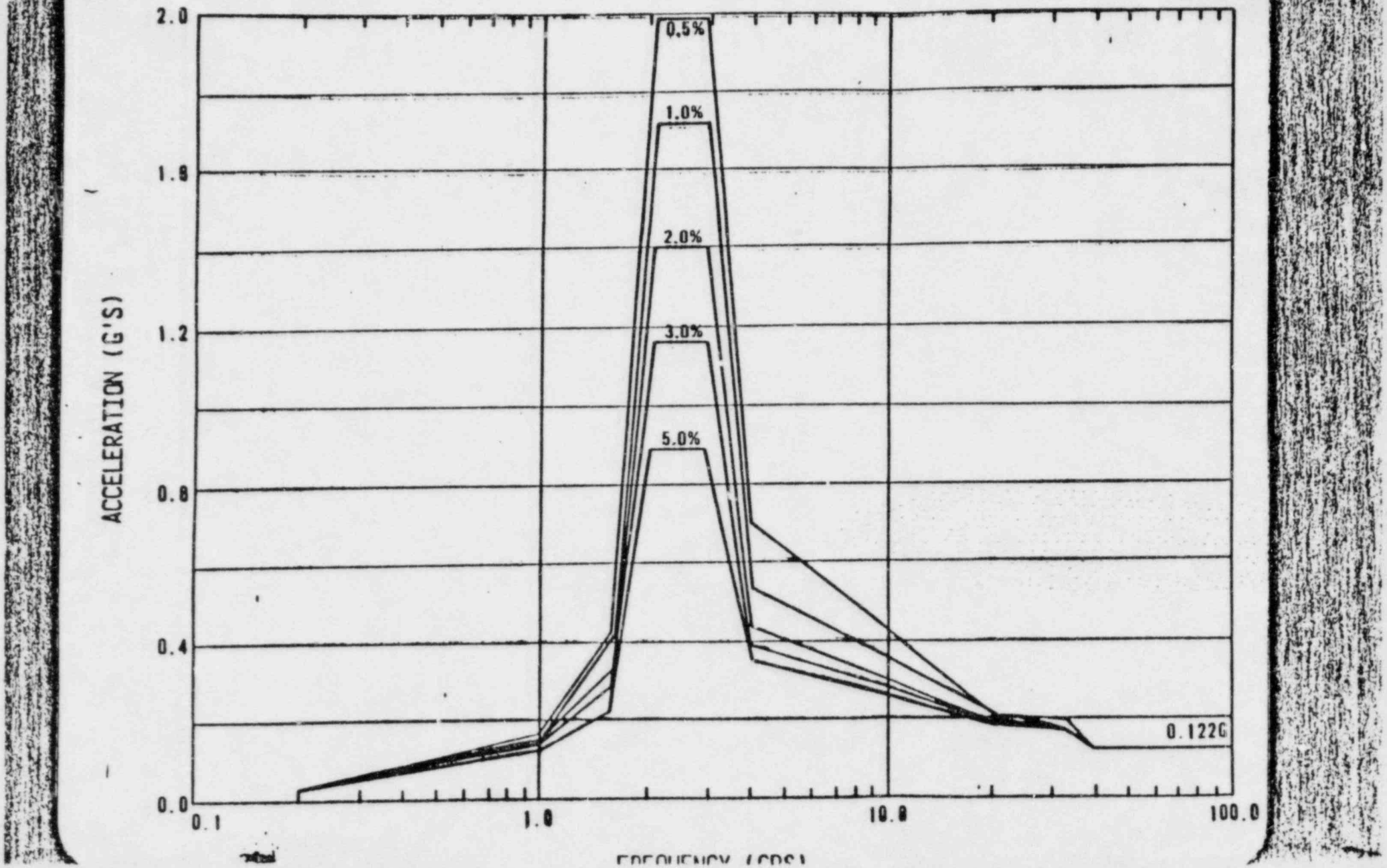
- **ORIGINAL ANALYSIS**

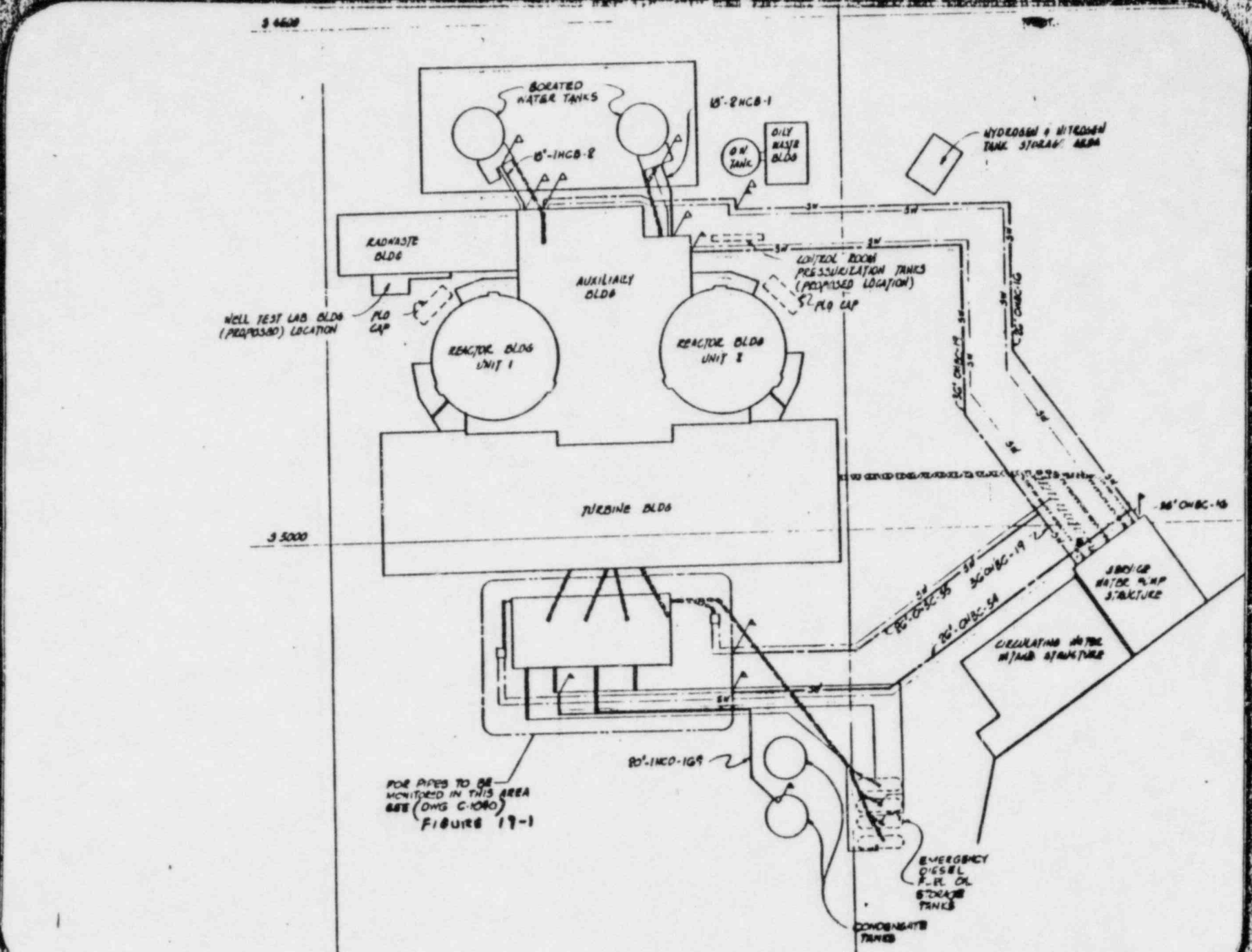
	Natural	Backfill
• Elastic Modulus (ksf)	22,000	7,650
• Poisson Ratio	.042	.042
• Unit Weight (psf)	135	120
• Shear Wave Velocity (f/s)	1,359	850

- **NEW ANALYSIS**

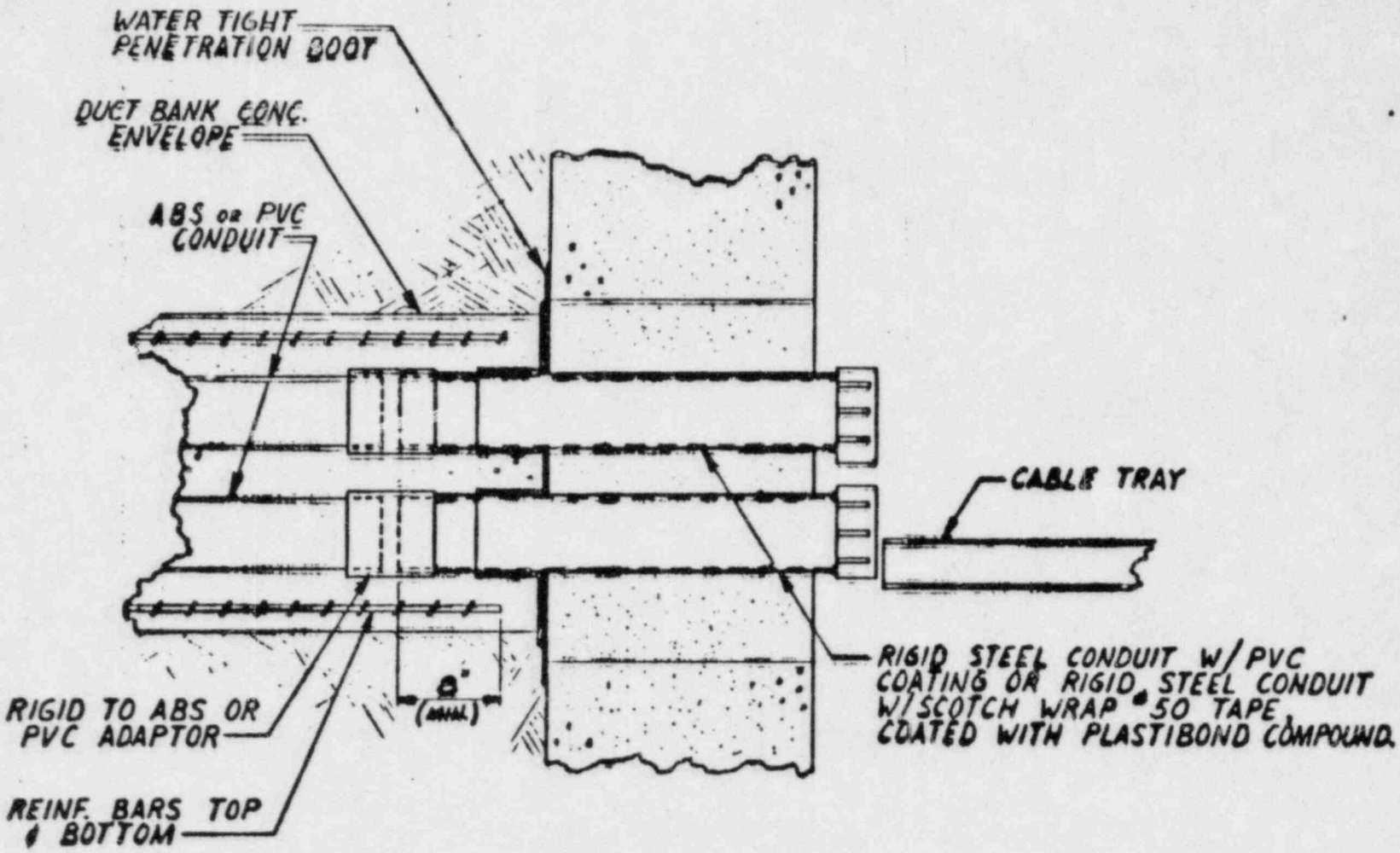
	Natural	Control Tower	Railroad Bay Area
• Elastic Modulus (ksf)	22,000	9,520	7,498
• Poisson Ratio	0.42	0.4	0.4
• Unit Weight (psf)	135	120	120
• Shear Wave Velocity (f/c)	1,359	955	848
• Cassion Stiffness	4×10^{10} k/ft		
• Feedwater Isolation Valve Pit			

Q1036-03

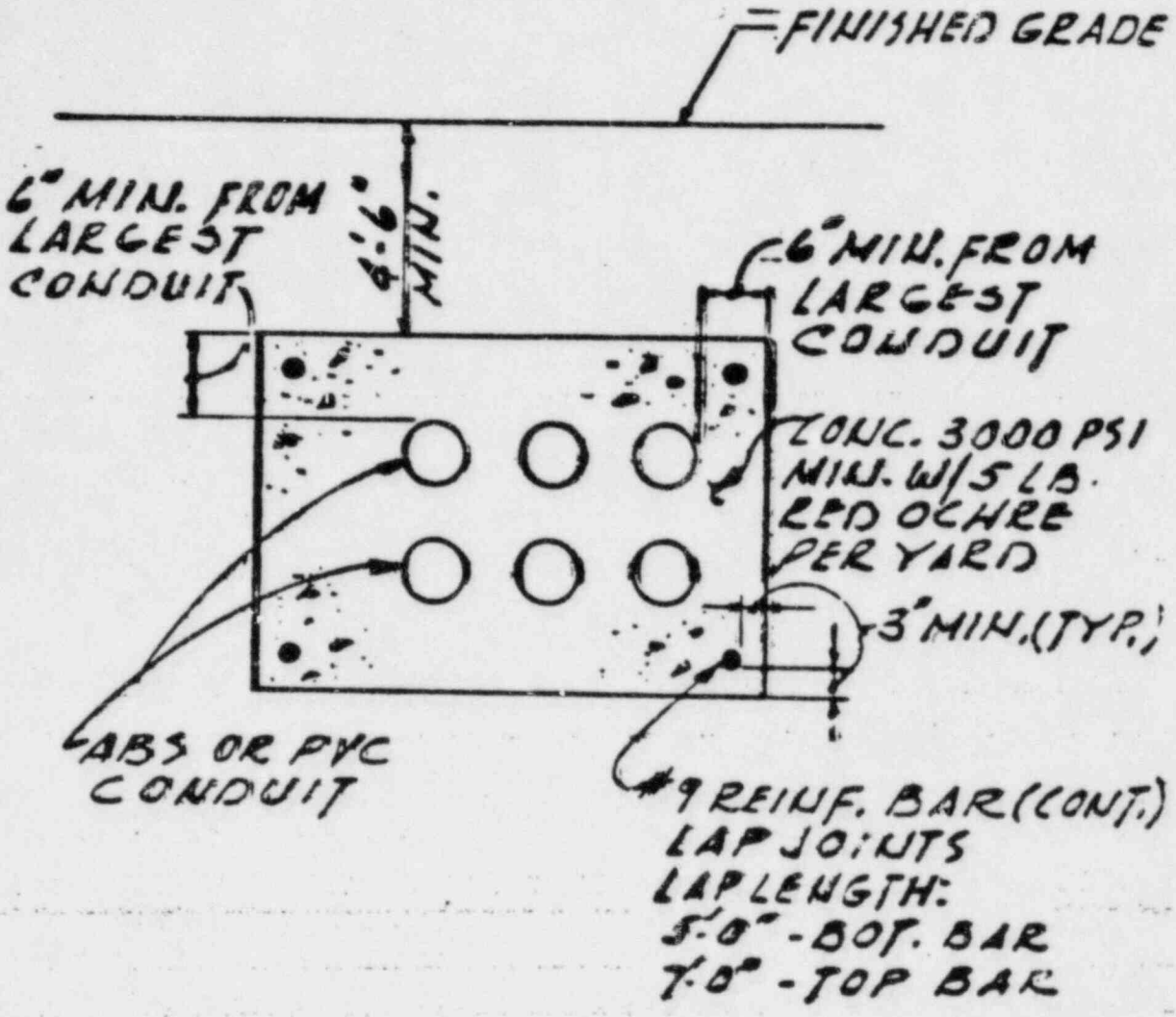

2.0
1.8
1.2
0.8
0.4
0.0
ACCELERATION (G'S)
0.5%
1.0%
2.0%
3.0%
5.0%
0.122G
0.1
1.0
10.0
100.0


BORATED WATER TANKS
18"-1HCB-1
18"-1HCB-2
OILY WASTE BLDG
O.W. TANK
HYDROGEN & NITROGEN TANK STORAGE AREA
RADWASTE BLDG
AUXILIARY BLDG
CONTROL ROOM PRESSURIZATION TANKS (PROPOSED LOCATION)
FLO CAP
WELL TEST LAB BLDG (PROPOSED) LOCATION
FLO CAP
REACTOR BLDG UNIT 1
REACTOR BLDG UNIT 2
TURBINE BLDG
36"-CWBC-19
36"-CWBC-18
SERVICE WATER PUMP STRUCTURE
CIRCULATING WATER INTAKE STRUCTURE
80"-1HCD-169
FOR PIPES TO BE MONITORED IN THIS AREA SEE (DWG C-1080) FIGURE 19-1
EMERGENCY DIESEL F.O. STORAGE TANKS
CONDENSATE TANKS

UG

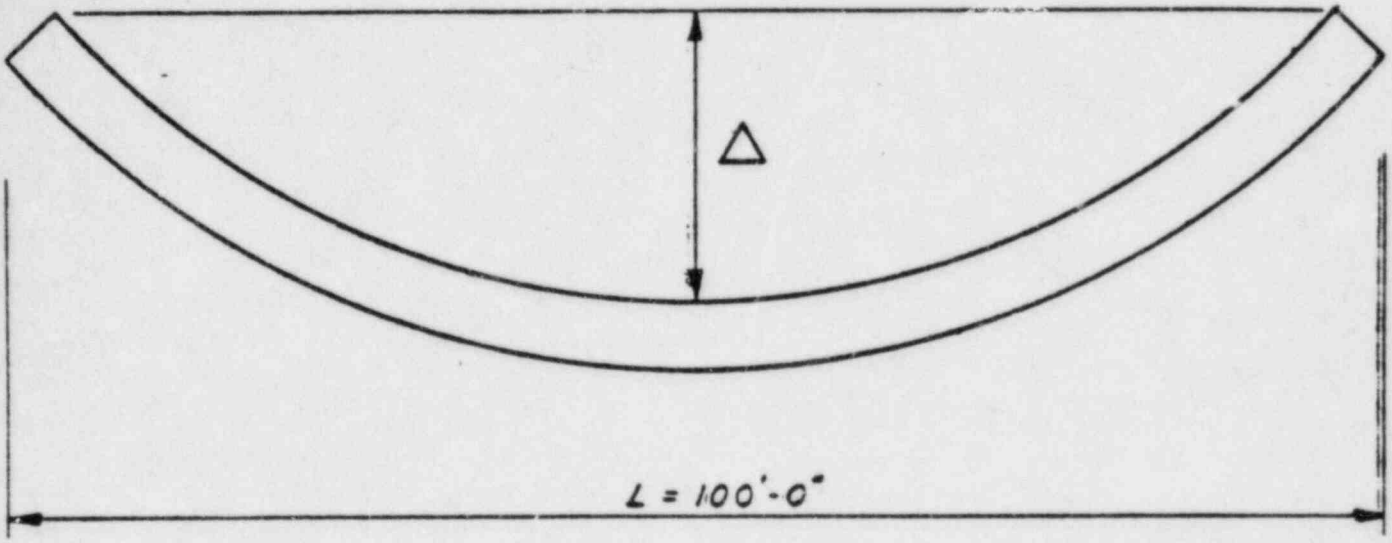


DUCT BANK & CONDUIT TERMINATION AT BUILDING WALL



TYPICAL CONSTRUCTION - SEISMIC UNDERGROUND DUCT BANK

DUCT BANK DEFLECTION



CONSTANT RADIUS OF CURVATURE IS ASSUMED

f'_c = 3000 PSI

E_c = 1,734 KSI (MODIFIED FOR LONG TERM DEFLECTION PER ACI 318-77 SECTION 9.5.2.5)

FOR A DUCT BANK 43" x 18" DEEP
Δ WHEN STEEL YIELDS = 43"

FOR A DUCT BANK 54" x 35" DEEP
Δ WHEN STEEL YIELDS = 15"

TABLE 30-1

FREE FIELD
DUCT BANK STRAINS
FOR SHEAR WAVE
AND COMPRESSION WAVE (SSE)

Duct Size	Ratio of Strain in Reinforcing Steel to Yield Strain		
	Bending	Axial	Combined
30 x 34	0.0007	0.082	0.0827
+10%	0.0008	0.082	0.0828
+20%	0.0009	0.082	0.0829
+50%	0.0012	0.082	0.0832

Notes:

E_y = yield strain of reinforcing steel = 0.00207 in./in.

f'_c = concrete design compressive strength = 3,000 psi

F_y = reinforcing steel yield stress = 60,000 psi

C_s = shear wave velocity = 2,000 fps

TABLE 30-2

REDUCTION IN AREA FROM DIFFERENTIAL MOVEMENT

(Auxiliary Building from El 593'-0" to 608'-0")

	OBE		SSE	
Direction	Differential Displacement	Percent Reduction in Area	Differential Displacement	Percent Reduction in Area
E-W	0.021"	0.7	0.042"	1.4
N-S	0.024"	0*	0.048"	0*
Vertical	0.001"	0.03	0.002"	0.06

*Axial movement, no reduction in area for this direction

TABLE 30-3

AUXILIARY BUILDING
INTERFACE STRAINS

(Differential Movement Due To SSE)

	Ratio of Strain in Reinforcing Steel to Yield Strain			
		Direction of Earthquake		
Duct Size	Vertical (Bending)	E-W (Bending)	N-S (Axial)	Combined
30 x 34	0.012	0.097	0.615	0.623
+10%	0.012	0.100	0.615	0.623
+20%	0.012	0.103	0.615	0.624
+50%	0.013	0.109	0.615	0.625

(1)

STRUCTURAL INVESTIGATION

(1) ORIGINAL DESIGN

(2) SEISMIC RESPONSE

(3) NEW ANALYSES

(2)

TYPES OF LOADS

PRIMARY

1. MECHANICAL (DEADLOAD, PRESSURE, WIND, ETC.)
2. SEISMIC INERTIA (BUT SHORT DURATION)
3. MISSILE IMPACT & PIPE RUPTURE (LIMITED ENERGY)

SECONDARY

1. INTERNAL SELF CONTRAINT
   - (A) SEISMIC DISPLACEMENT (CYCLIC)
   - (B) THERMAL (CYCLIC)
2. SETTLEMENT (1/2 CYCLE)
3. FORMING (1/2 CYCLE)

(3)

MIDLAND DESIGN CRITERIA

FSAR

(A) $1.4D + 1.7L$

(B) $1.4 (D + L + E_O) + \ldots$

(C) $1.25 (D + L + W) + \ldots$

(D) $1.0D + 1.0L + 1.0E_{SS} + \ldots$

(E) $1.0D + 1.0L + 1.0W_T + \ldots$

ADDITIONAL CRITERIA

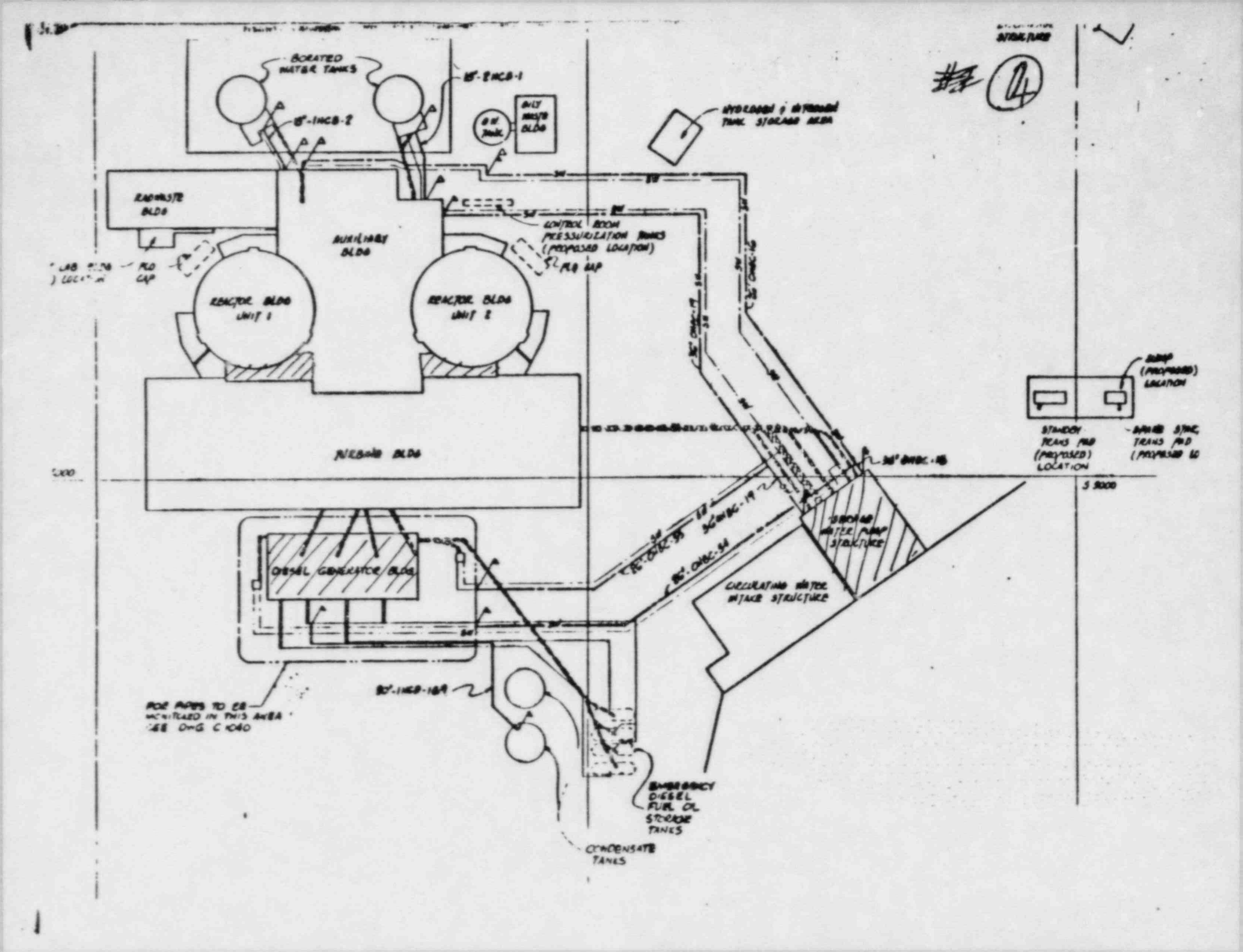
(A) $1.05D + 1.28L + 1.05$ SET

(B) $1.4D + 1.4$ SET

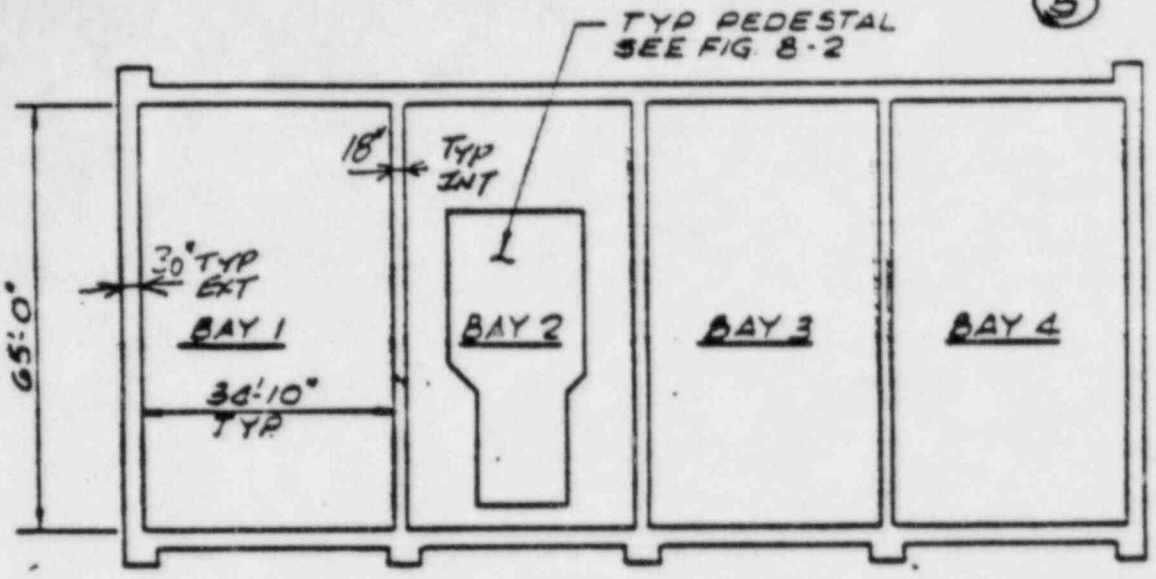
(C) $1.0D + 1.0L + 1.0W + 1.0$ SET

(D) $1.0D + 1.0L + 1.0E_O + 1.0$ SET

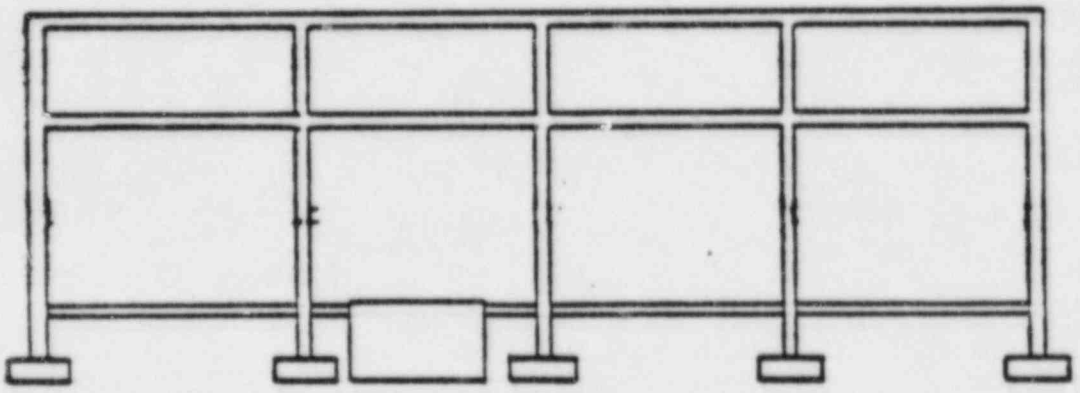
D: DEAD LOAD
L: LIVE LOAD
E_O: (OBE) EARTHQUAKE
W: DESIGN WIND
E_{SS}: (SSE) EARTHQUAKE
W_T: TORNADO
SET: SETTLEMENT


BORATED WATER TANKS
18'-8 INCH-1
18'-1 INCH-2
RADWASTE BLDG
AUXILIARY BLDG
REACTOR BLDG UNIT 1
REACTOR BLDG UNIT 2
DIESEL GENERATOR BLDG
CONTROL ROOM PRESSURIZATION TANKS (PROPOSED LOCATION)
PLD CAP
STANDBY TRANS PAD (PROPOSED) LOCATION
CIRCULATING WATER INTAKE STRUCTURE
FOR PIPES TO EB INSTALLED IN THIS AREA SEE DWG C 1040
EMERGENCY DIESEL FUEL OIL STORAGE TANKS
CONDENSATE TANKS
#7
4

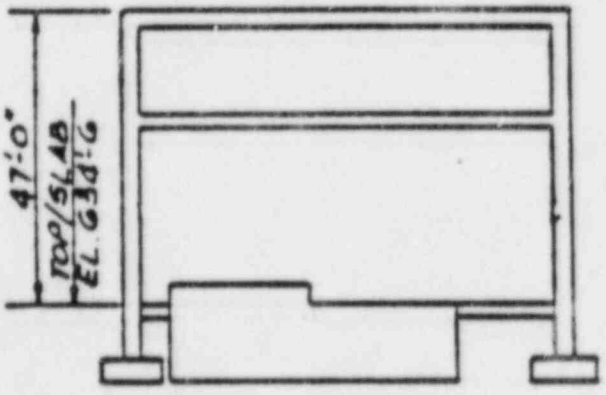
(5)



PLAN



SECTION
LOOKING NORTH



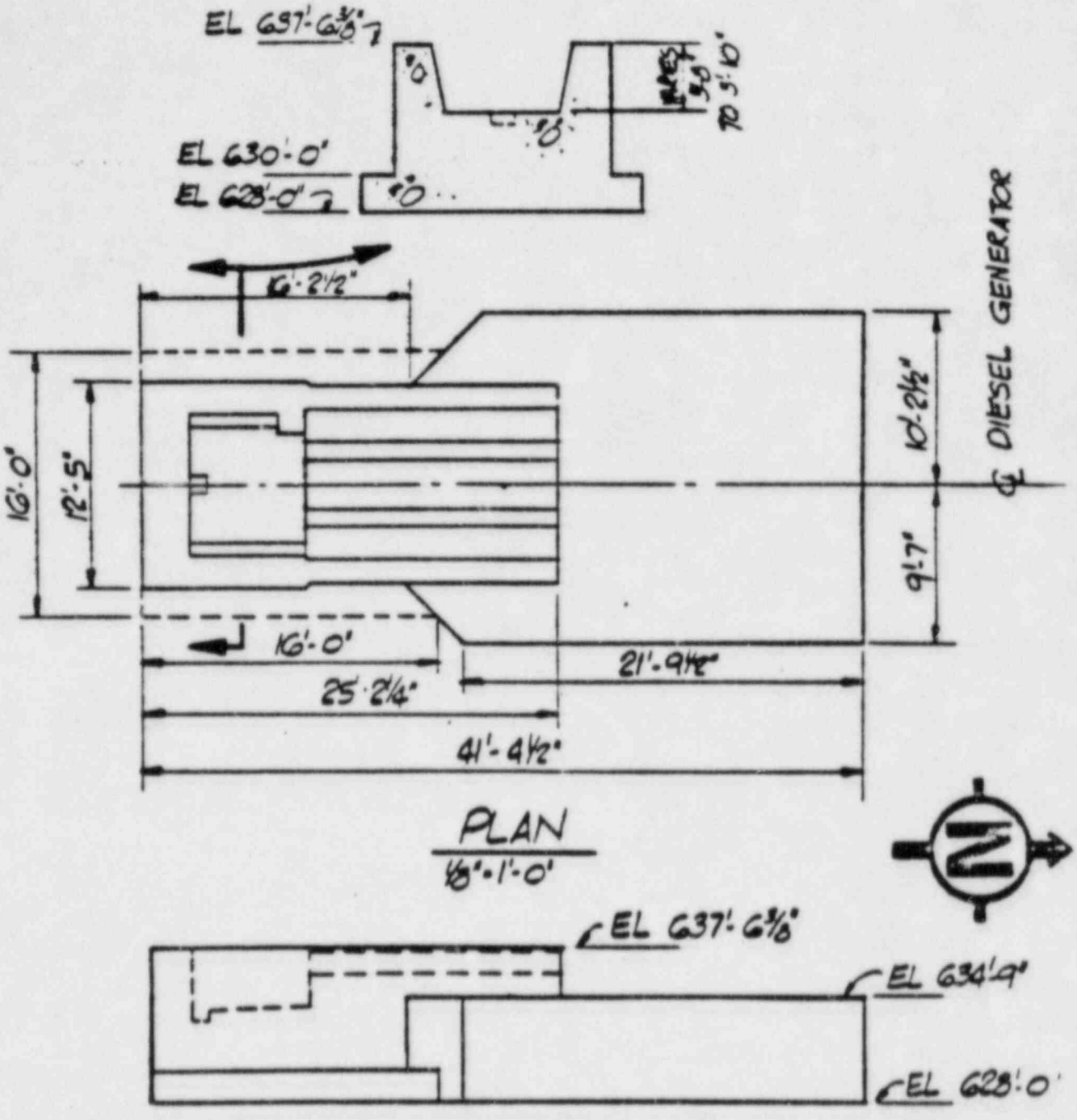
SECTION
LOOKING WEST

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

DIESEL GENERATOR BLDG
PLAN & SECTIONS

FIG.14

DATE. 4-24-79



PLAN

1/8" = 1'-0"

ELEVATION

1/8" = 1'-0"

DIESEL GENERATOR PEDESTAL

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

DIESEL GENERATOR
PEDESTAL

FIG. 17

DATE 4.24.79

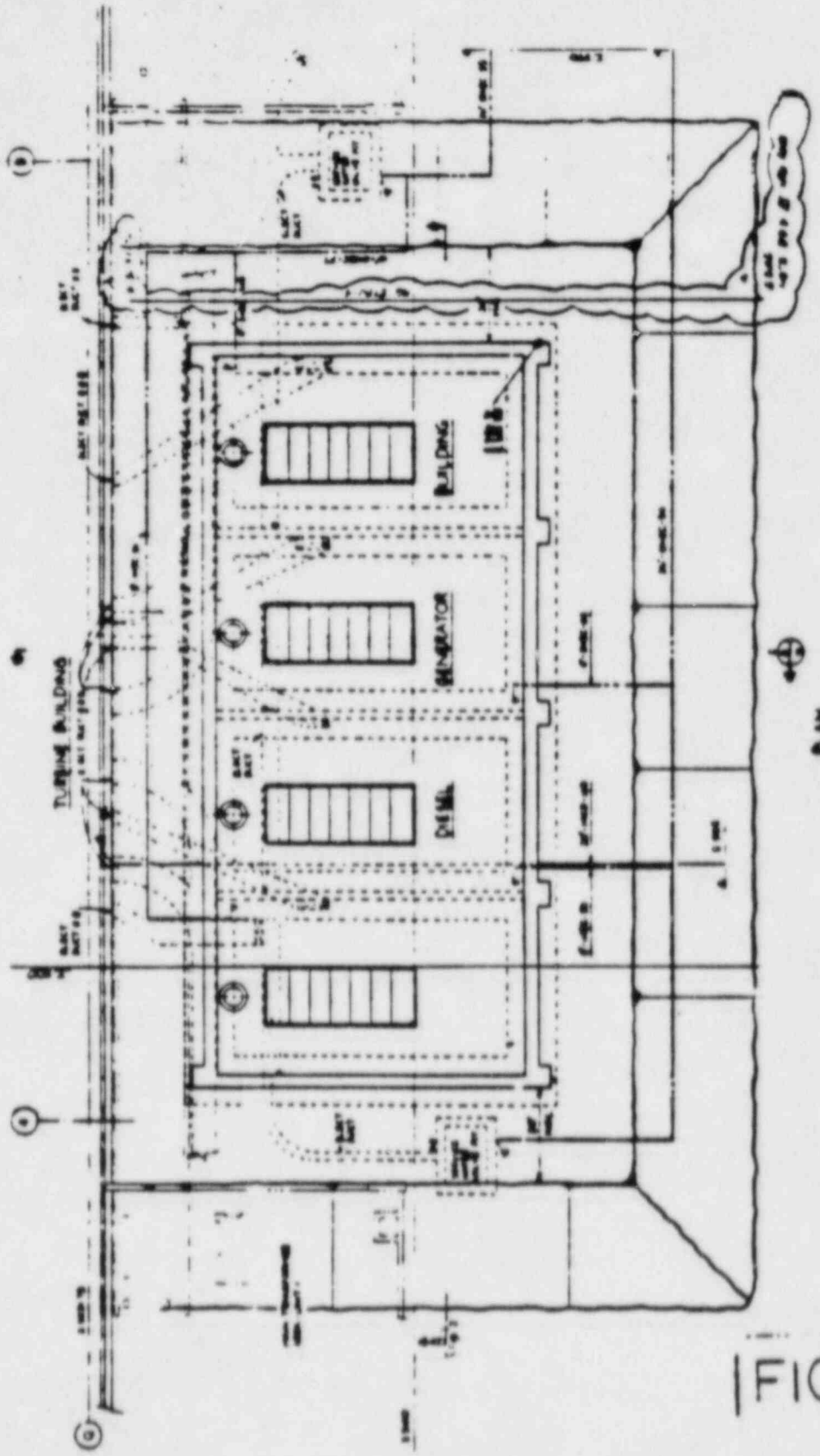


FIG.15

(8)

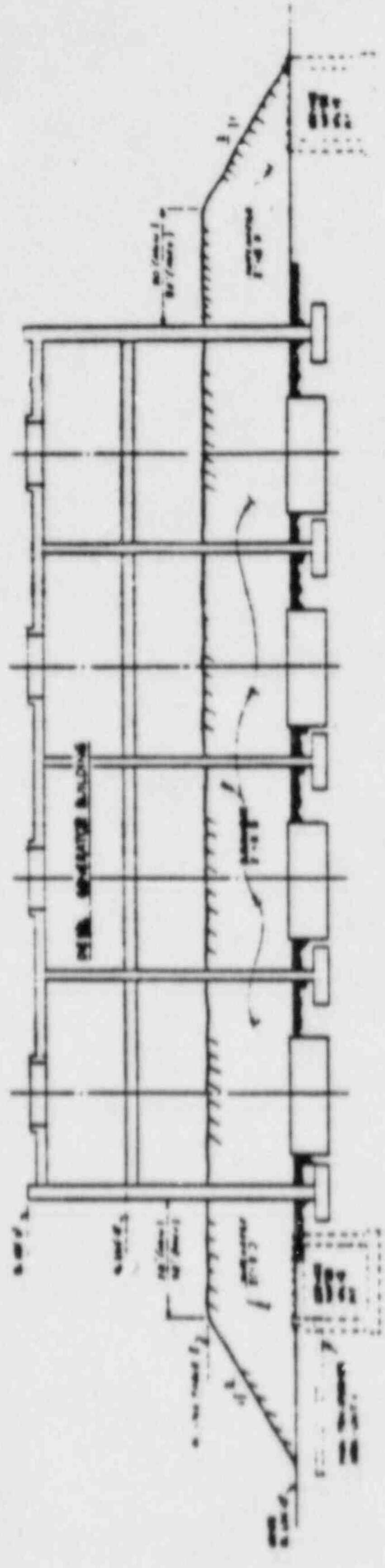
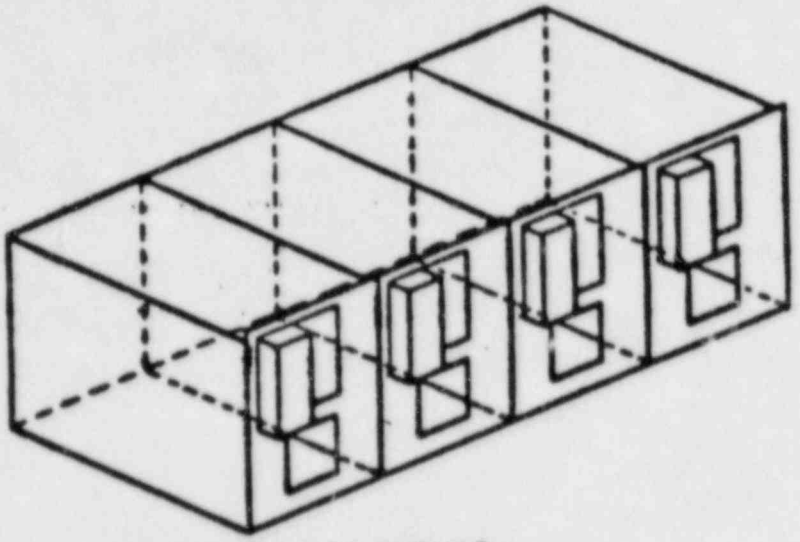
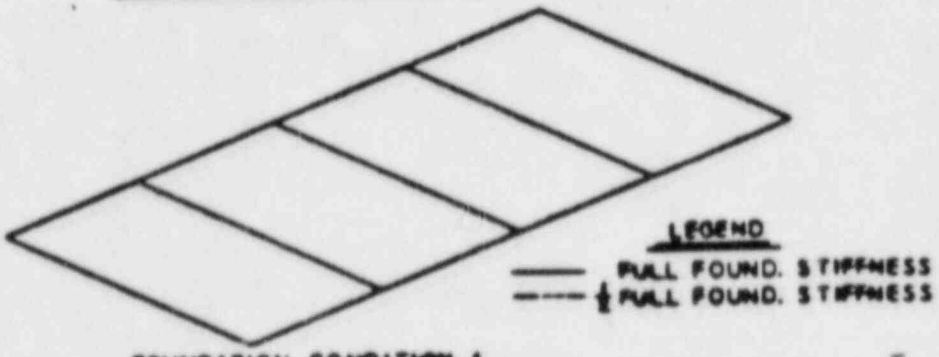


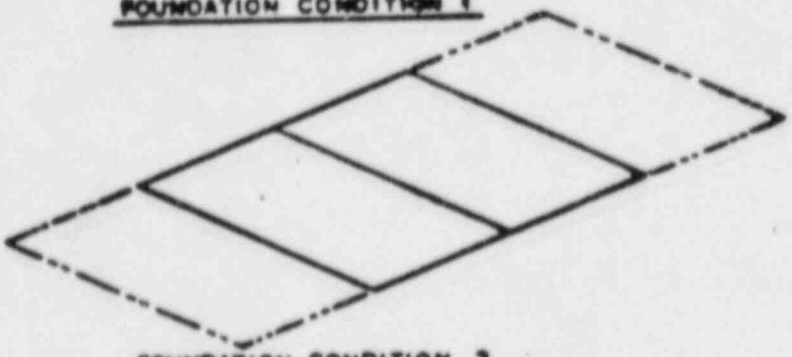
FIG.16



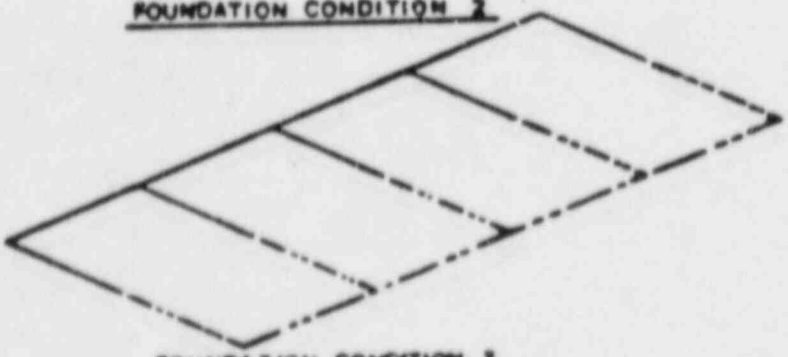
DIESEL GEN BLDG OUTLINE



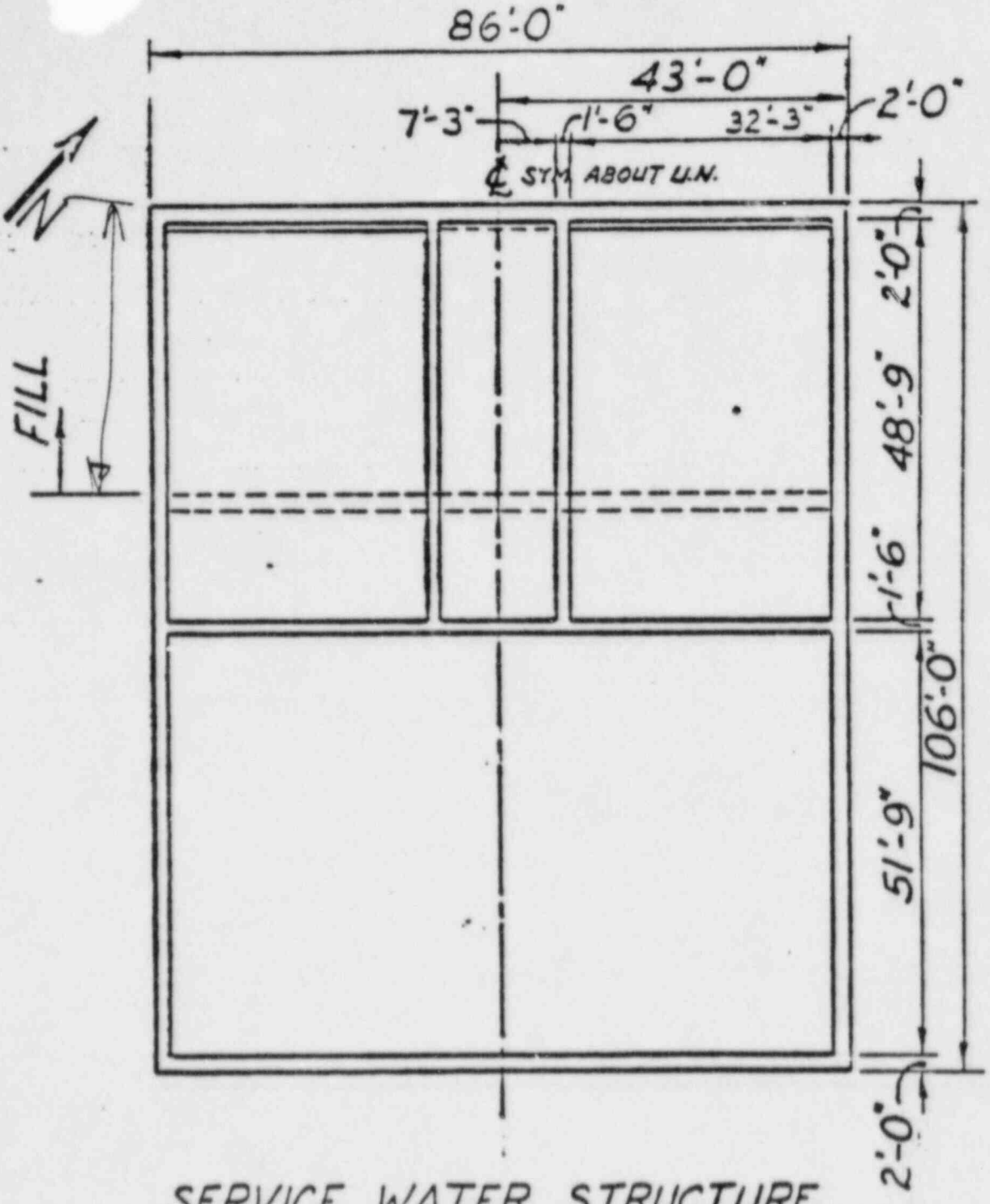
FOUNDATION CONDITION 1



FOUNDATION CONDITION 2

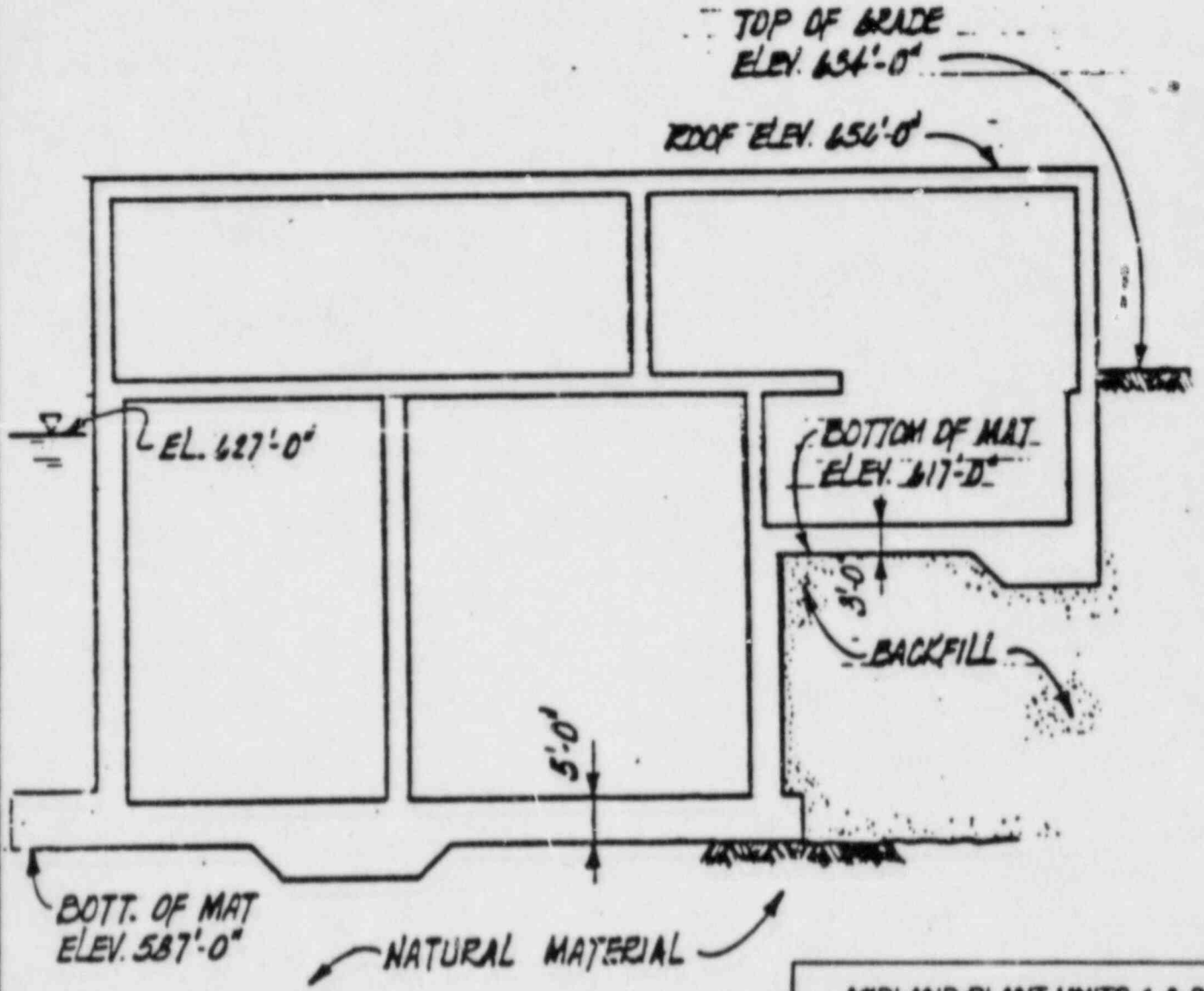


FOUNDATION CONDITION 3



SERVICE WATER STRUCTURE
PLAN AT EL. 634'-6"

FIG.18



TYPICAL SECTION

(LOOKING WEST)

SERVICE WATER STRUCTURE

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

SERVICE WATER PUMP STRUCTURE TYPICAL SECTION

FIGURE 8.1 REV. 6

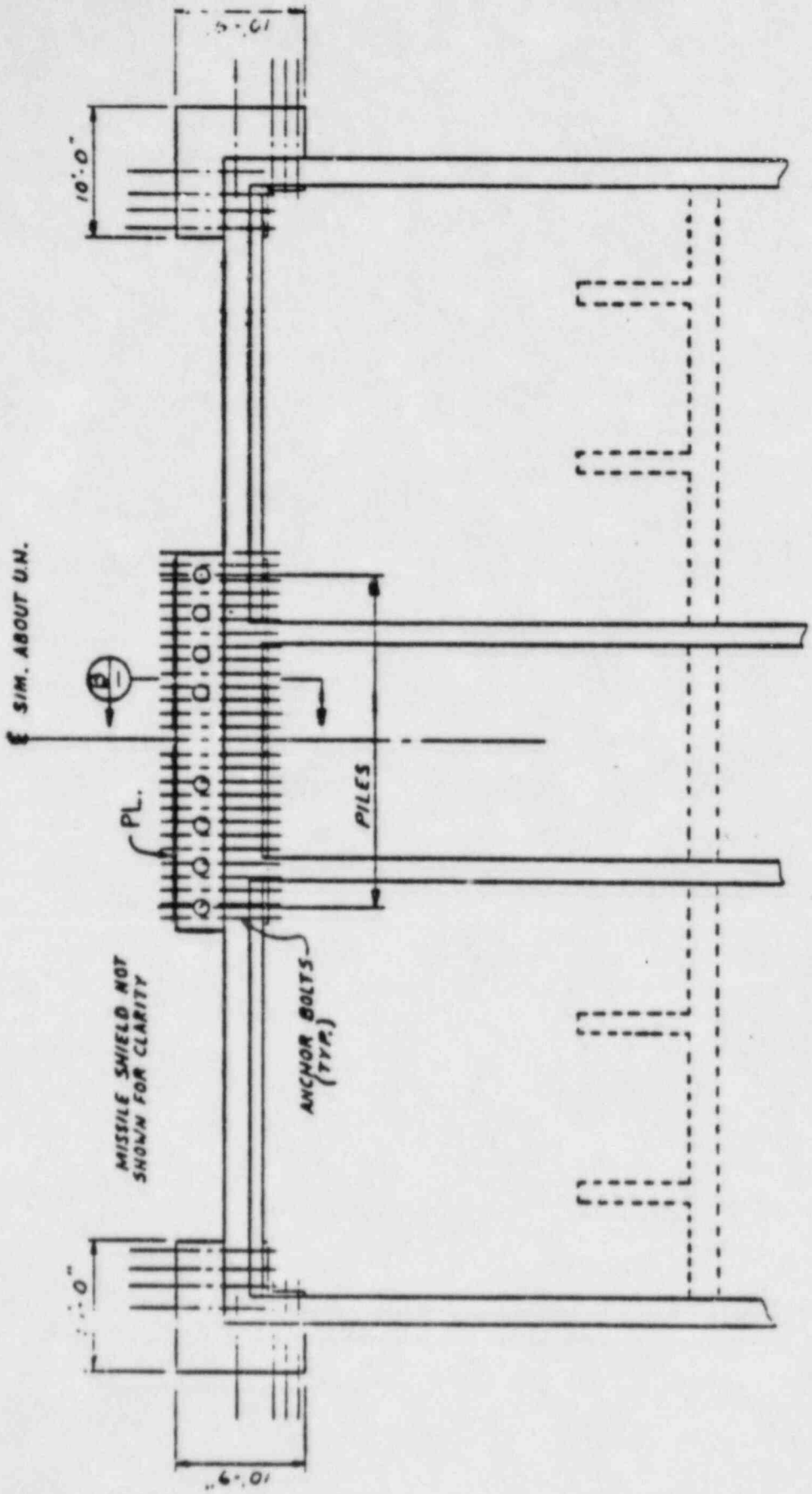
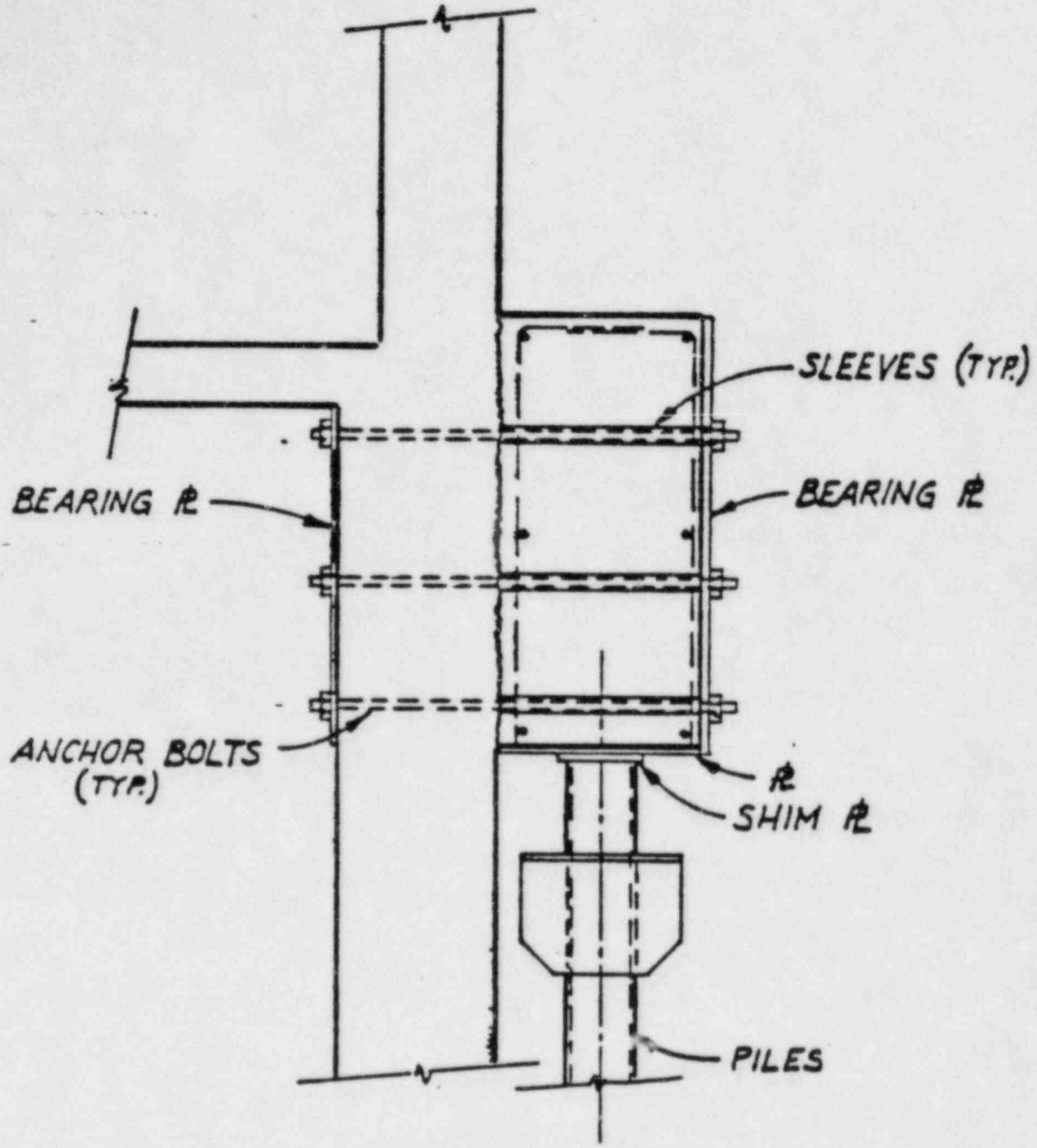
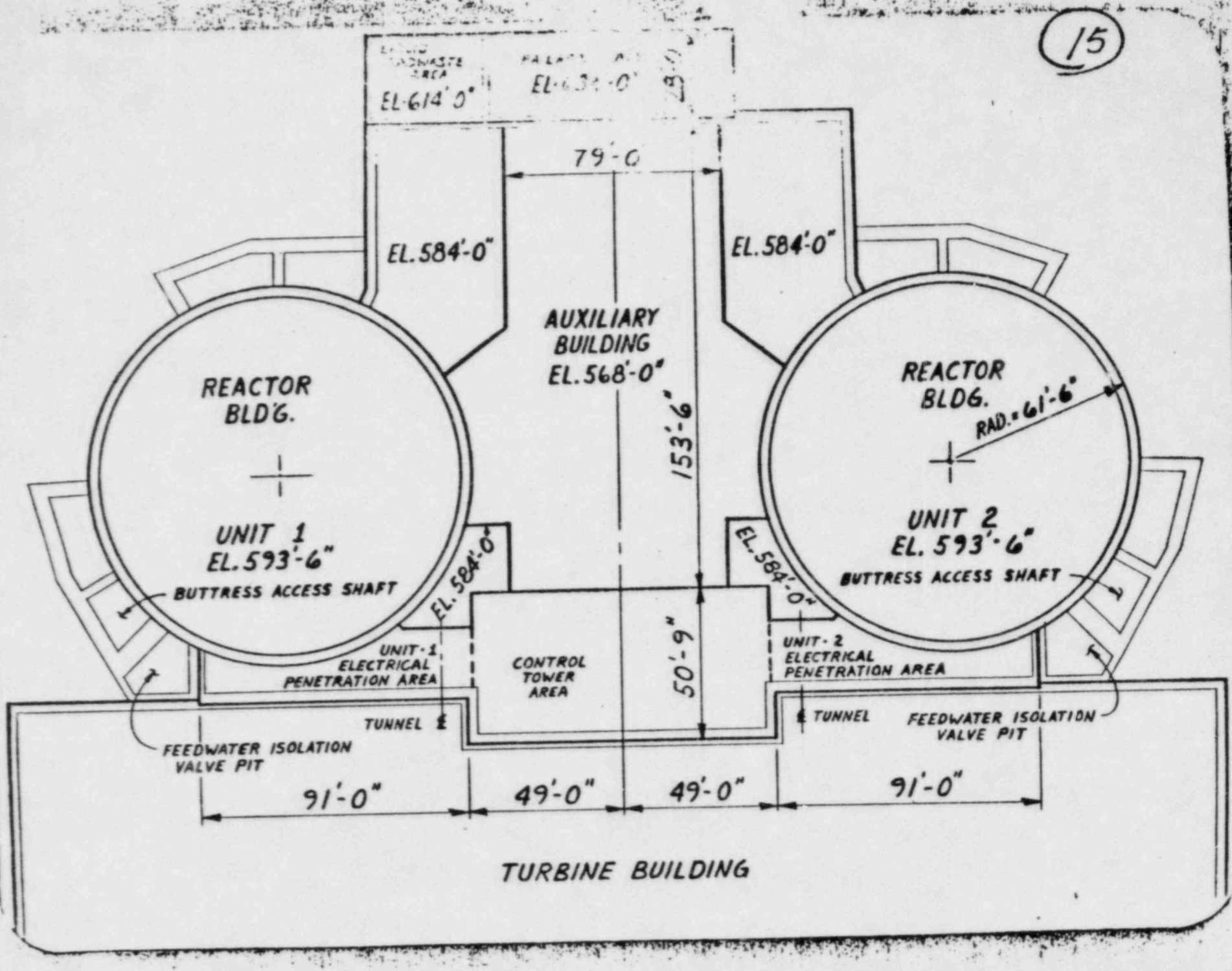

SIM. ABOUT U.N.
PL.
PILES
MISSILE SHIELD NOT SHOWN FOR CLARITY
ANCHOR BOLTS (TYP.)
10'-0"
10'-0"
PLAN AT EL. 634'-6"

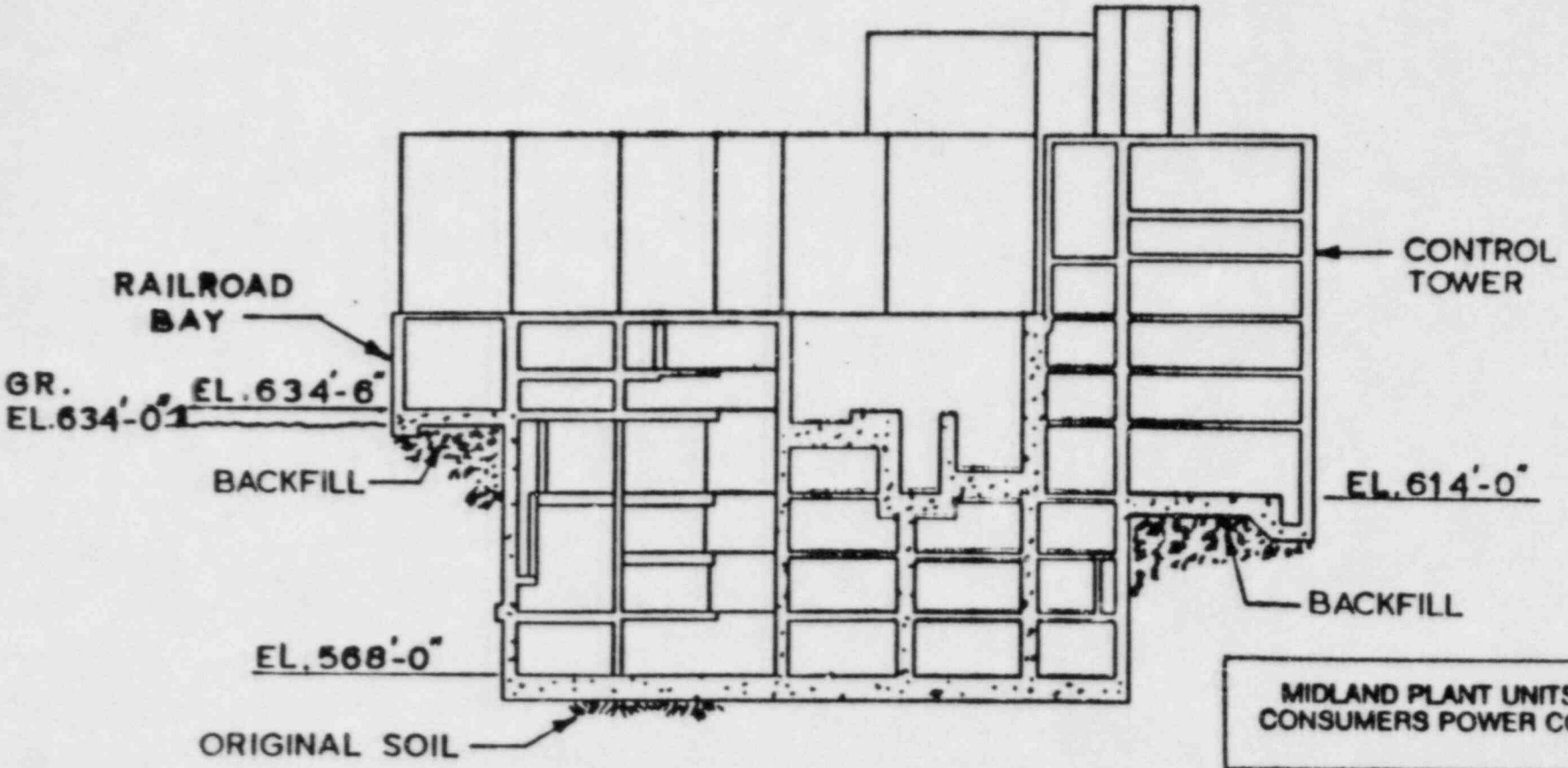
FIG. 20



DETAIL (1)

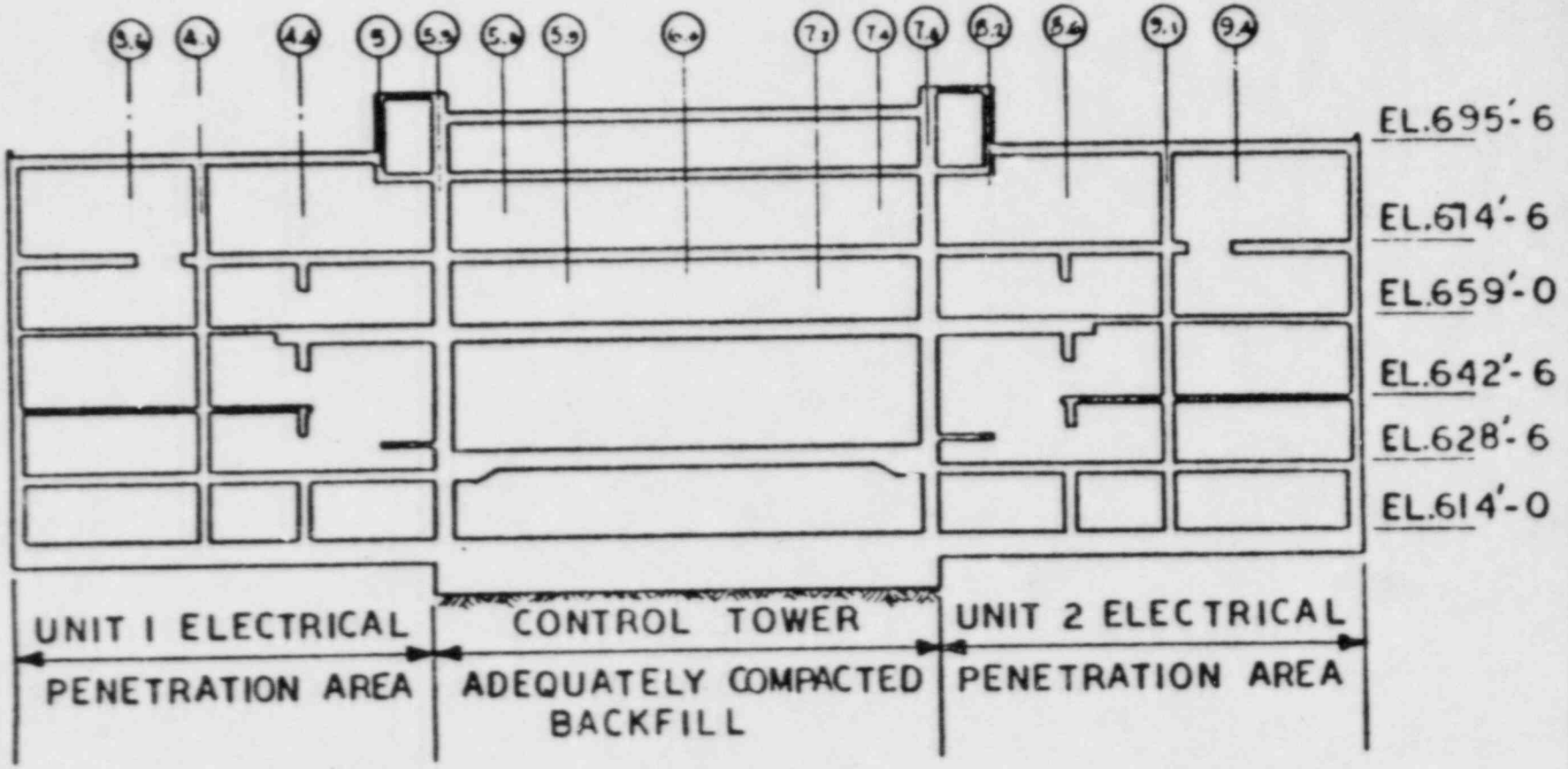
FIG.22


EL. 614'-0"
79'-0
EL. 584'-0"
EL. 584'-0"
AUXILIARY BUILDING EL. 568'-0"
153'-6"
REACTOR BLD'G.
UNIT 1 EL. 593'-6"
BUTTRESS ACCESS SHAFT
REACTOR BLDG.
RAD. = 61'-6"
UNIT 2 EL. 593'-6"
BUTTRESS ACCESS SHAFT
EL. 584'-0"
EL. 584'-0"
UNIT-1 ELECTRICAL PENETRATION AREA
CONTROL TOWER AREA
50'-9"
UNIT-2 ELECTRICAL PENETRATION AREA
TUNNEL ℄
℄ TUNNEL
FEEDWATER ISOLATION VALVE PIT
FEEDWATER ISOLATION VALVE PIT
91'-0"
49'-0"
49'-0"
91'-0"
TURBINE BUILDING



TYPICAL SECTION (LOOKING EAST)
AUXILIARY BUILDING

MIDLAND PLANT UNITS 1 & 2 CONSUMERS POWER COMPANY
AUXILIARY BLDG. TYPICAL SECTION
FIGURE 64 REV. 6R


EL.695'-6
EL.674'-6
EL.659'-0
EL.642'-6
EL.628'-6
EL.614'-0
UNIT 1 ELECTRICAL
PENETRATION AREA
CONTROL TOWER
ADEQUATELY COMPACTED
BACKFILL
UNIT 2 ELECTRICAL
PENETRATION AREA

SECTION B-B

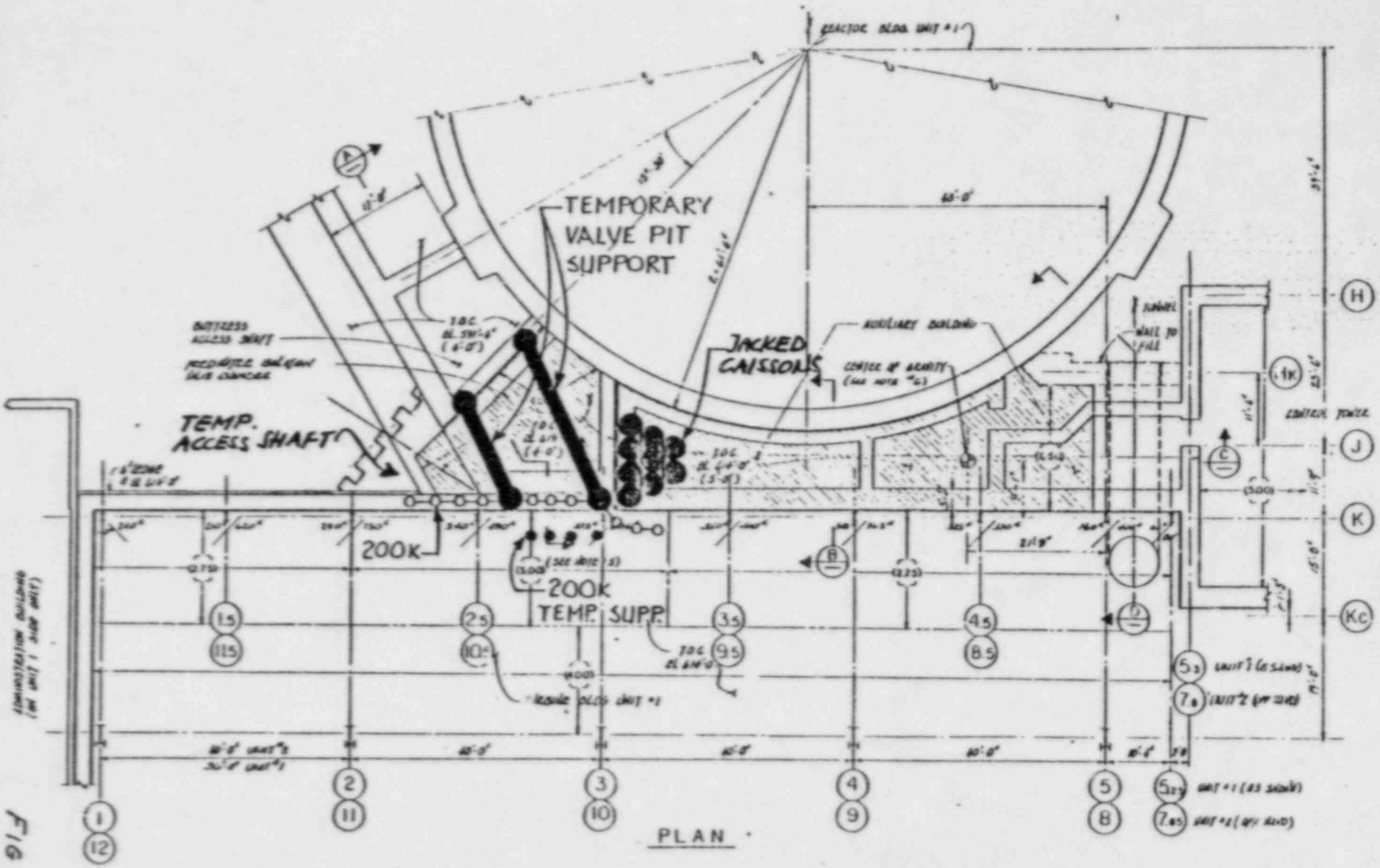
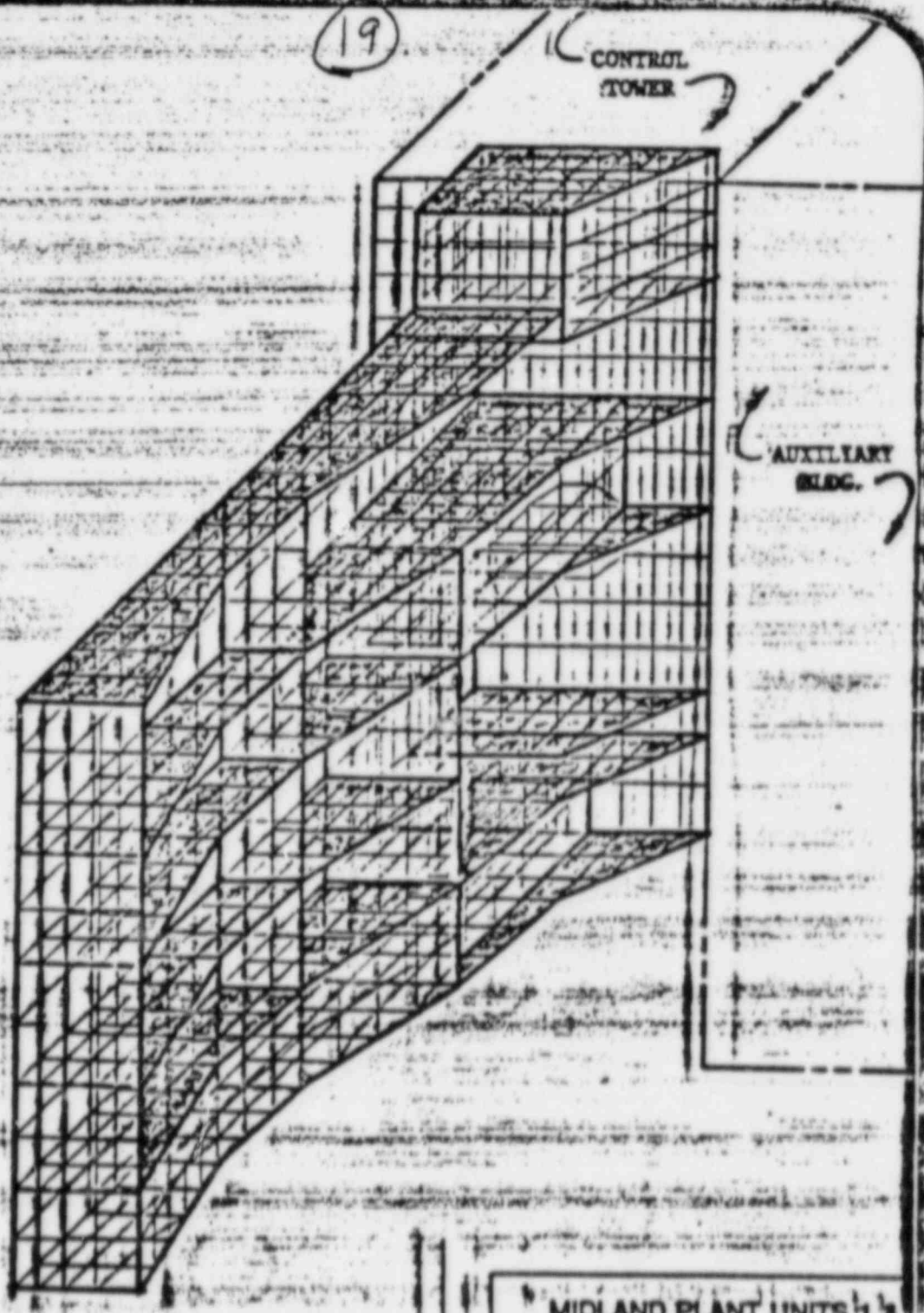

TEMPORARY
VALVE PIT
SUPPORT
JACKED
CAISSONS
TEMP.
ACCESS SHAFT
200K
200K
TEMP. SUPP.
PLAN

FIG 30

(19)



FINITE ELEMENT MODEL
STATIC ANALYSIS

AUXILIARY BUILDING

UNIT #2 ELECTRICAL PENETRATION AREA (LOOKING WEST)

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPA

AUXILIARY BUILDING

FIGURE _____ DATE 1/

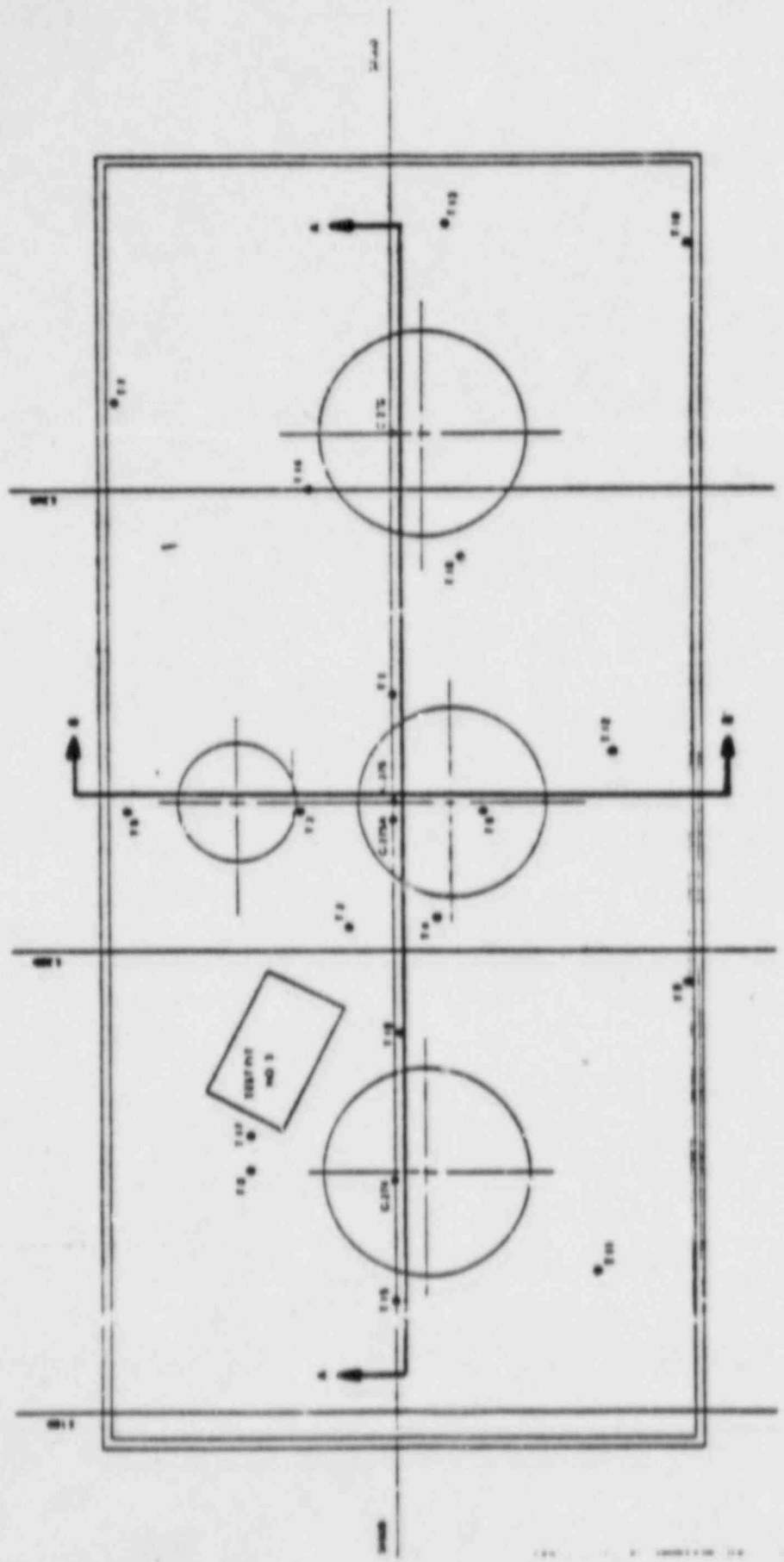
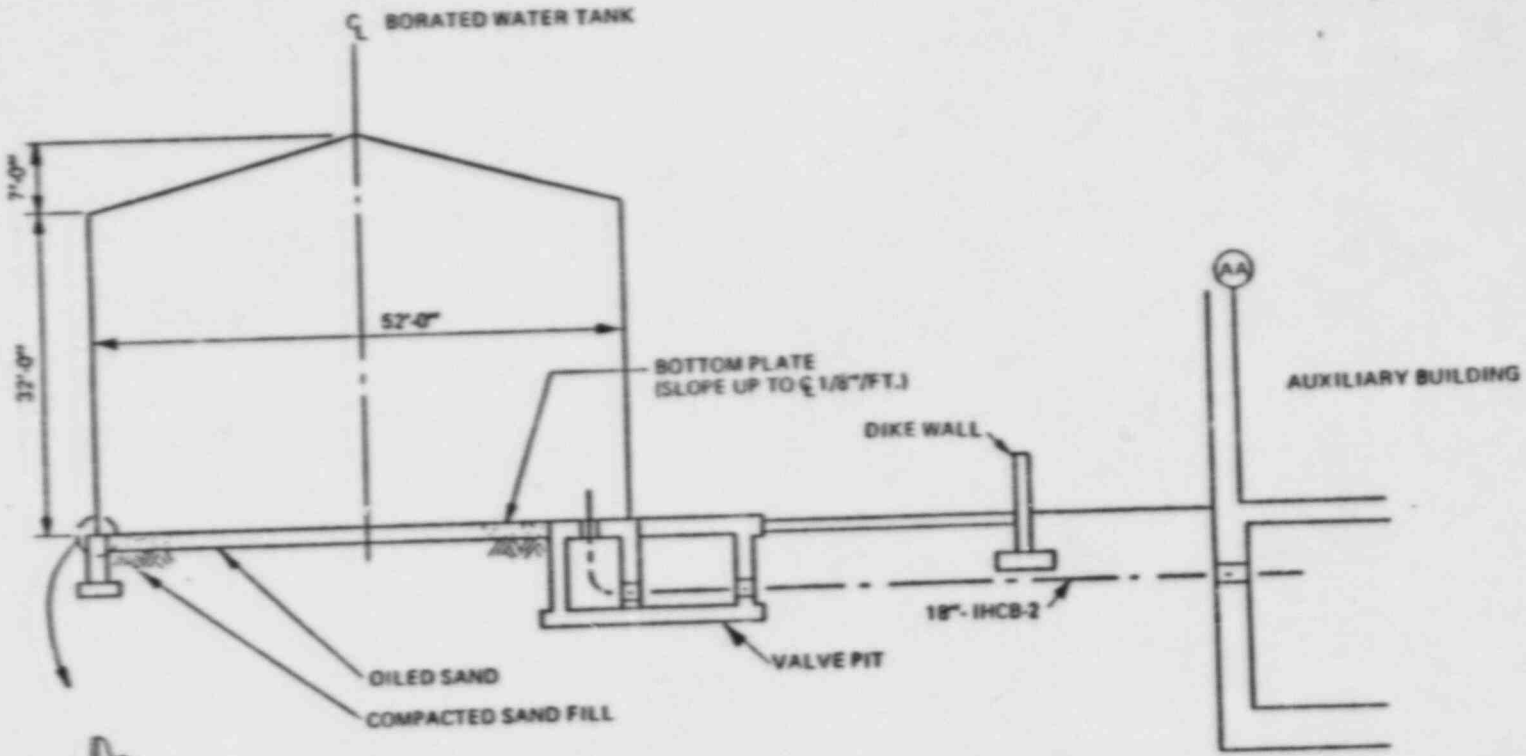
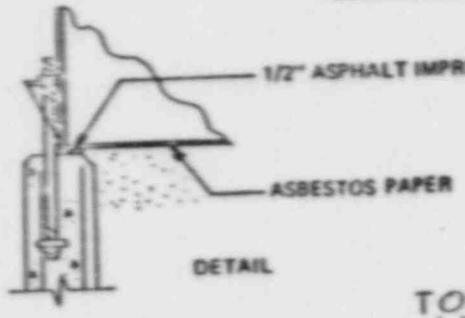
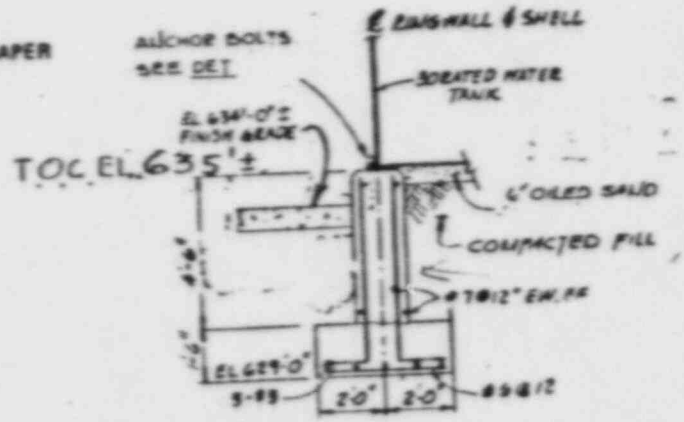


FIG.23







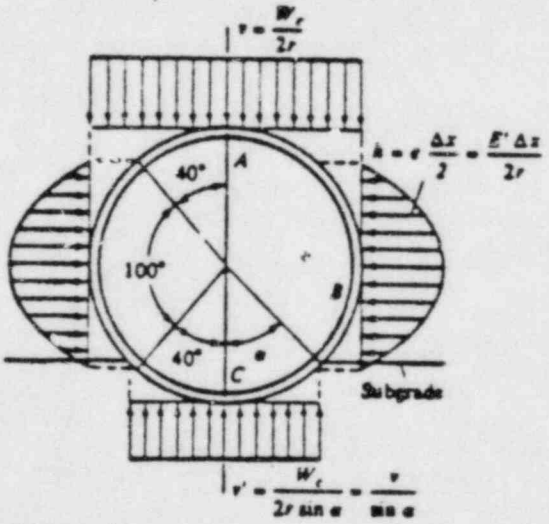
CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2

Section Through Borated Water Storage Tank Foundation and Valve Pit

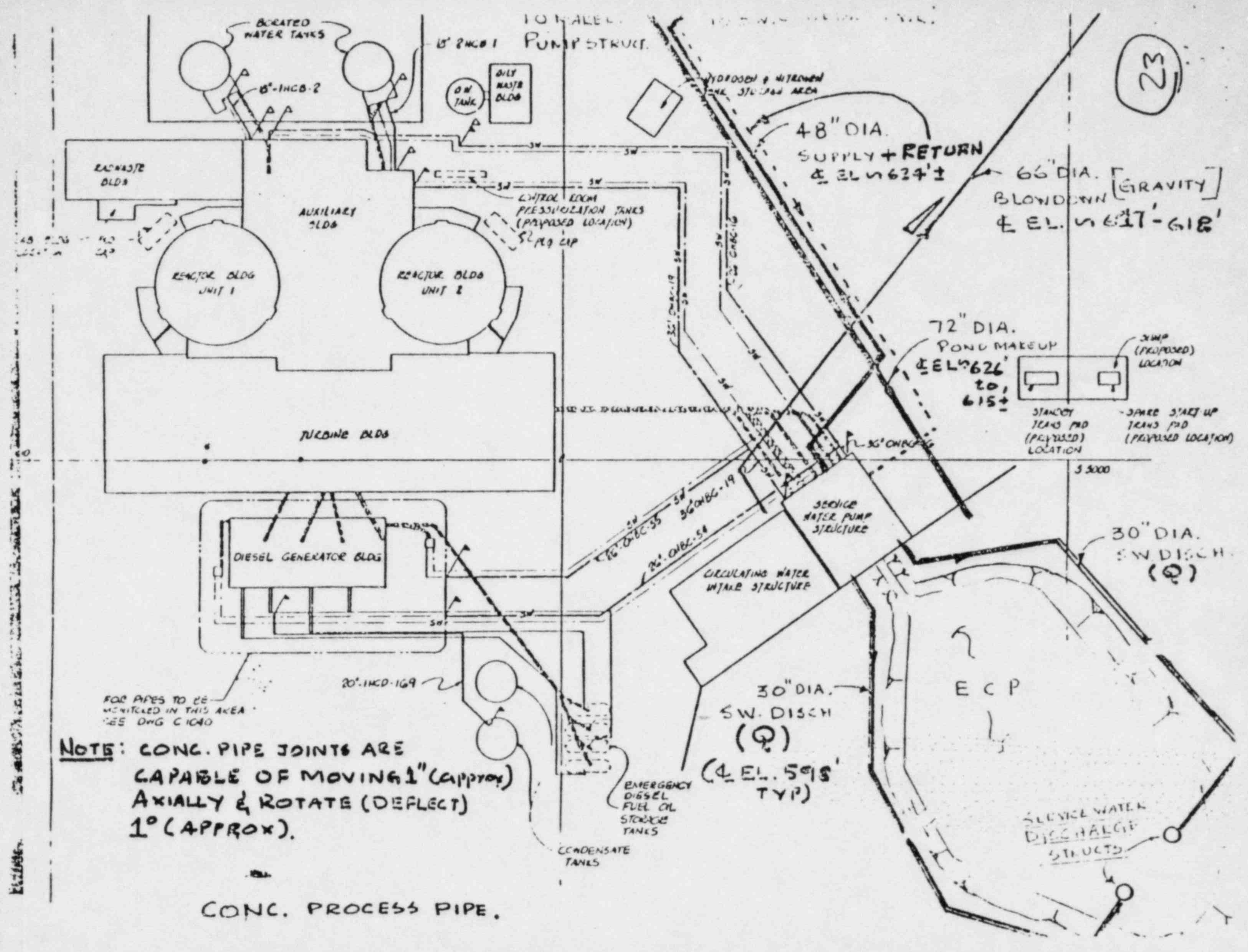
Figure 31-1

STRESS IN BURIED PIPES DUE TO DEADLOAD OF SOIL AND LIVE LOAD FROM COOPER'S E-80 LOADING

	Soil Modulus E'=1,900 psi (85% Compaction AASHO T-99 Specification)	
Pipe Diameter	36 in.	26 in.
Wall Thickness	3/8 in.	3/8 in.
Yield Stress (ksi)	38	38
Stresses (ksi)		
Internal pressure (uniform)	+3.1	+2.2
External Loads (maximum)	-0.7	-0.4
Ring Bending	±26.9	±20.5
Vertical Displacement (% of Diameter)	1.4%	1.1%



Assumed distribution of pressure on flexible culvert pipe.


23
TO MAKEUP PUMP STRUCT.
BORATED WATER TANKS
18" 2HCB-1
18"-1HCB-2
OILY WASTE BLDG
OW TANK
HYDROGEN & NITROGEN TANK STORAGE AREA
48" DIA.
SUPPLY + RETURN
℄ EL ≈ 624' ±
66" DIA.
BLOWDOWN [GRAVITY]
℄ EL. ≈ 617'-618'
RADWASTE BLDG
AUXILIARY BLDG
CONTROL ROOM PRESSURIZATION TANKS (PROPOSED LOCATION)
REACTOR BLDG UNIT 1
REACTOR BLDG UNIT 2
TURBINE BLDG
72" DIA.
POND MAKEUP
℄ EL ≈ 626' to 615' ±
SUMP (PROPOSED) LOCATION
STANDBY TRANS PAD (PROPOSED) LOCATION
SPARE START UP TRANS PAD (PROPOSED LOCATION)
S 3000
SERVICE WATER PUMP STRUCTURE
CIRCULATING WATER INTAKE STRUCTURE
30" DIA.
SW. DISCH.
(Q)
DIESEL GENERATOR BLDG
20"-1HCD-169
FOR PIPES TO BE MONITORED IN THIS AREA SEE DWG C 1040
ECP
30" DIA.
SW. DISCH
(Q)
(℄ EL. 595' TYP)
EMERGENCY DIESEL FUEL OIL STORAGE TANKS
CONDENSATE TANKS
SERVICE WATER DISCHARGE STRUCTS.
NOTE: CONC. PIPE JOINTS ARE CAPABLE OF MOVING 1" (approx) AXIALLY & ROTATE (DEFLECT) 1° (APPROX).
CONC. PROCESS PIPE.

SUMMARY OF QUESTION 24 (a thru i)

1. DEFINE MAXIMUM GROUNDWATER LEVEL

2. NUMBER, LOCATION, SPACING, DEPTH, ZONES OF INFLUENCE, BACKUP SYSTEMS, USE OF GROUTING, USE OF RETAINING WALLS, ETC.

3. EFFECT OF EARTHQUAKES, TORNADOES, PIPE LEAKAGE, FLOODS, PRECIPITATION, PIPE BREAK

4. RECHARGE TIME AT CRITICAL STRUCTURES

5. OBSERVATION WELL NETWORK AND MONITORING PROGRAM

6. WELL DESIGN (EFFECTS ON SCREEN CLOGGING, CHEMICAL QUALITY OF WATER, ETC.)

7. FINES MONITORING

8. EFFECTS ON TITTABAWASSEE RIVER AND SURROUNDING WATER USERS

9. EFFECTS ON SHEAR WAVE VELOCITIES

10. RETAINING WALL SETTLEMENT

11. MEETS NRC REQUIREMENTS IN SRP 2.4-13 AND BRANCH TECHNICAL POSITION PAPER

Figure 1
1-16-80

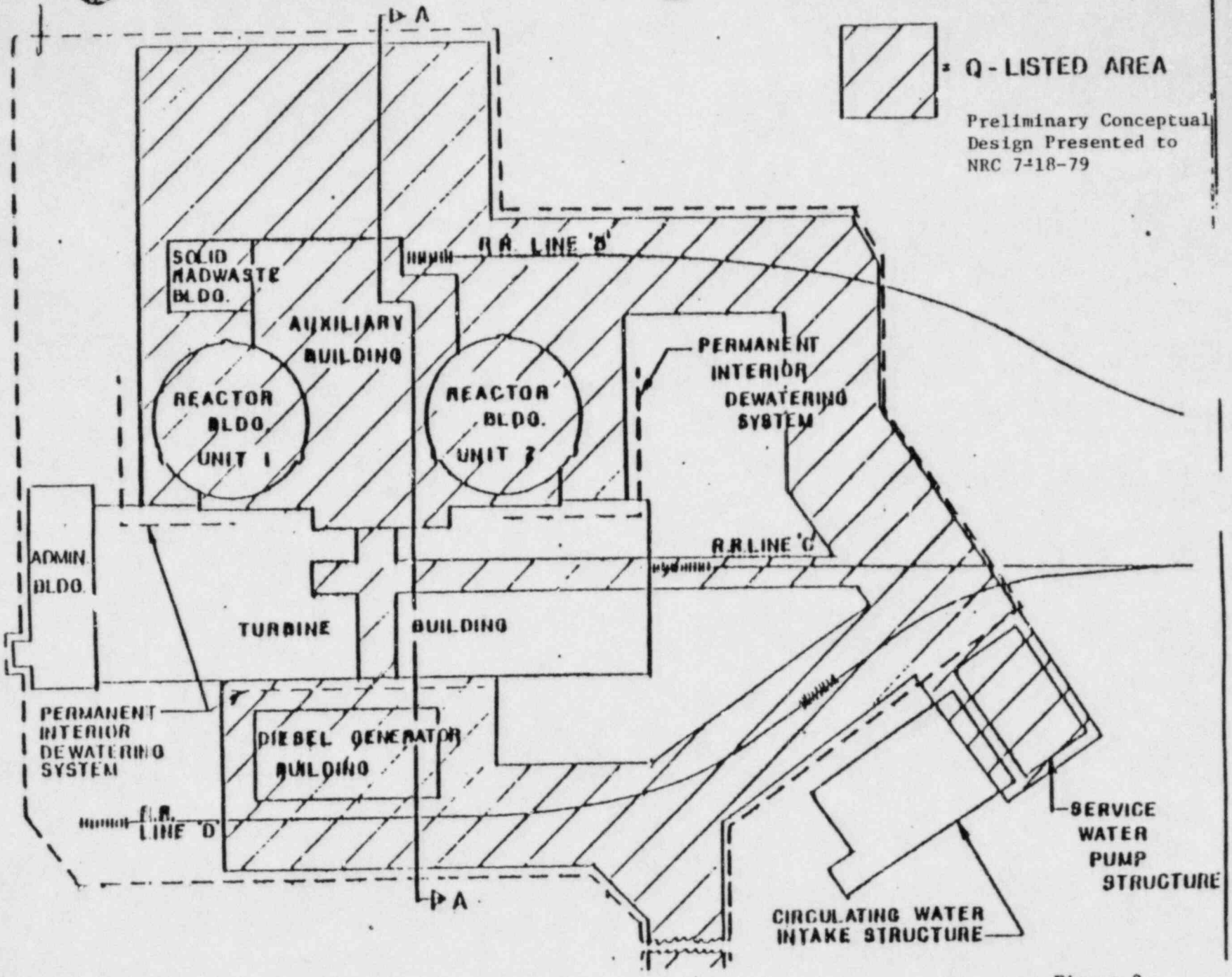
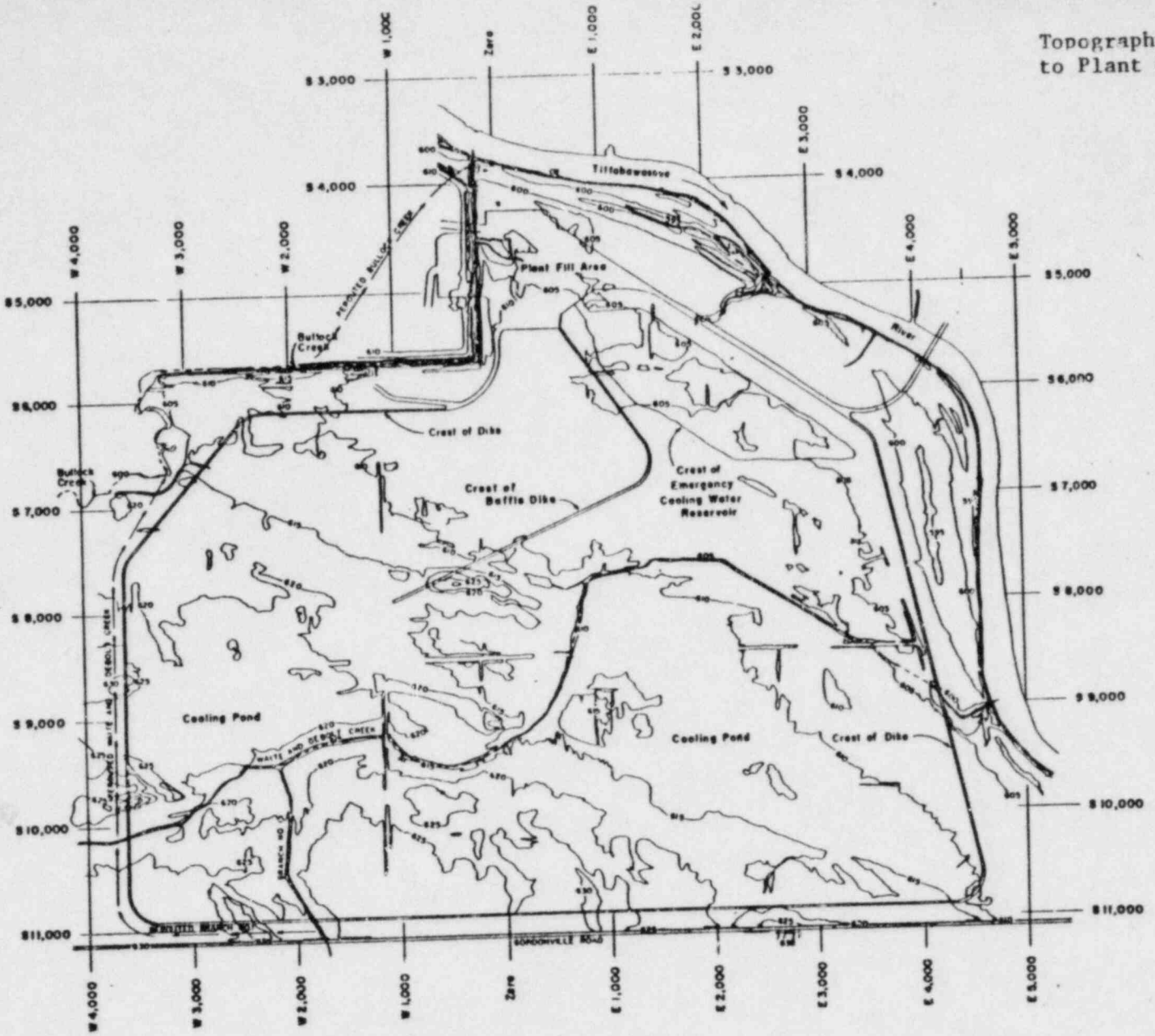


Figure 2
1-16-80

Topography Prior
to Plant Construction



LEGEND

ORIGINAL CREEK OR DRAIN
REROUTED CREEK OR DRAIN

N

SCALE IN FEET

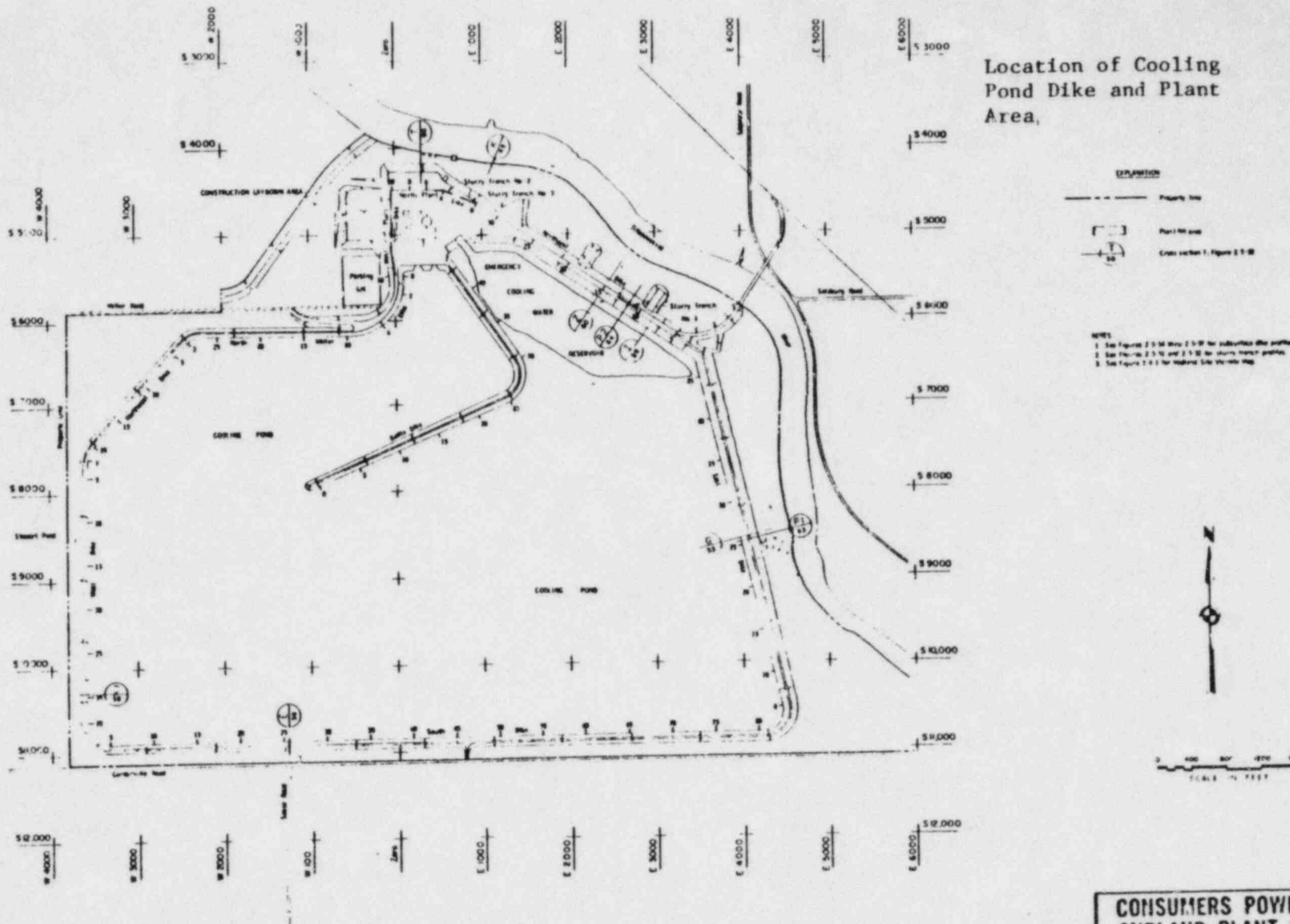
CONTOUR INTERVAL = 5 FEET

CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

Creek and Drainage Locations

Figure 3-
1-16-80

Location of Cooling Pond Dike and Plant Area.

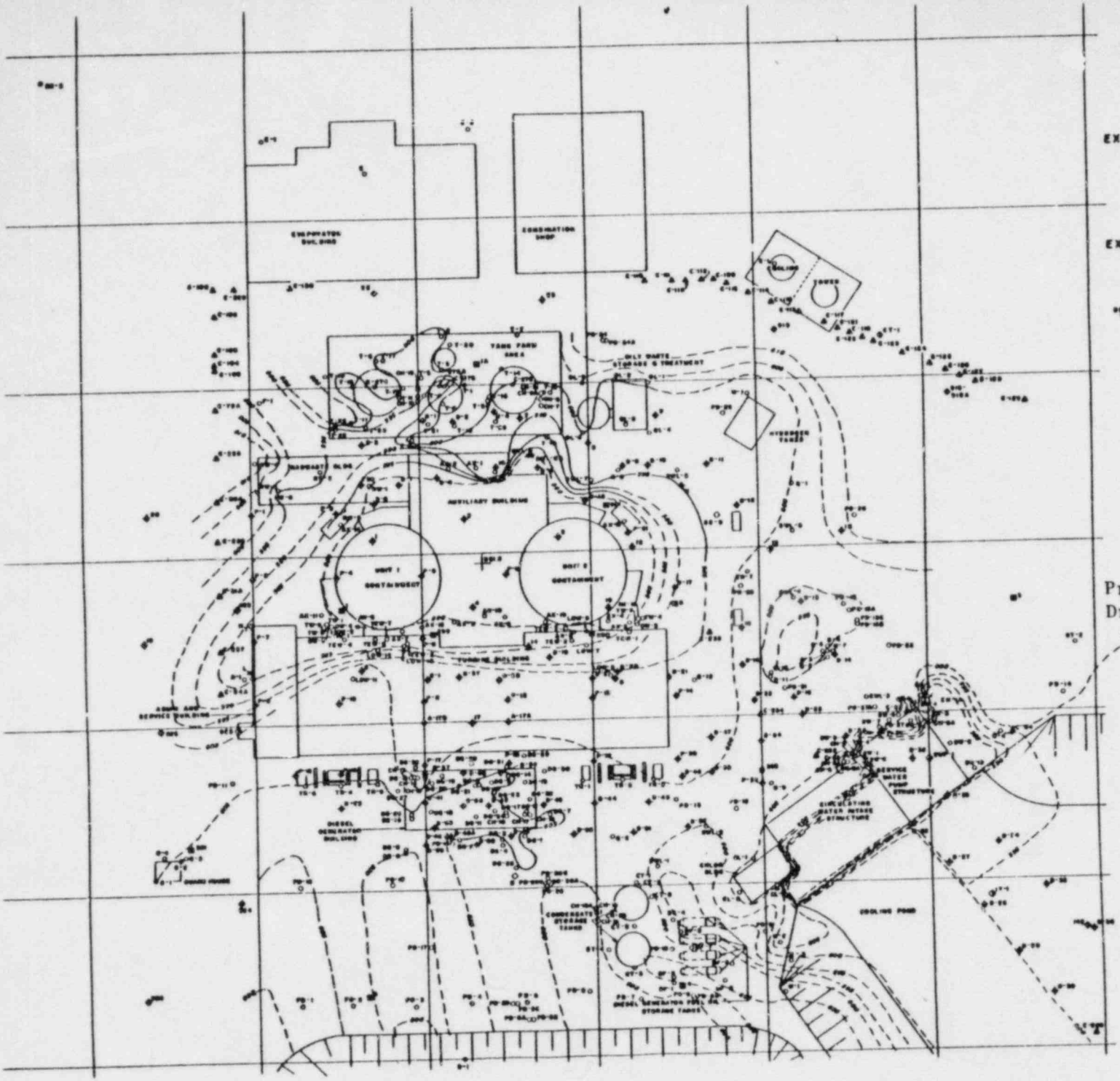


CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

Site with Plant Fill Area, Slurry Trench and Dike Section Locations

Figure 4

1-16-80



EXPLANATION

EXPLORATION PROGRAM - PRECONSTRUCTION

- ■ MICHIGAN DRILLING COMPANY BORINGS; 1956 & 1968
- ◆ DAMES & MOORE BORINGS; 1968 & 1969

EXPLORATION PROGRAM - CONSTRUCTION PERIOD

- ▲ WALTER FLOOD COMPANY BORINGS; 1969 & 1970
- ◆ BECHTEL BORINGS; 1970
- ■ SOIL & MATERIALS ENGINEERING INC BORINGS; 1973
- ◆ BECHTEL BORINGS; 1973 & 1974
- ○ BECHTEL BORINGS; 1977 & 1978
- ○ BECHTEL BORINGS; 1978, 1979 & 1980
- CONTOUR ON BOTTOM OF EXCAVATION
- INFERRED CONTOUR ON BOTTOM OF EXCAVATION

NOTE:
Contour interval is 5 feet

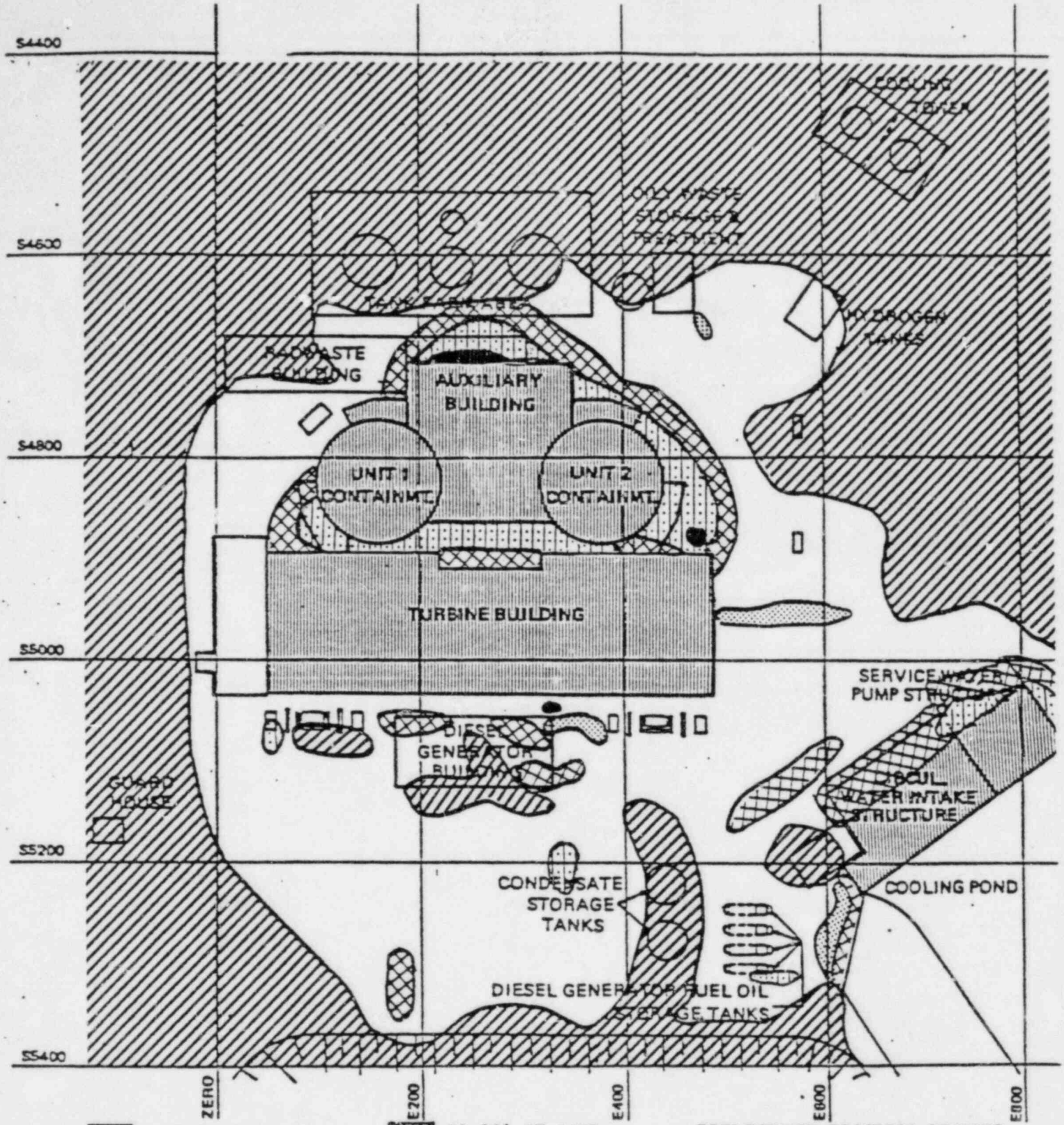
Preliminary Progress
Drawing - Subject to Revision

N

0 50 100 150 200
SCALE IN FEET

BECHTEL		
MIDLAND POWER PLANT		
BOTTOM OF EXCAVATION CONTOUR MAP		
BECHTEL	7220	FIGURE 5

2-25-80



*BASED ON BORINGS 1-16-80

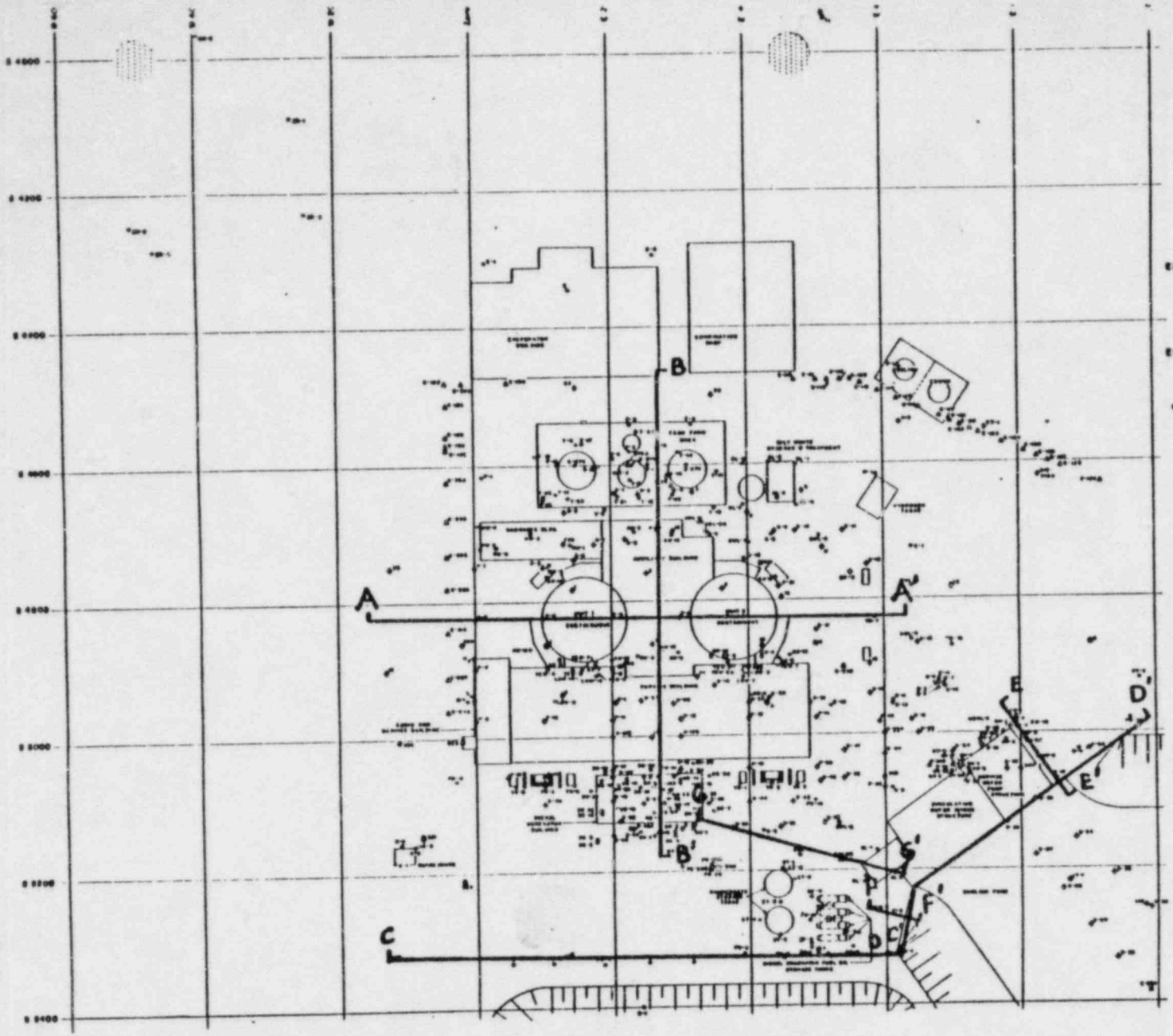
PRELIMINARY PROGRESS DRAWING
SUBJECT TO REVISION

BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

ACCUMULATIVE THICKNESS OF SAND IN BACKFILL*

JOB NO.	DRAWING NO.
7220	FIGURE 6



EXPLANATION

EXPLORATION PROGRAM - PRECONSTRUCTION

- MICHIGAN DRILLING COMPANY BORINGS; 1956 & 1969
- DAMES & MOORE BORINGS; 1968 & 1969

EXPLORATION PROGRAM - CONSTRUCTION PERIOD

- WALTER FLOOD COMPANY BORINGS; 1969 & 1970
- BECHTEL BORINGS; 1970
- SOIL & MATERIALS ENGINEERING INC BORINGS; 1973
- BECHTEL BORINGS; 1973 & 1974
- BECHTEL BORINGS; 1977 & 1978
- BECHTEL BORINGS; 1978 & 1979

Preliminary Progress Drawing - Subject to Revision

N

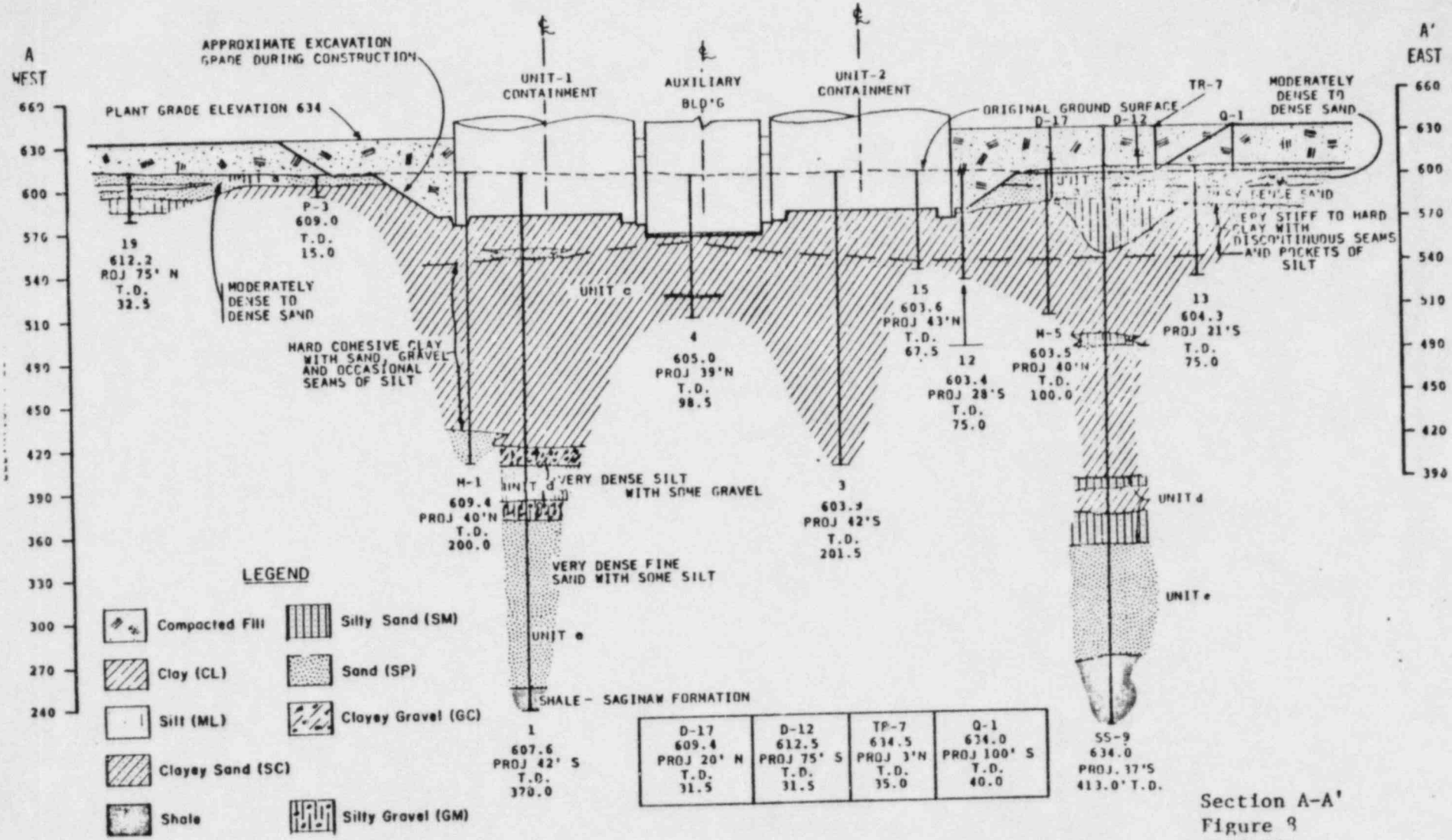
BECHTEL

MIDLAND POWER PLANT

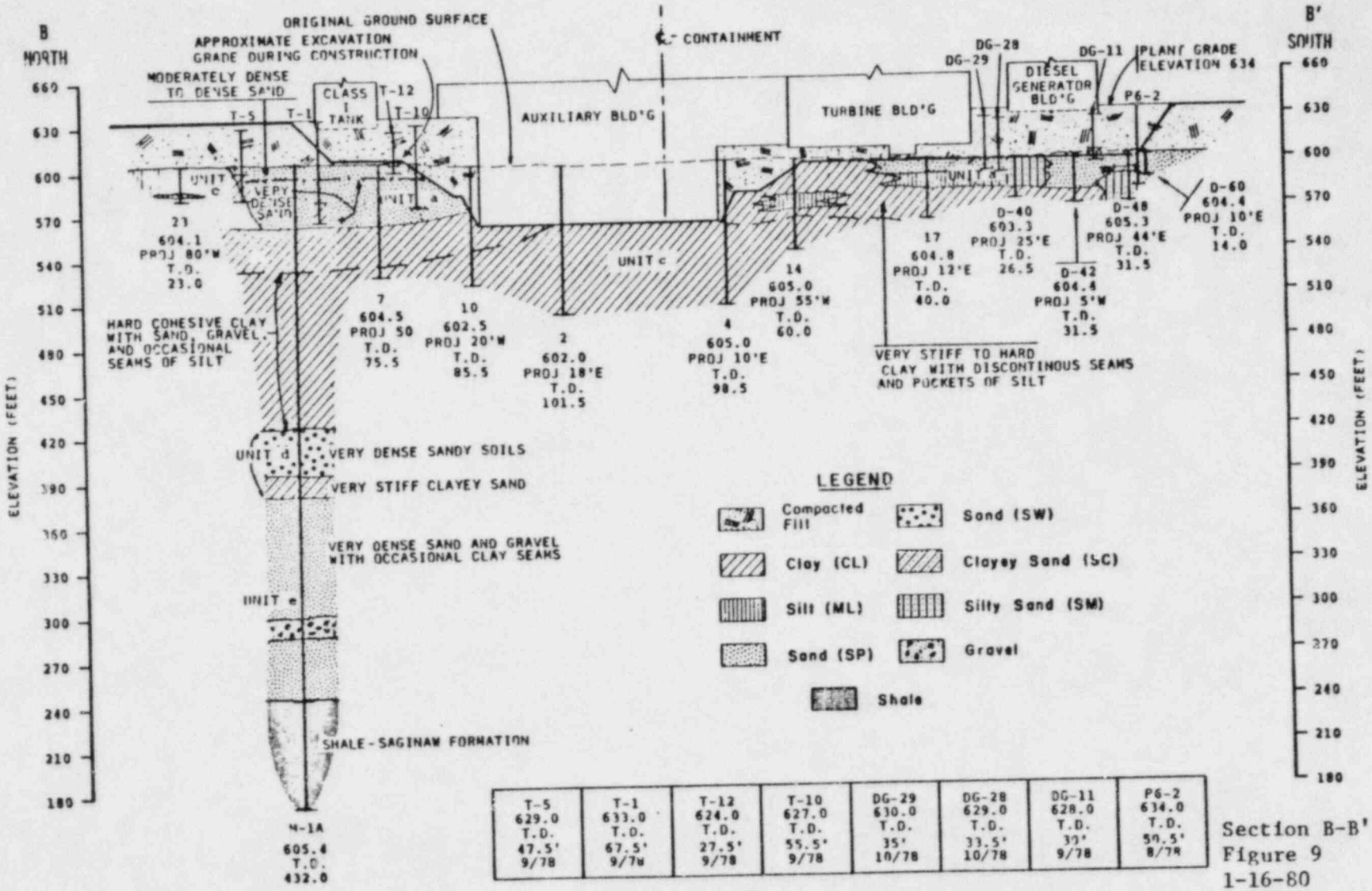
COMPOSITE BORING LOCATION PLAN

7220 | FIGURE 7 | A

Section Location
1-16-80

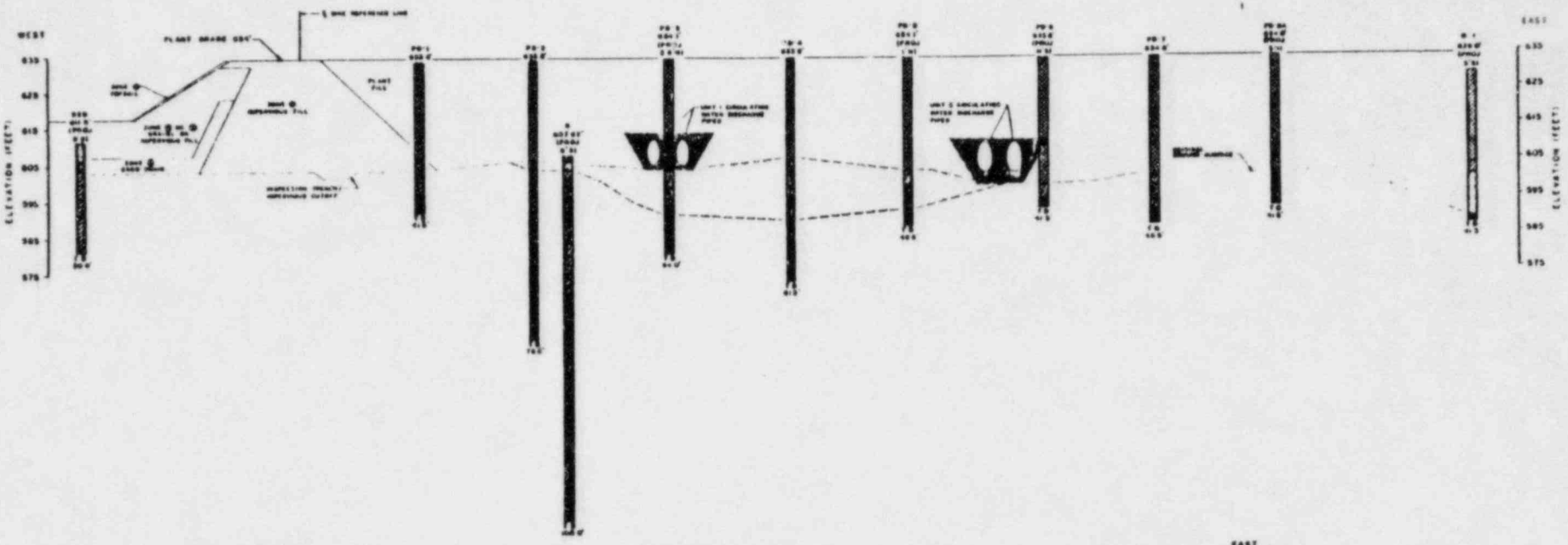


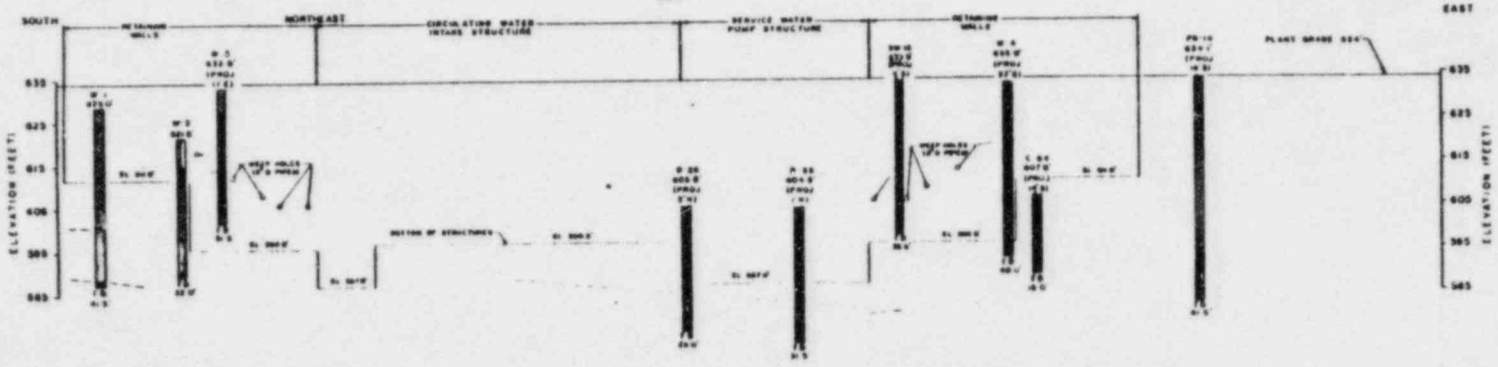
Section A-A'
Figure 8
1-16-80



T-5	T-1	T-12	T-10	DG-29	DG-28	DG-11	P6-2
629.0	633.0	624.0	627.0	630.0	629.0	628.0	634.0
T.D.	T.D.	T.D.	T.D.	T.D.	T.D.	T.D.	T.D.
47.5'	67.5'	27.5'	55.5'	35'	33.5'	33'	50.5'
9/78	9/78	9/78	9/78	10/78	10/78	9/78	8/78

Section B-B'
Figure 9
1-16-80





LEGEND

- SAND (SP)
- CLAY (CL)
- CLAY FILL
- SILT (ML)
- SAND FILL
- SILTY SAND (SM)
- CLAYEY SAND (SC)

EXPLANATION

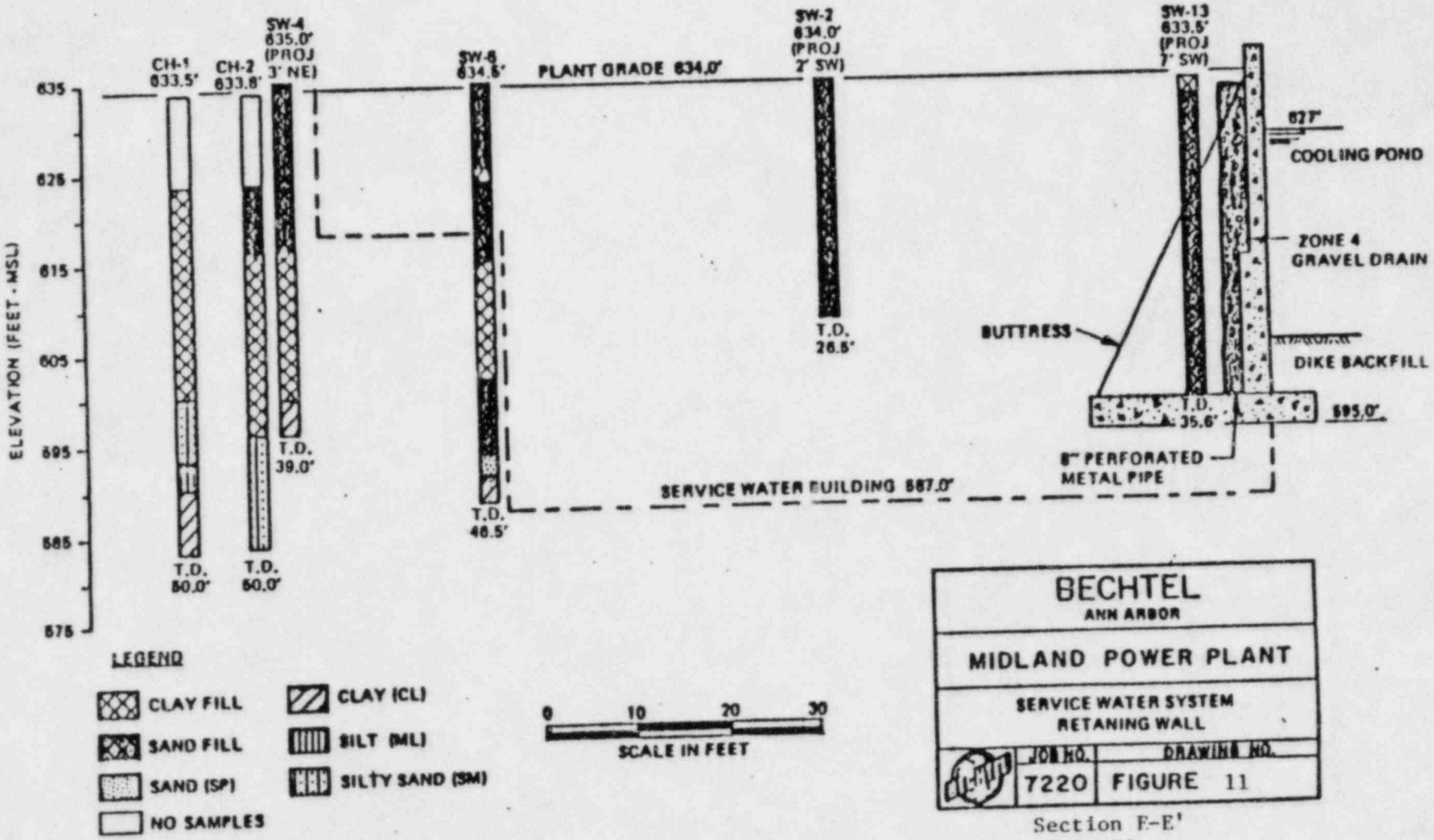
- FD 3 — BORING NUMBER
- 634.1 — GROUND SURFACE ELEVATION
- (PROJ.) — DISTANCE AND DIRECTION OF BORING TO SECTION LINE
- 465 — TOTAL DEPTH IN FEET

BECHTEL

MIDLAND POWER PLANT

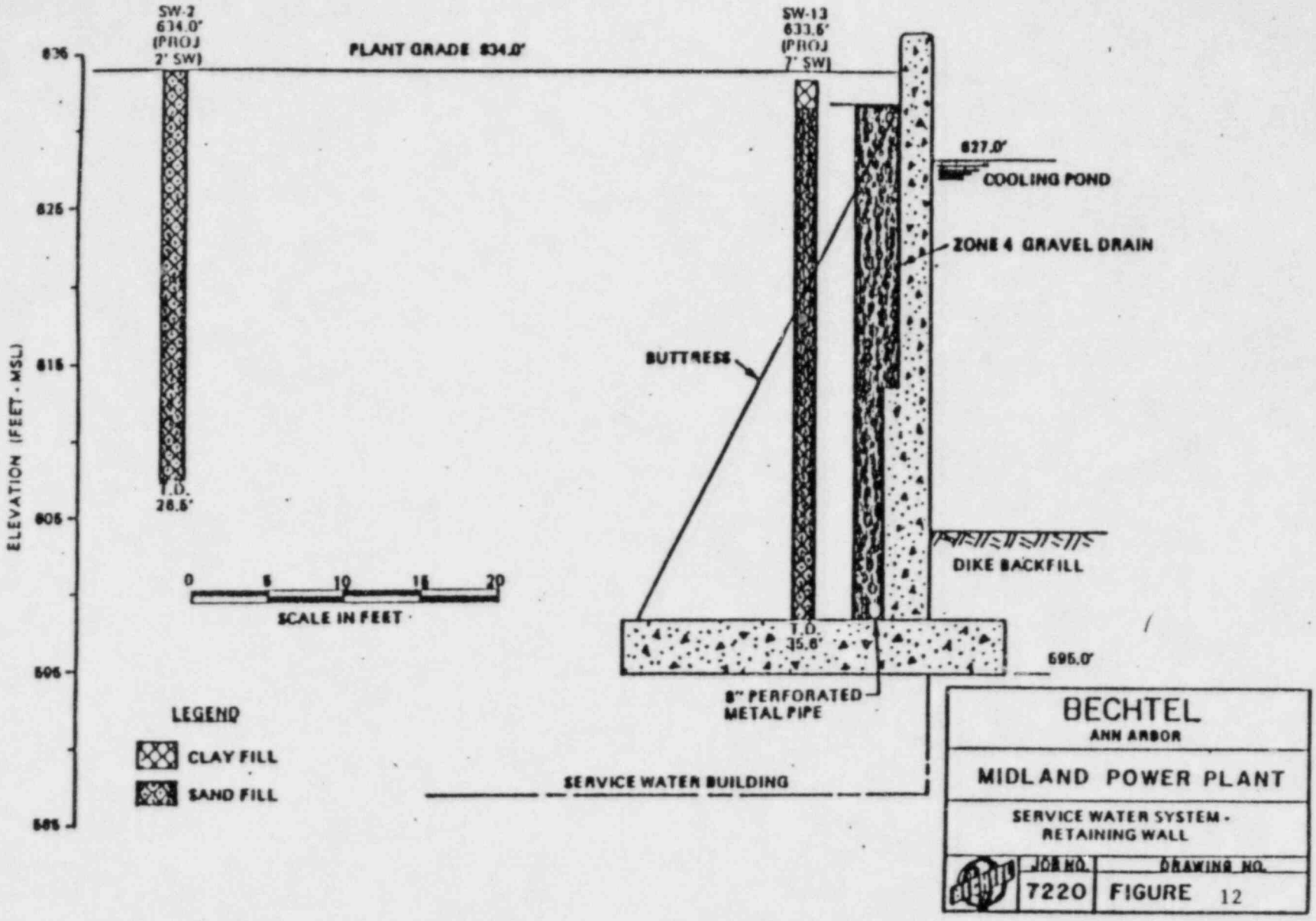
CROSS SECTIONS C-C' AND D-D'

1-16-80 | 7220 | FIGURE 10 | A

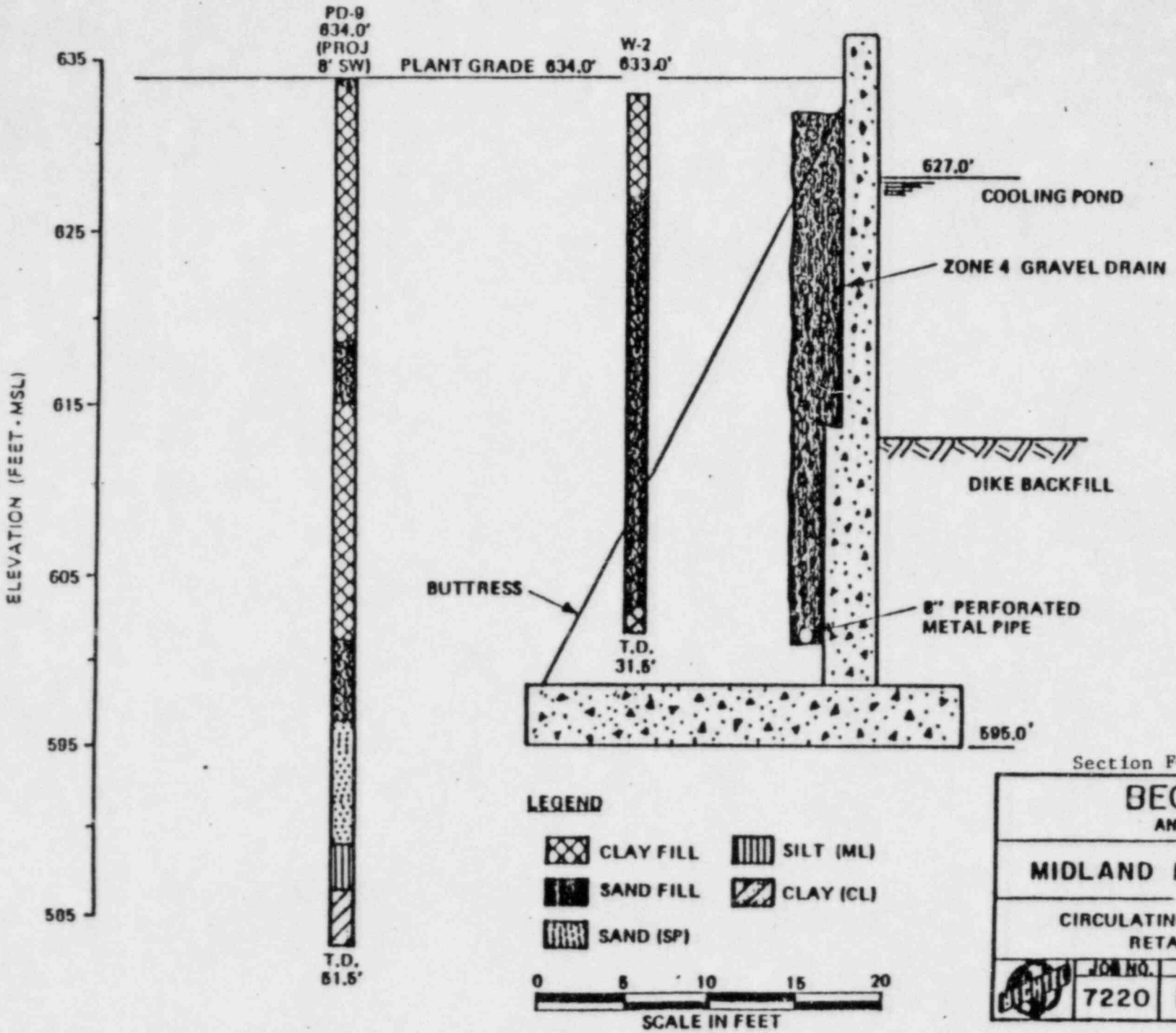


BECHTEL ANN ARBOR		
MIDLAND POWER PLANT		
SERVICE WATER SYSTEM RETANING WALL		
	JOB NO.	DRAWING NO.
	7220	FIGURE 11

Section E-E'
1-16-80



Section EE' Retail
1-16-80



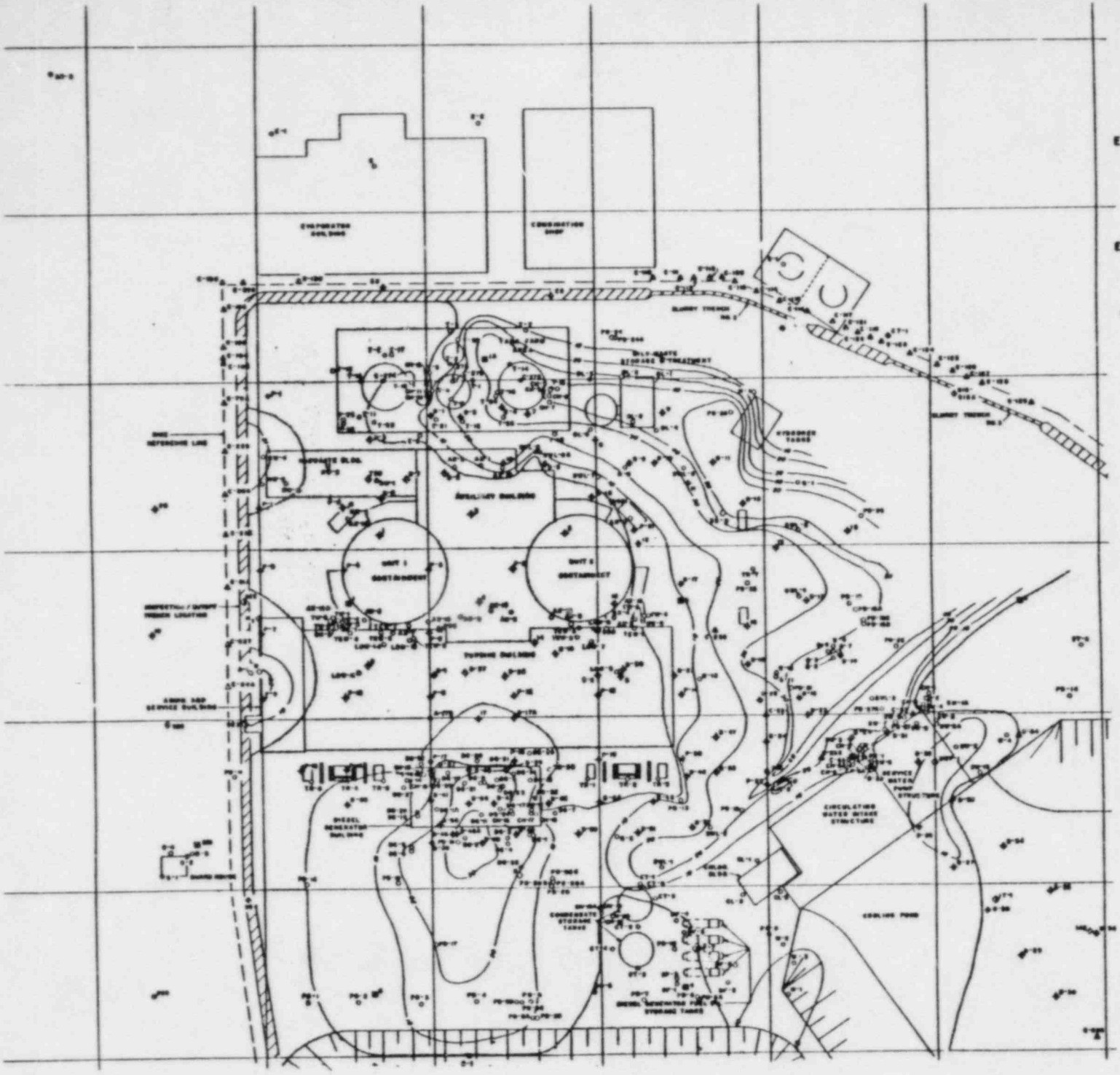
Section F-F' 1-16-80

BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

CIRCULATING WATER SYSTEM
RETANING WALL

JOB NO.	DRAWING NO.
7220	FIGURE 13



EXPLANATION

EXPLORATION PROGRAM - PRECONSTRUCTION

- ■ MICHIGAN DRILLING COMPANY BORINGS; 1956 & 1968
- ◆ DAMES & MOORE BORINGS; 1968 & 1969

EXPLORATION PROGRAM - CONSTRUCTION PERIOD

- ▲ WALTER FLOOD COMPANY BORINGS; 1969 & 1970
- ◆ BECHTEL BORINGS; 1970
- ■ SOIL & MATERIALS ENGINEERING INC BORINGS; 1973
- ◆ BECHTEL BORINGS; 1973 & 1974
- ○ BECHTEL BORINGS; 1977 & 1978
- ○ BECHTEL BORINGS; 1978, 1979 & 1980
- CONTOUR REPRESENTS THICKNESS OF REMAINING NATURAL SANDS. CONTOUR INTERVAL IS TEN FEET
- AREAS INSIDE THE DIKE INSPECTION / CUTOFF TRENCH UNDERLAIN BY NATURAL CLAY
- AREAS INSIDE THE DIKE INSPECTION / CUTOFF TRENCH UNDERLAIN BY NATURAL SAND

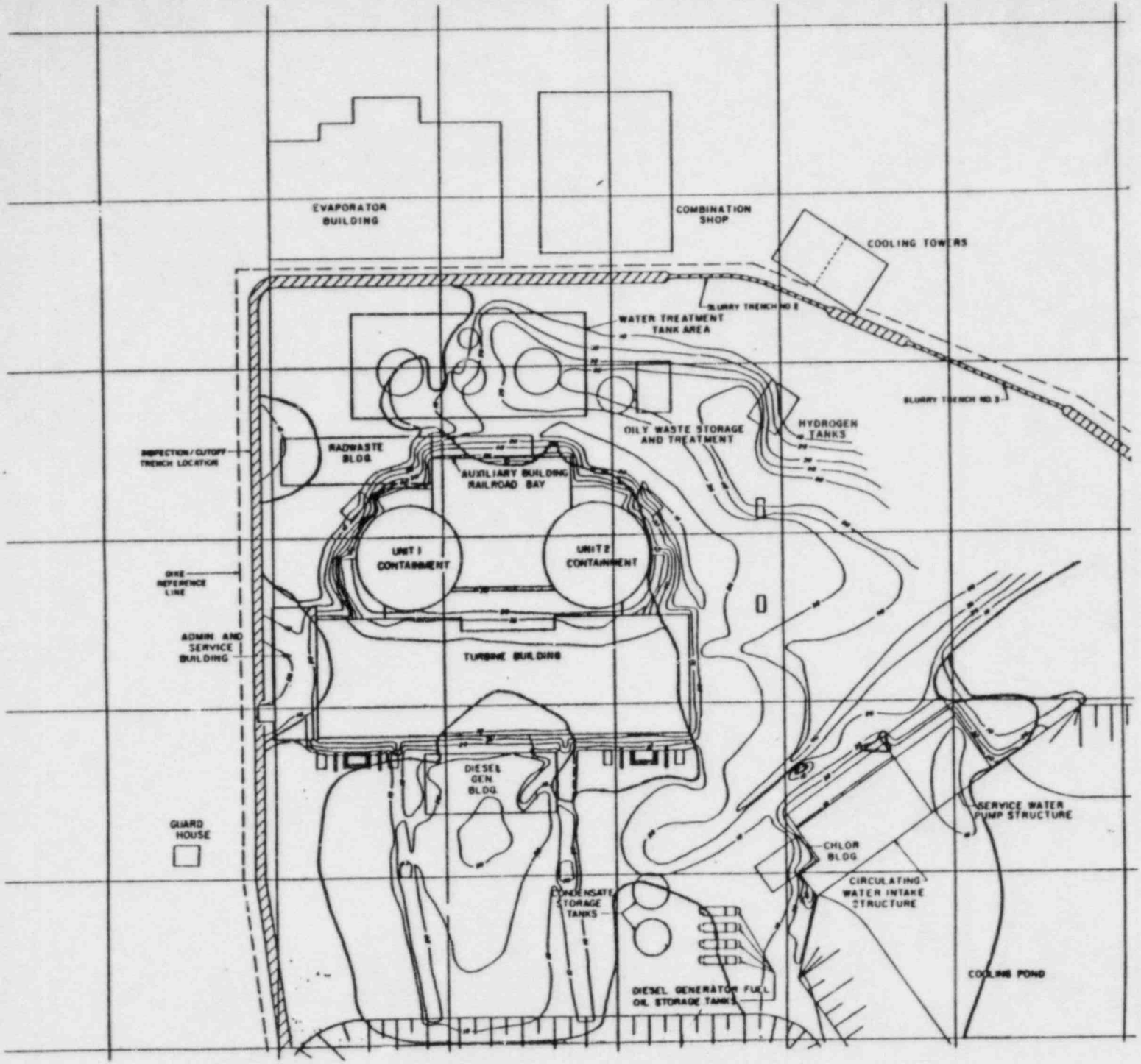
Preliminary Progress
Drawing - Subject to Revision

N

0 50 100 150 200
SCALE IN FEET

BECHTEL			
MIDLAND POWER PLANT			
ISOPACH OF REMAINING NATURAL SANDS			
BECHTEL	7220	FIGURE 14	A

1-16-80



LEGEND

- AREAS ABSENT OF NATURAL SAND
- CONTOURS REPRESENT THICKNESS OF BACKFILL SANDS, NATURAL SANDS OR COMBINATIONS OF THE TWO WHERE IN DIRECT CONTACT WITH EACH OTHER

NOTES:

1. Distribution of backfill and natural sands based on interpretation of boring logs and construction records
2. Contours are controlled by the placement of backfill sands and location of building foundations

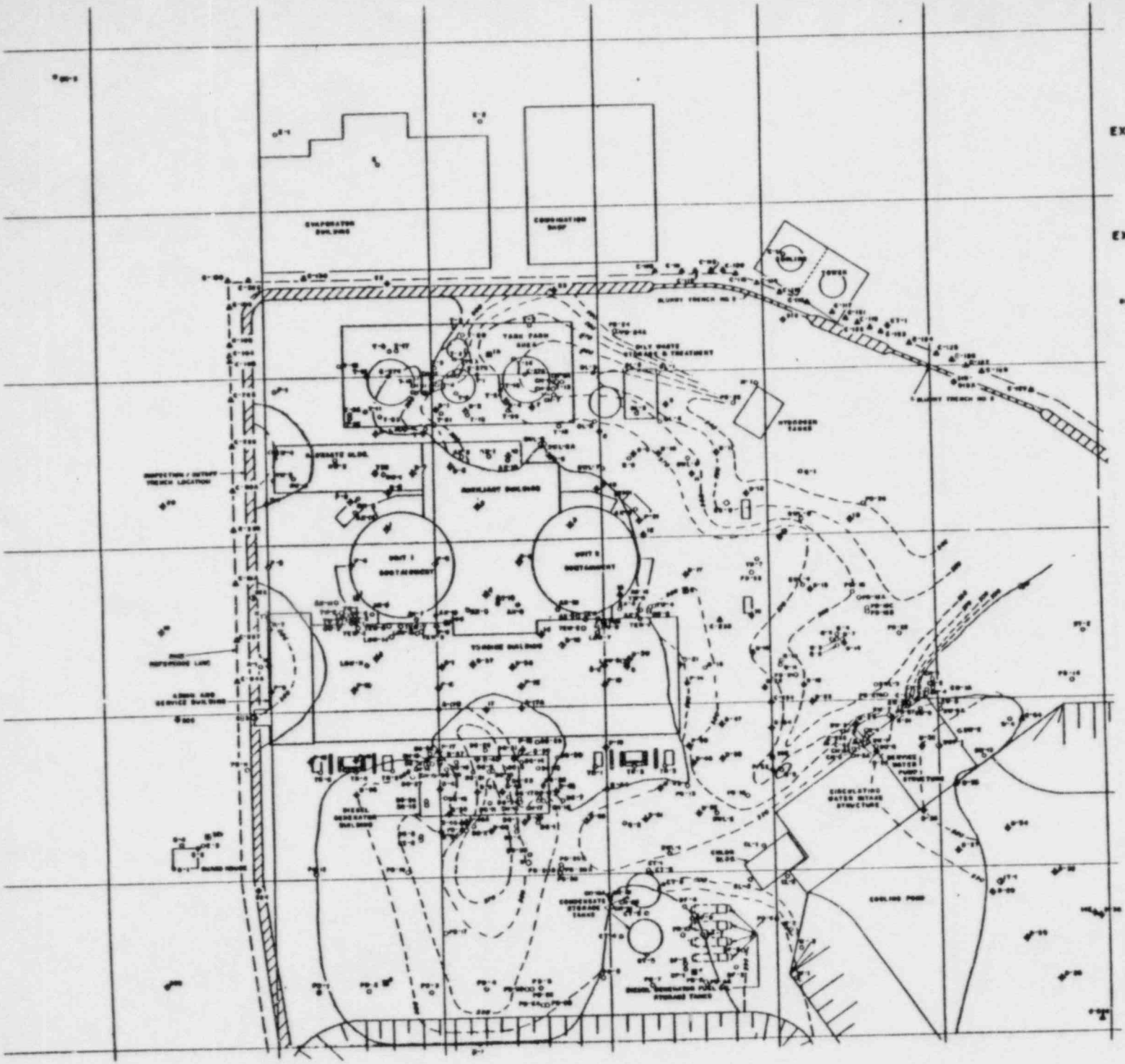
Preliminary Progess Drawings - Subject to Revision

N

0 25 50 100 150 200
SCALE IN FEET

BECHTEL			
MIDLAND POWER PLANT			
ISOPACH MAP OF BACKFILL AND NATURAL SANDS			
	7220	FIGURE 15	A

1-16-80



EXPLANATION

EXPLORATION PROGRAM - PRECONSTRUCTION

- ■ MICHIGAN DRILLING COMPANY BORINGS; 1956 & 1968
- ◆ DAMES & MOORE BORINGS; 1968 & 1969

EXPLORATION PROGRAM - CONSTRUCTION PERIOD

- ▲ WALTER FLOOD COMPANY BORINGS; 1969 & 1970
- ◈ BECHTEL BORINGS; 1970
- ■ SOIL & MATERIALS ENGINEERING INC BORINGS; 1973
- ◈ BECHTEL BORINGS; 1973 & 1974
- ○ BECHTEL BORINGS; 1977 & 1978
- ○ BECHTEL BORINGS; 1978, 1979 & 1980
- CONTOUR REPRESENTS APPROXIMATE BOTTOM OF NATURAL SAND AFTER CONSTRUCTION. CONTOUR INTERVAL IS 10'
- AREAS INSIDE THE DIKE INSPECTION / CUTOFF TRENCH UNDERLAIN BY NATURAL CLAY
- AREAS INSIDE THE DIKE INSPECTION / CUTOFF TRENCH UNDERLAIN BY NATURAL SAND

Preliminary Progress Drawing - Subject to Revision

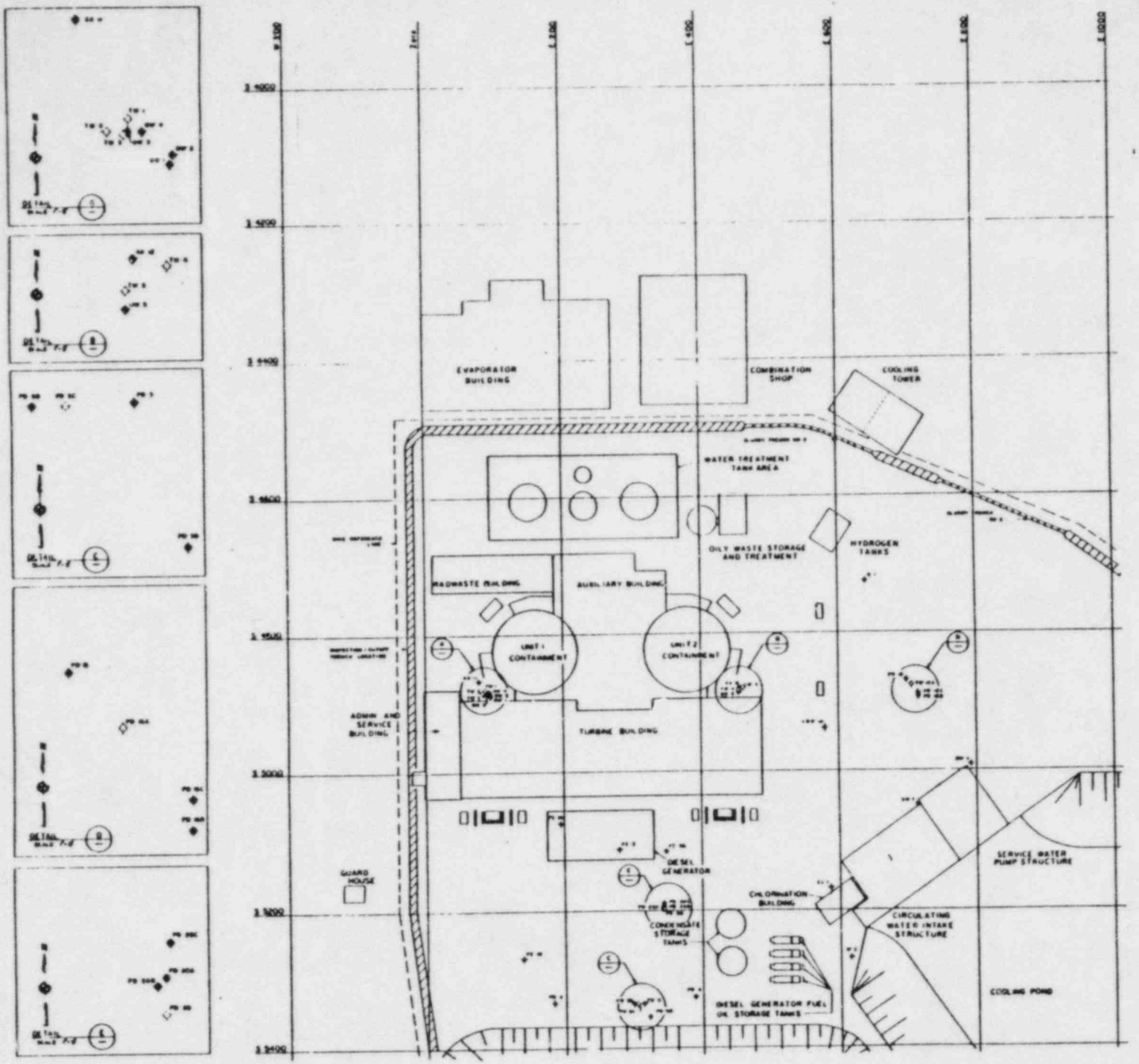
N

0 50 100 150 200

SCALE IN FEET

BECHTEL			
MIDLAND POWER PLANT			
CONTOURS ON BOTTOM OF NATURAL SAND AFTER CONSTRUCTION			
BECHTEL	7220	FIGURE 16	A

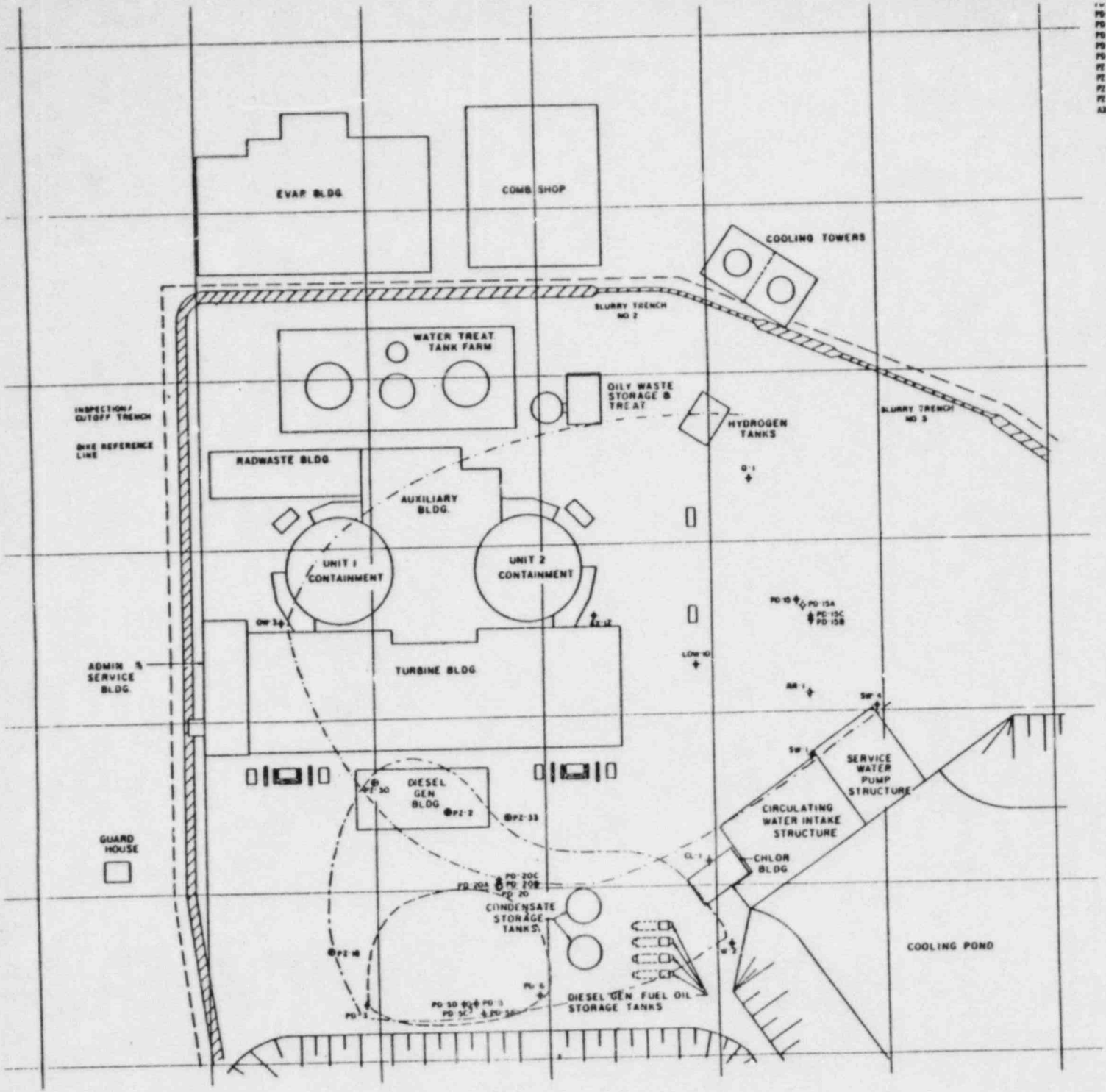
2-25-80



Pumping Test Locations

BECHTEL			
MIDLAND POWER PLANT			
PUMPING TEST LOCATION PLAN			
	7220	FIGURE 17	A

2-25-80



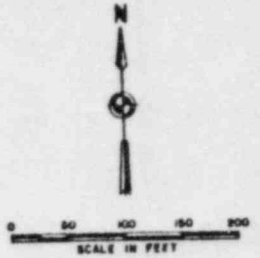
PD-1	36-43	191.3	NATURAL SAND
PD-2B	29.6-34.6	199.6-9	BACKFILL SAND
PD-20A	35-40	196	BACKFILL AND NATURAL SAND
PD-20B	28.5-33.5	200.55	BACKFILL SAND
PD-20C	29-34	201.1	BACKFILL SAND
PZ-18	20-22	661.8	BACKFILL SANDY CLAY
PZ-10	24-28	680.8	BACKFILL SAND
PZ-2	20-25	806	BACKFILL SAND (?)
PZ-33	11.3-13.3	671.8	BACKFILL SAND
AR-12	32-42	562	BACKFILL SAND

Preliminary Progress Drawing - Subject to Revision

LEGEND

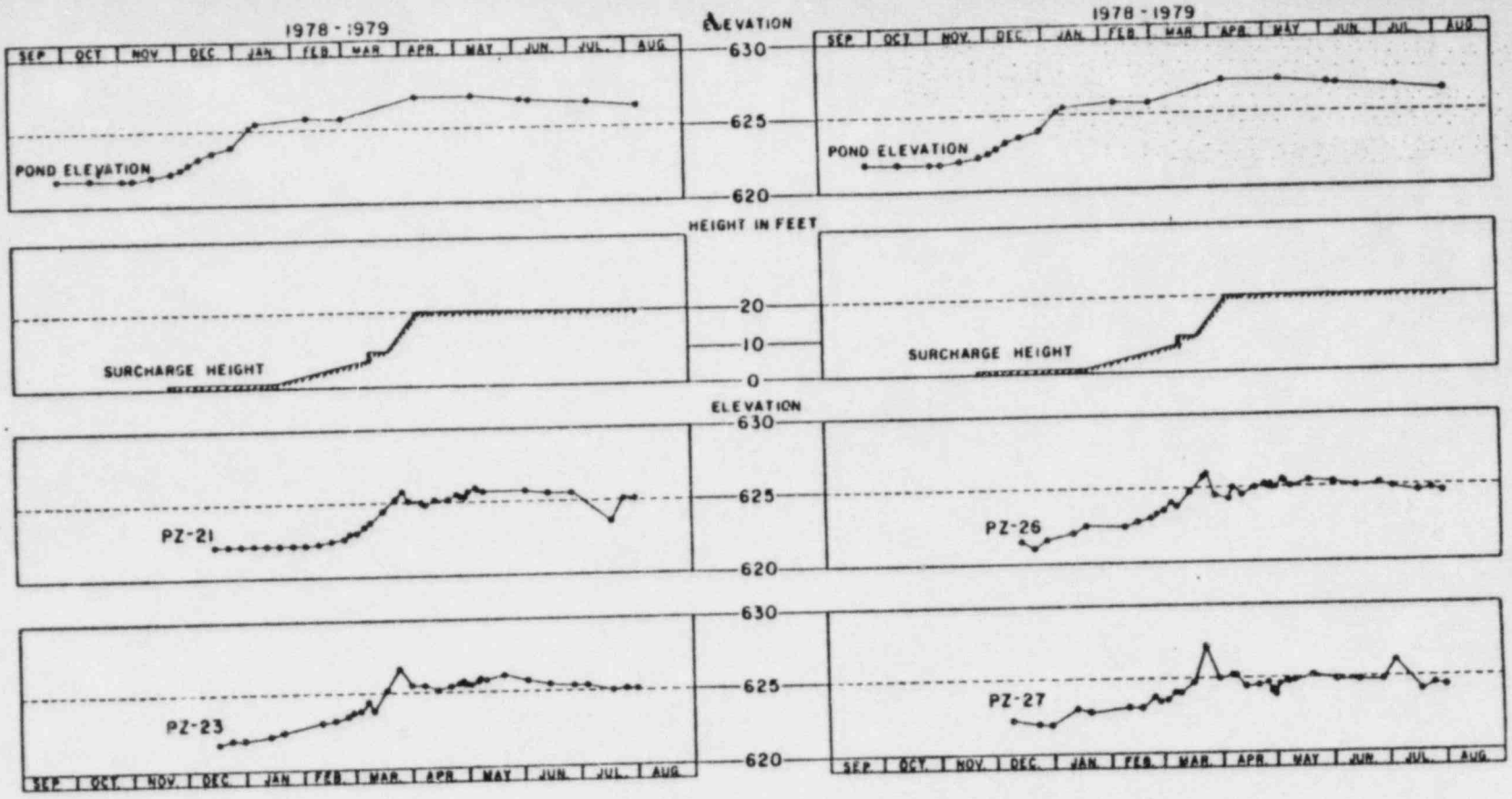
- PD-5C — LOCATION OF PUMPING WELLS
- OW-3 — LOCATION OF OBSERVATION WELLS
- PZ-3 — LOCATION OF PIEZOMETERS
- AREAL EXTENT OF CONE OF DEPRESSION* FROM PD-15A TEST AFTER 8,830 MINUTES OF PUMPING (Q=12.5 GPM)
- AREAL EXTENT OF CONE OF DEPRESSION* FROM PD-20 TEST AFTER 4,365 MINUTES OF PUMPING (Q=7 GPM)
- AREAL EXTENT OF CONE OF DEPRESSION* FROM PD-5C TEST AFTER 4,959 MINUTES OF PUMPING (Q=83 GPM)

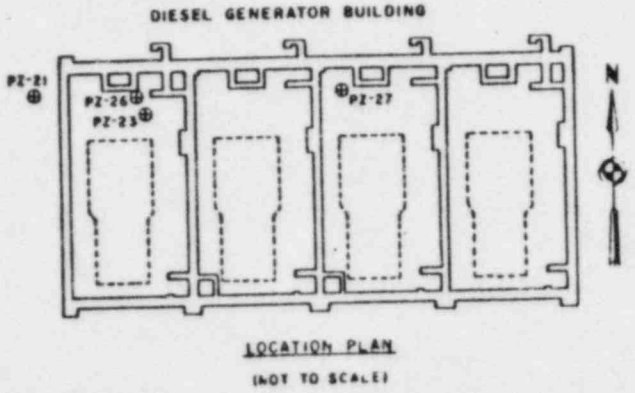
*AREAL EXTENT OF CONE OF DEPRESSION DEFINED AS 0.8' OF DRAWDOWN



BECHTEL ANN ARBOR		
MIDLAND POWER PLANT		
PLAN OF CONES OF INFLUENCE FROM PUMPING TESTS		
JOB NO. 7220	DRAWING NO. FIGURE 18	REV. A

2-25-80



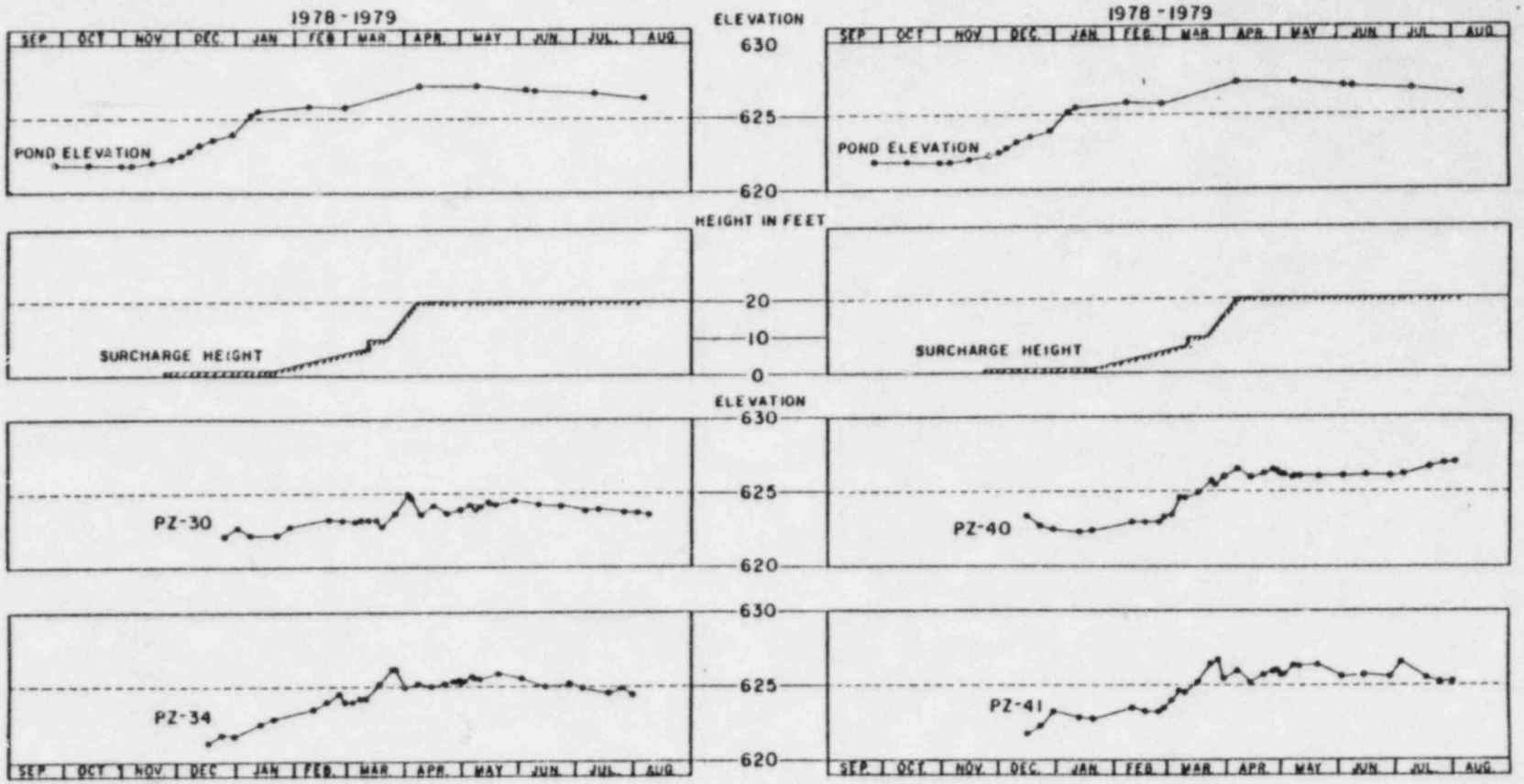


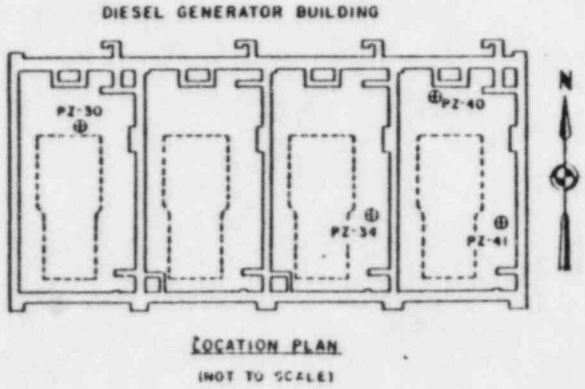
LOCATION PLAN

(NOT TO SCALE)

BECHTEL			
MIDLAND POWER PLANT			
HYDROGRAPHS OF COOLING POND AND PIEZOMETERS 21,23,26,27			
	JOB NO.	DRAWING NO.	REV.
	7220	FIGURE 19	A

2-25-80



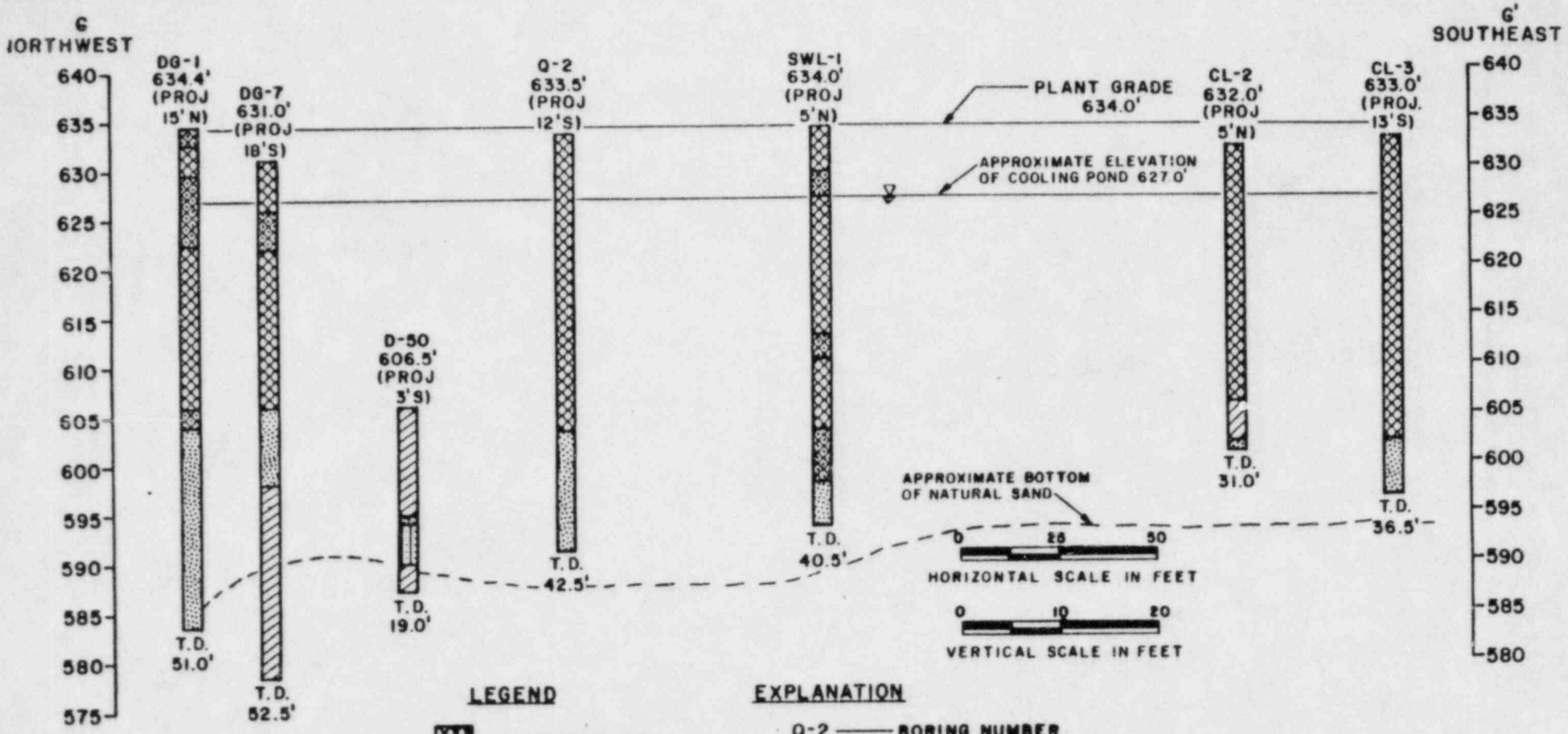


LOCATION PLAN

(NOT TO SCALE)

BECHTEL ANN ARBOR			
MIDLAND POWER PLANT			
HYDROGRAPHS OF COOLING POND AND PIEZOMETERS 30,34,40,41			
	JOB NO. 7220	DRAWING NO. FIGURE 20	REV. A

2-25-80



LEGEND

- CLAY BACKFILL
- SAND BACKFILL
- CLAY (CL)
- SILTY SAND (SM)
- SAND (SP)

EXPLANATION

Q-2 — BORING NUMBER
633.5' — GROUND SURFACE ELEVATION
(PROJ. 12'S) — DISTANCE AND DIRECTION OF BORING TO SECTION LINE
T.D. 42.5' — TOTAL DEPTH IN FEET

NOTES:

1. For location of Cross-Section see Figure 24-1
2. Boring D-50 was drilled in 1970, prior to backfill placement.
3. For contours on bottom of natural sand see Figure 24-12

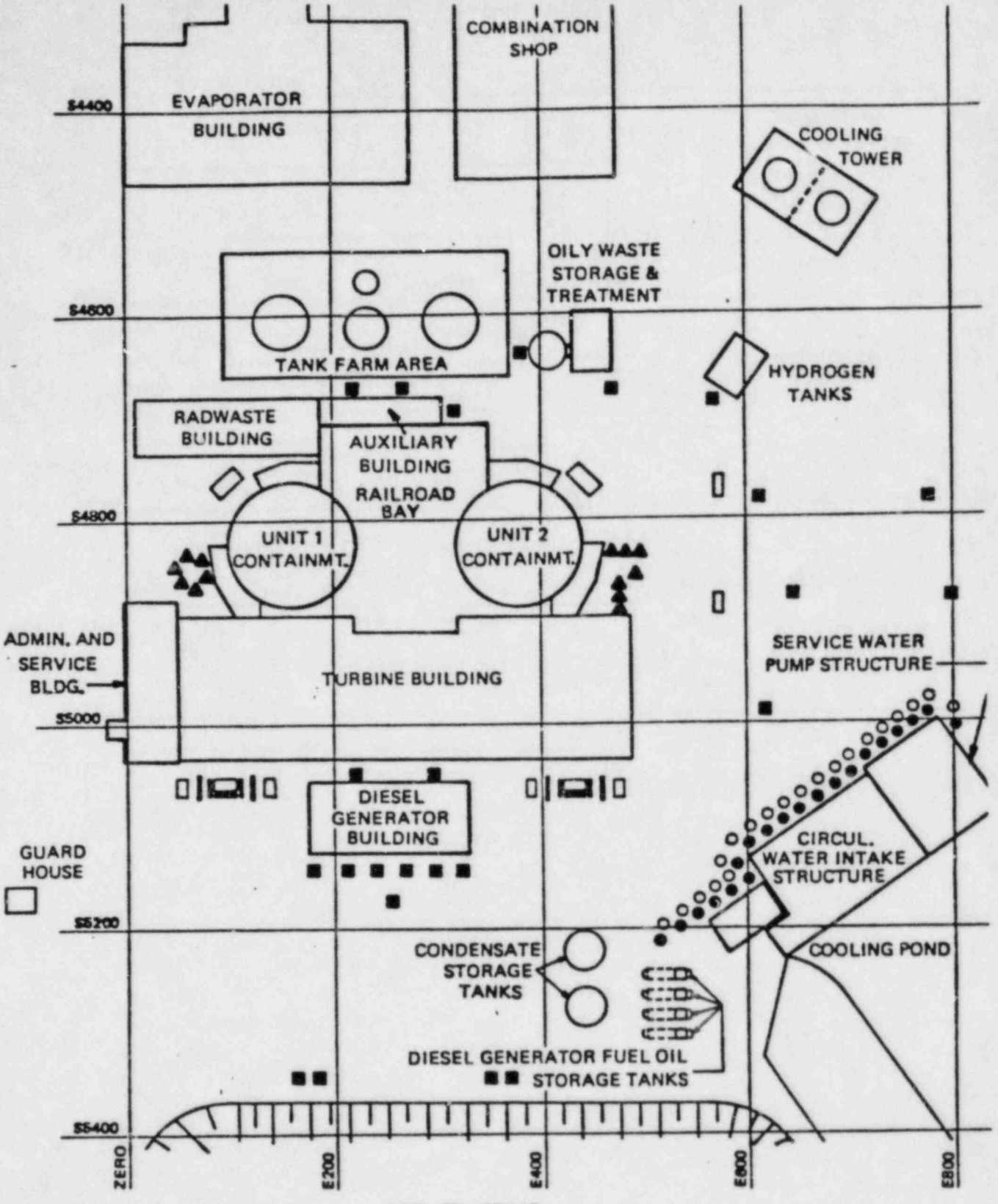
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

CROSS-SECTION G-G' FLOW PATH FROM SERVICE WATER STRUCTURE TO DIESEL GENERATOR BUILDING

JOB NO.	DRAWING NO.	REV.
7220	FIGURE 21	A

2-25-80



NOT TO SCALE

- ● INTERCEPTOR WELL
- ○ BACKUP INTERCEPTOR WELL
- ■ AREA WELL
- ▲ SIX-INCH TEMPORARY DEWATERING WELL

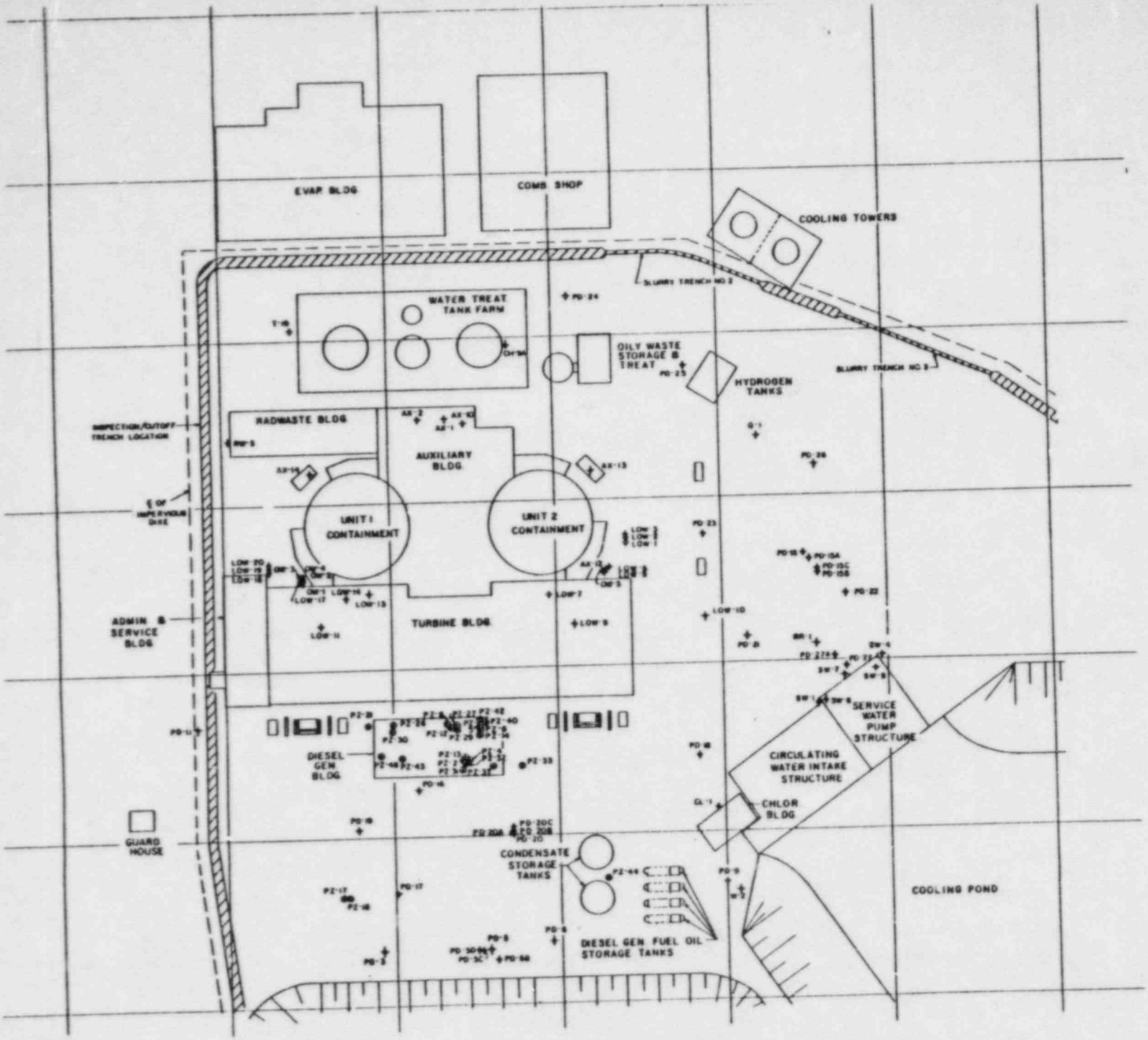
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

GENERAL LOCATION
PLAN OF DEWATERING SYSTEM

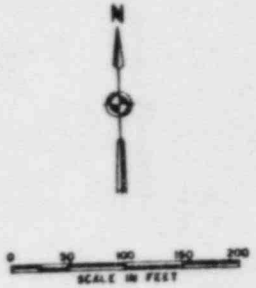
JOB NO.	DRAWING NO.
7220	FIGURE 22

2-25-80



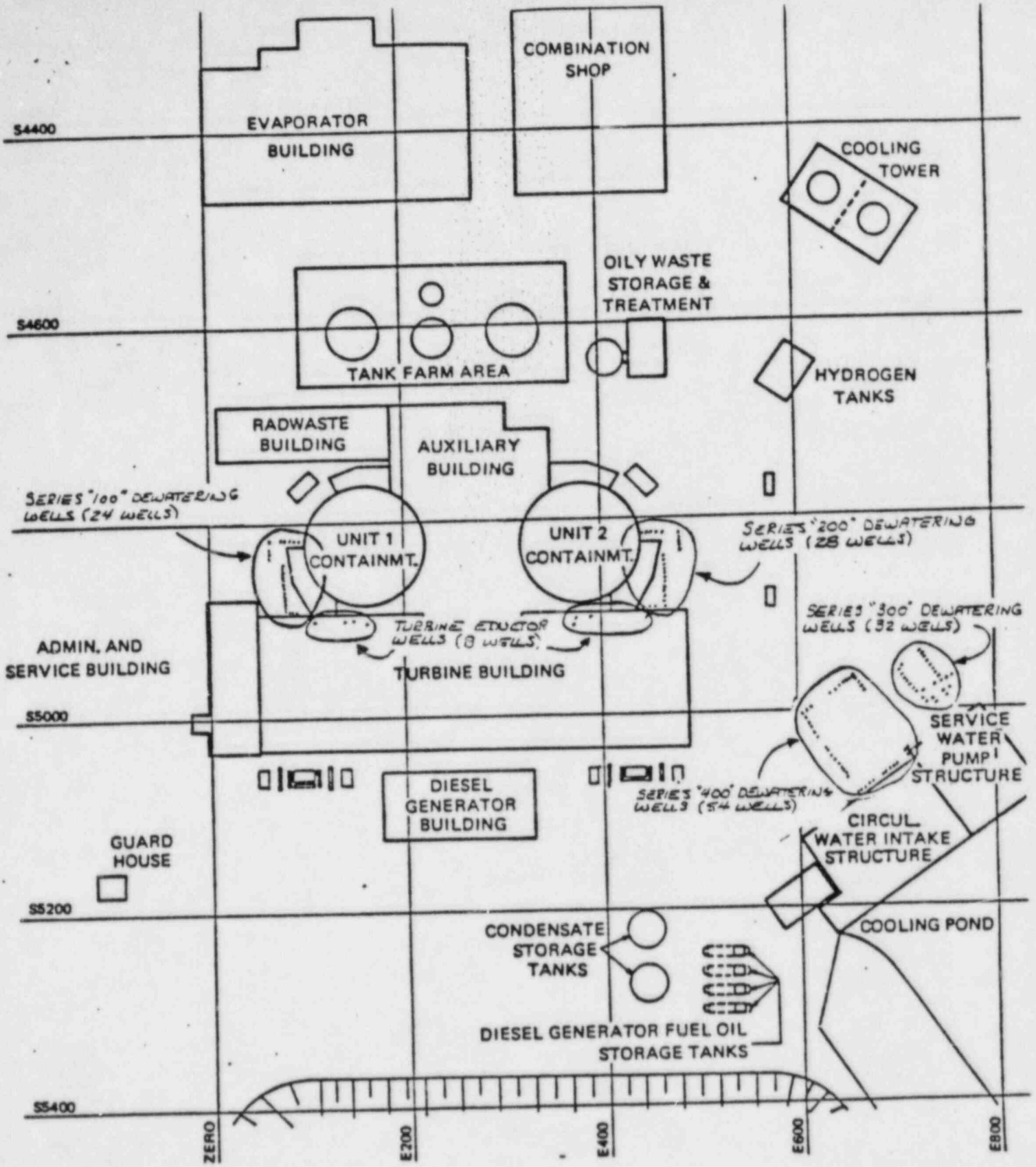
EXPLANATION

- AX-1 LOCATION OF EXISTING OBSERVATION WELLS
- PZ-3 LOCATION OF EXISTING PIEZOMETERS



BECHTEL			
MIDLAND POWER PLANT			
PIEZOMETER AND OBSERVATION WELL LOCATION PLAN			
	7220	FIGURE 23	A

2-25-80



0 50 100 150 200
SCALE IN FEET

BECHTEL
ANN ARBOR

MIDLAND POWER PLAN

PLAN OF
TEMPORARY DEWATERING WEL

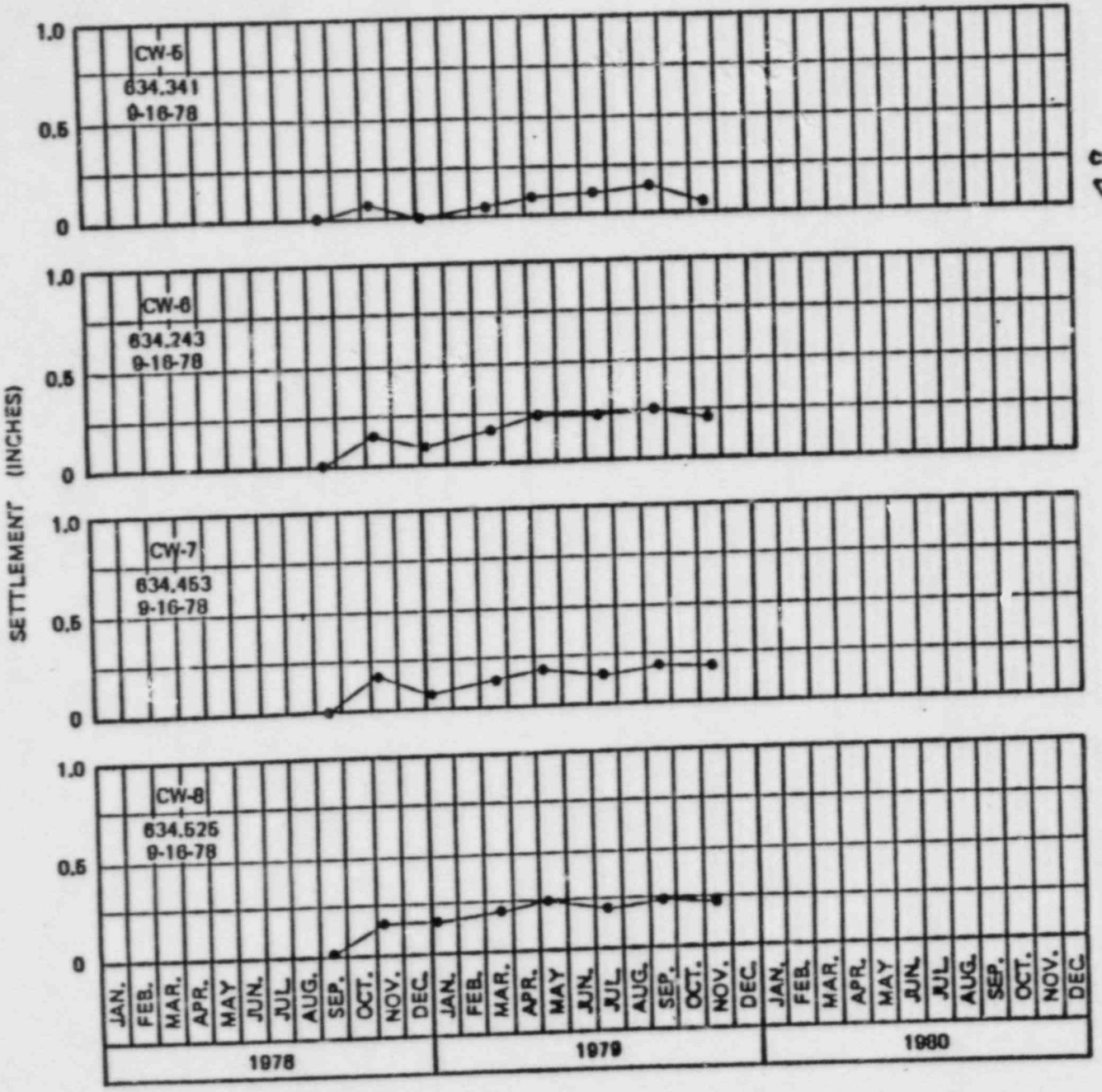
1-16-80 | JOB NO. 7220 | DRAWING NO. FIGURE 24

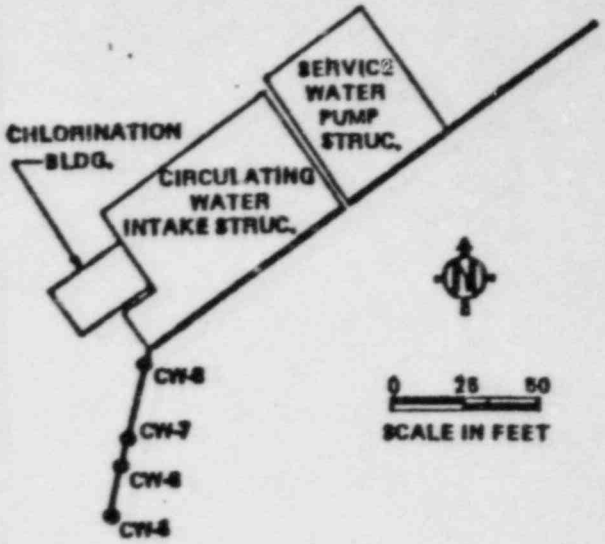
TABLE 1

Ground Water Quality Analyses from Aquifer Pumping Tests

Test Well Number	Date	Aquifer	Turbidity	pH	Total Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$	Calcium mg/l	Chlorides mg/l	Iron mg/l	Sulfate mg/l	Sodium mg/l
TW-2	6-19-79	Shallow Backfill Sand	3.2	7.4	730	260	212	300	0.4	380	160(1)
TW-3	6-18-79	Shallow Backfill Sand	5.3	7.2	730	250	212	320	12	340	150(1)
TW-4	6-14-79	Deep Backfill Sand	2.2	7.3	790	220	220	320	0.3	405	140
TW-5	6-12-79	Shallow Backfill Sand	3.4	7.1	880	305	276	300	3.6	535	28
PD-5C	11-26-79	Natural Sand	0.8	7.1	464	278	---	136	0.1	140	40
PD-15A	12-7-79	Natural Sand	16	7.1	512	69	167	114	0.2	160	78
PD-20	11-26-79	Deep Backfill Sand	22	7.2	553	342	164	227	6.3	440	115

(1) calculated





EXPLANATION

CW-5 —— SETTLEMENT MARKER
634.341 —— INITIAL ELEVATION
9-16-78 —— DATE OF INITIAL READING

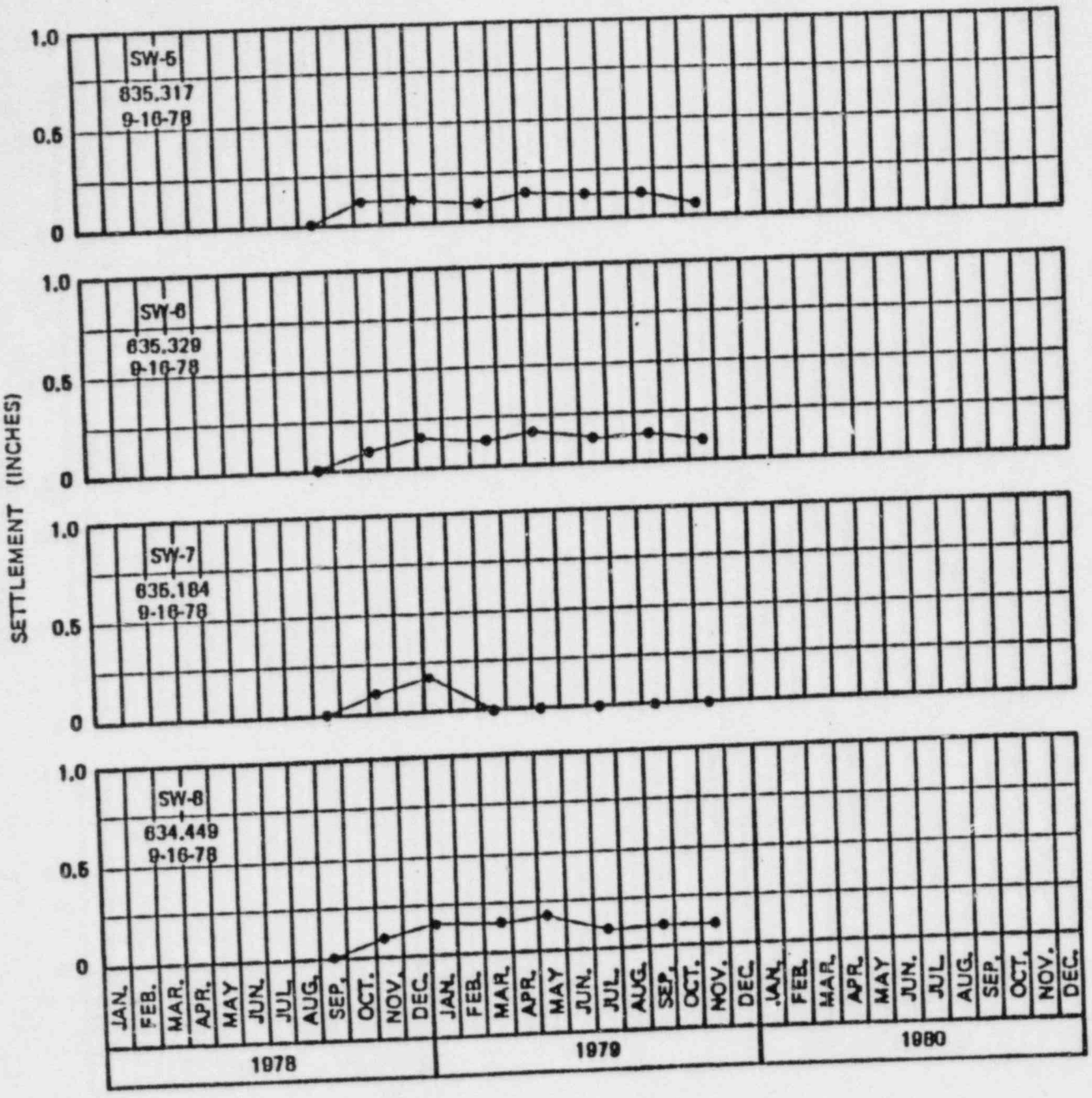
2-25-80

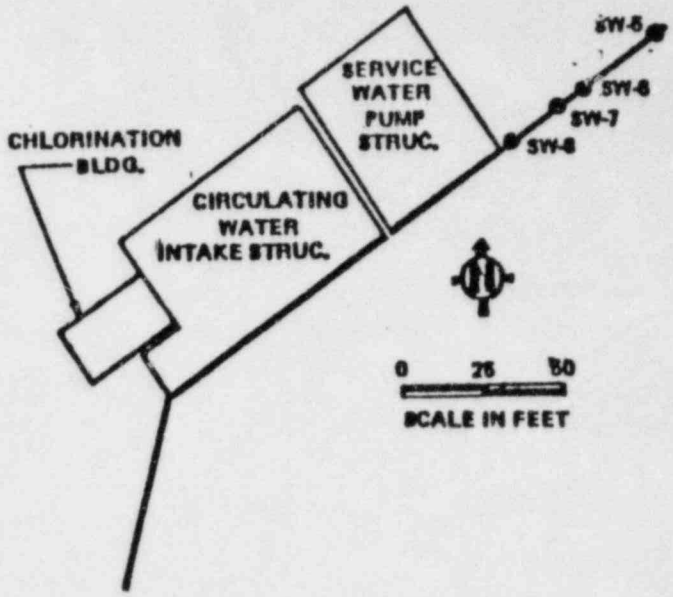
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

RETAINING WALL (WEST)
RATE OF SETTLEMENT

JOB NO. | DRAWING NO.





EXPLANATION

SW-5 —— SETTLEMENT MARKER
835.317 —— INITIAL ELEVATION
9-16-78 —— DATE OF INITIAL READING

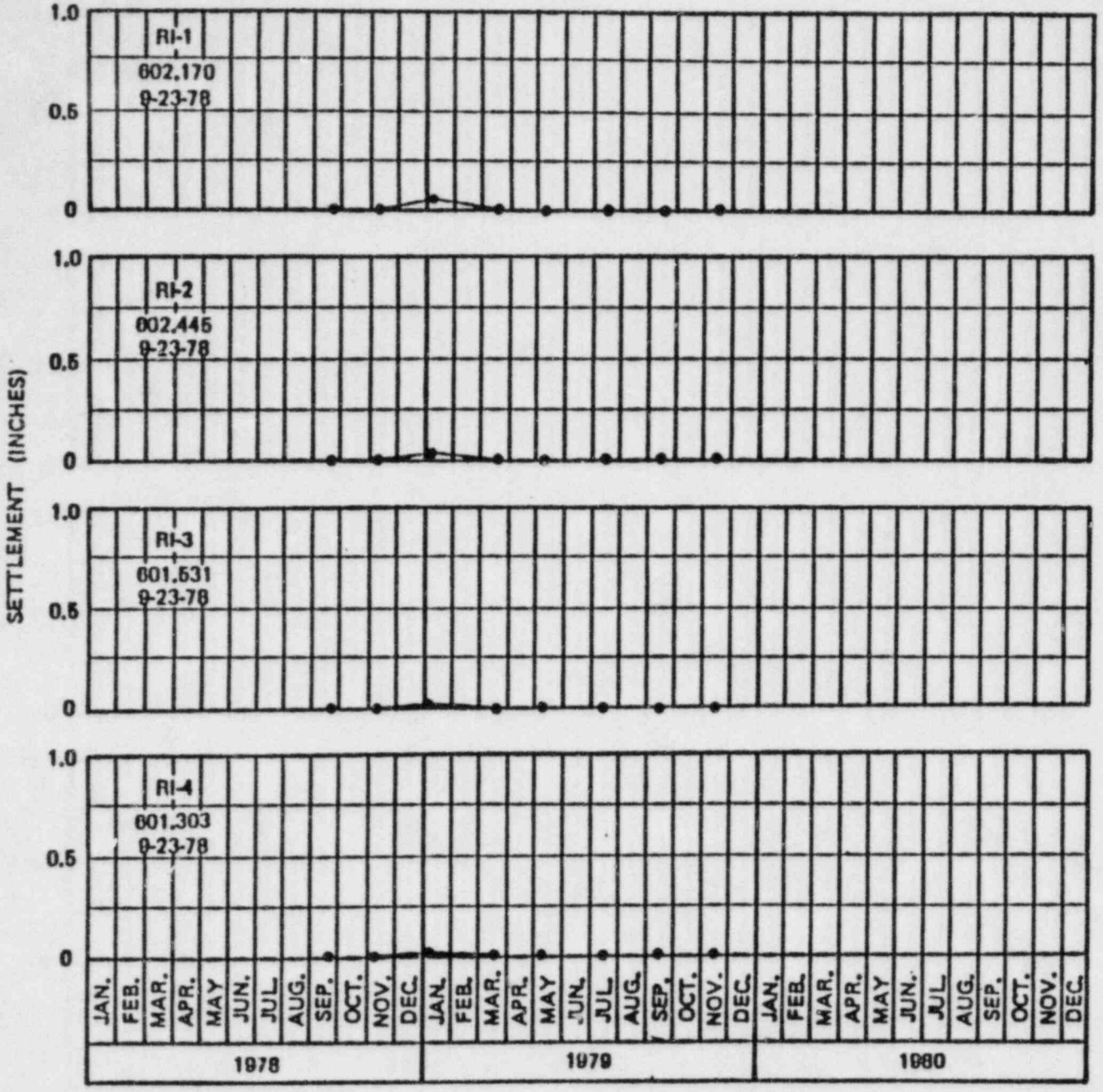
2-25-80

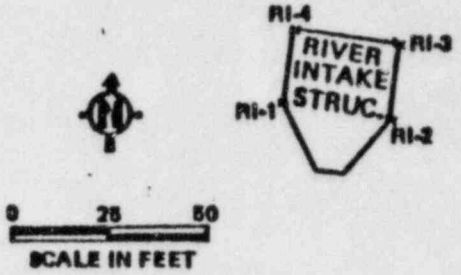
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

RETAINING WALL (EAST)
RATE OF SETTLEMENT

JOB NO. 7220
DRAWING NO. FIGURE 26





EXPLANATION

RI-1 —— SETTLEMENT MARKER
602.170 —— INITIAL ELEVATION
9-23-78 —— DATE OF INITIAL READING

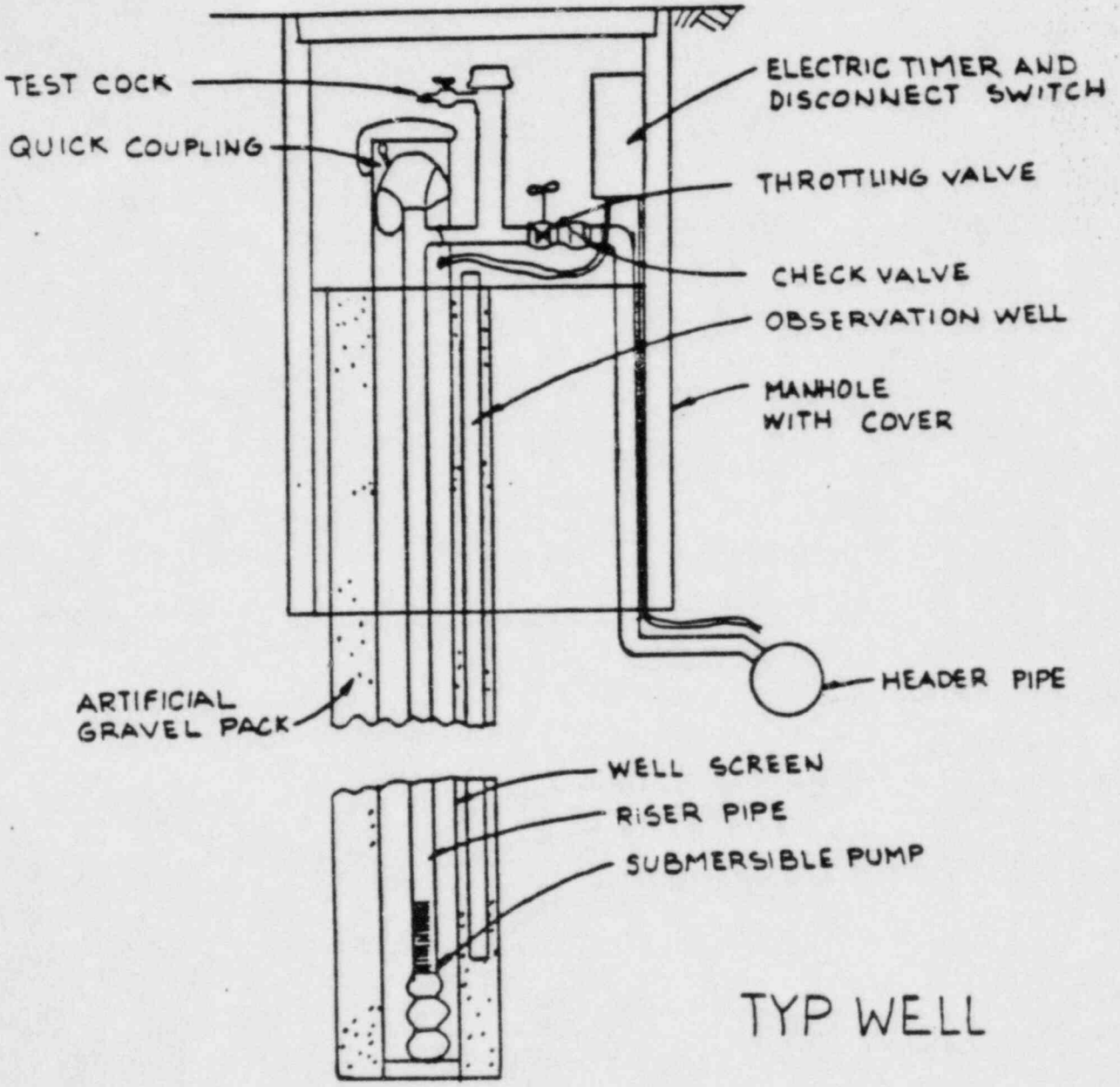
2-25-80

BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

RIVER INTAKE STRUCTURE
RATE OF SETTLEMENT

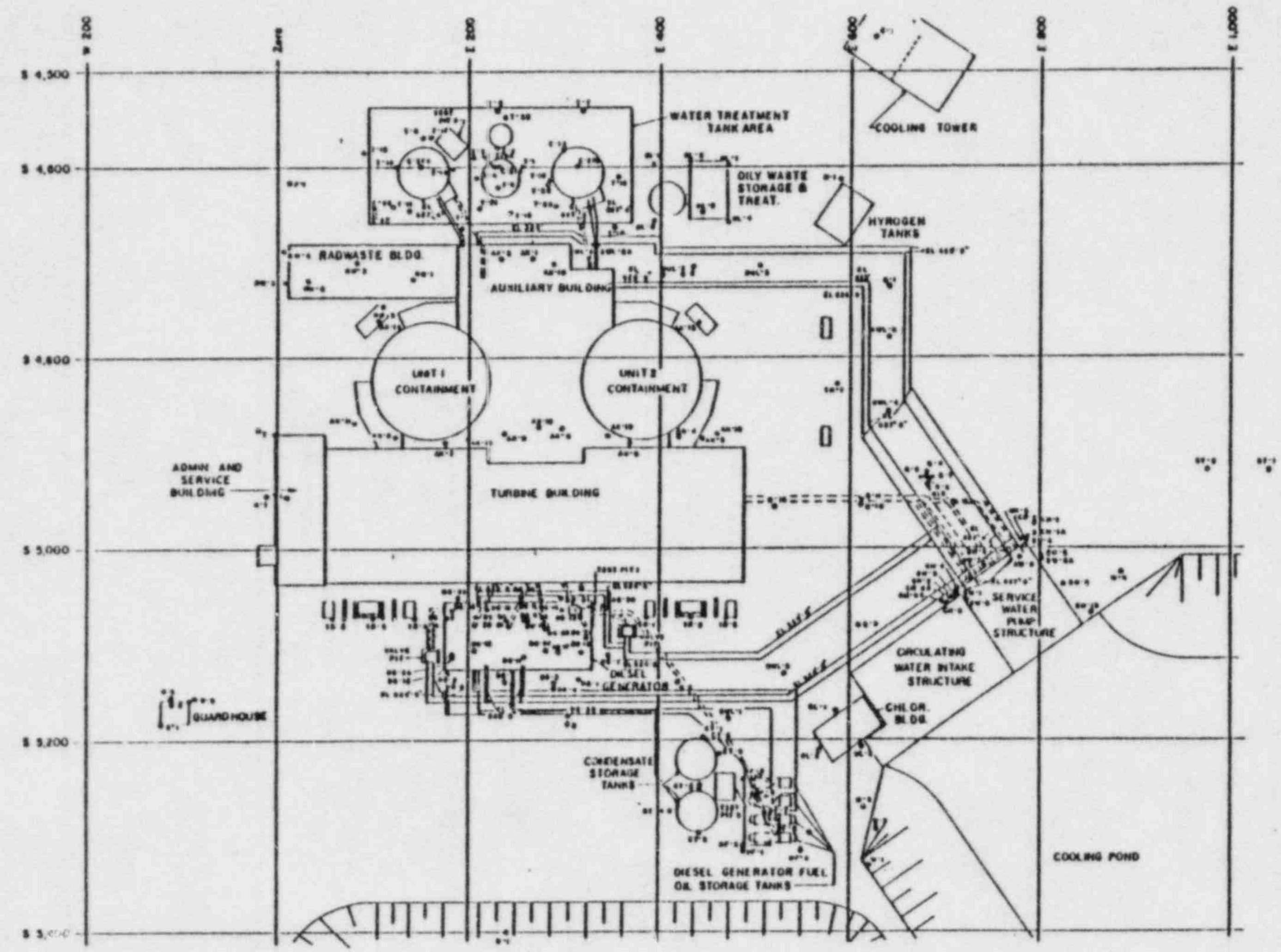
JOB NO.	DRAWING NO.	R
7220	FIGURE 27	



Preliminary progress drawing-subject to revision.

Figure No. 28
1-16-80

- SITE PLAN
- SITE SUBSURFACE SOIL CONDITIONS
- FILL
- LIQUEFACTION
- PERMANENT DEWATERING
- CORRECTIVE MEASURES FOR SETTLEMENT OF STRUCTURES ON FILL
- DIESEL GENERATOR BUILDING
- TANKS
- AUXILIARY BUILDING
- SERVICE WATER STRUCTURE



EXPLANATION

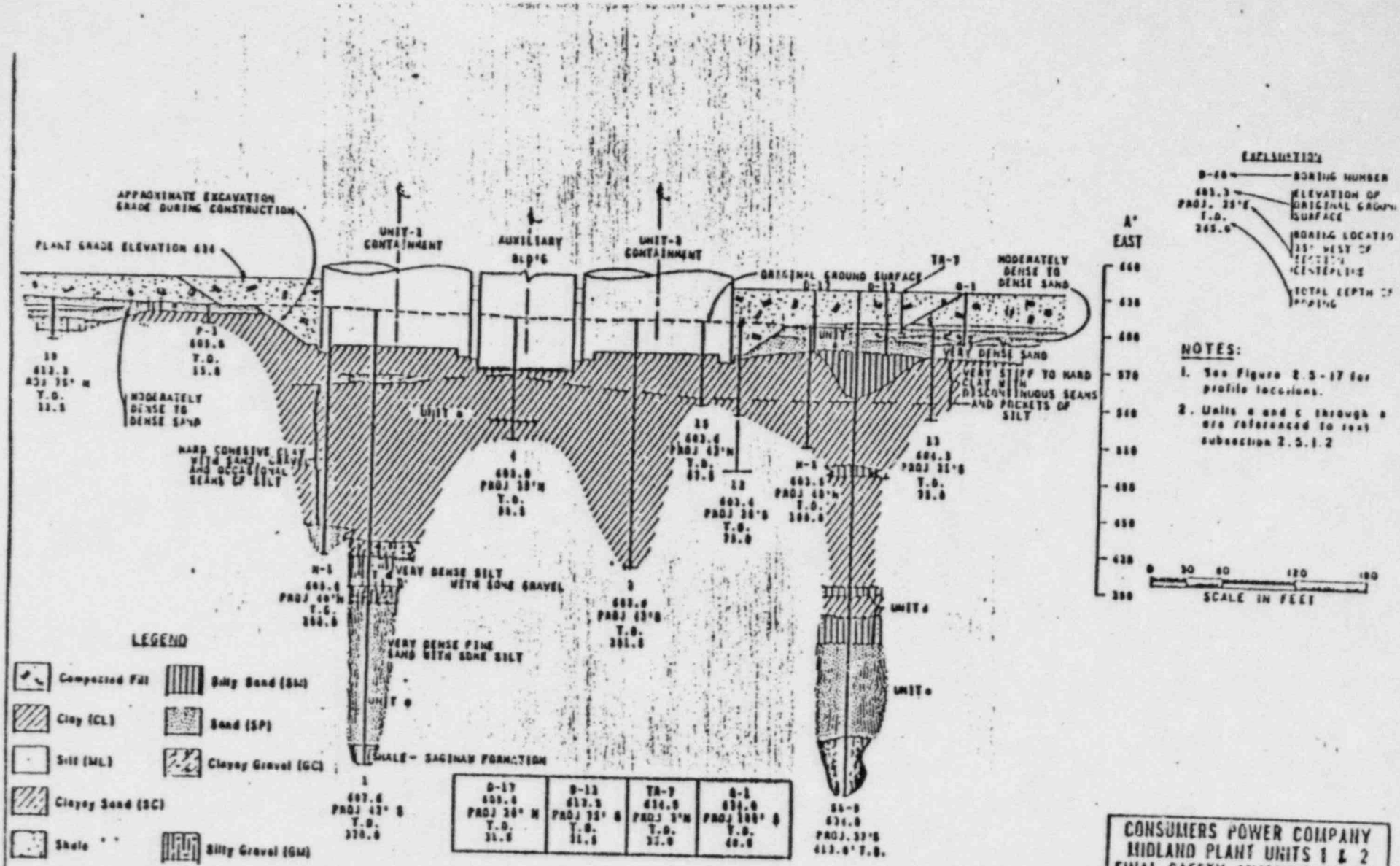
- BECHTEL BORINGS 1977 & 1978
- BECHTEL BORINGS, JULY THROUGH OCTOBER, 1978 & 1979

NOTE:

Information of piping obtained from project drawings M 160 rev 3, 10-19-76, M 167 rev 8, 7-25-78, M 168 rev 2, 9-28-78, M 169 rev 3, 6-25-78, & M 30 SH1 rev 4, 1-17-79, & M-30 SH2 rev 8, 7-31-79

BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
UNDERGROUND UTILITIES	
JOB NO. 7220	DRAWING NO. FIGURE	REV A

2



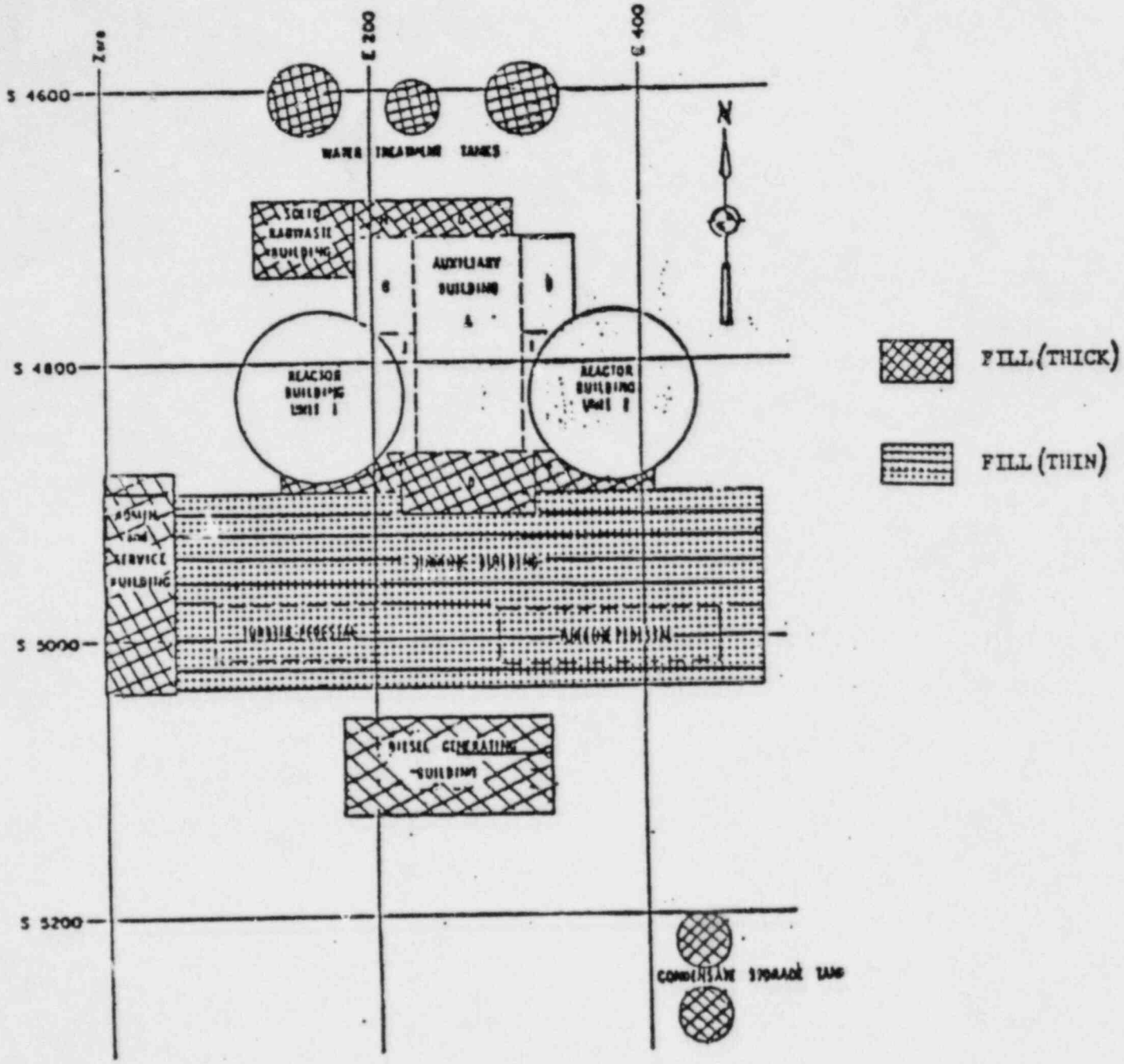
CONSUMERS POWER COMPANY
MIDLAND PLANT UNITS 1 & 2
FINAL SAFETY ANALYSIS REPORT

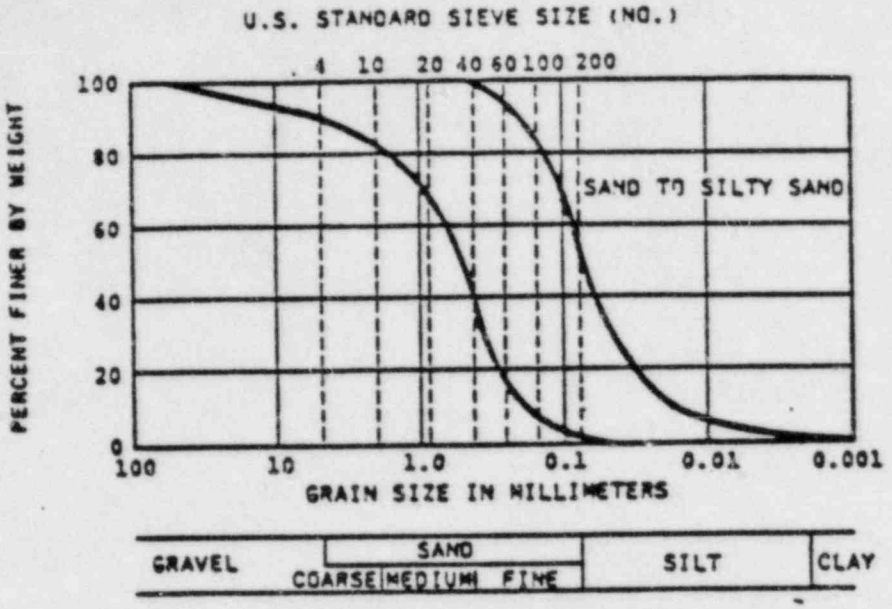
Generalized Subsurface Profile Section A
(3E-G-107, Rev 2)

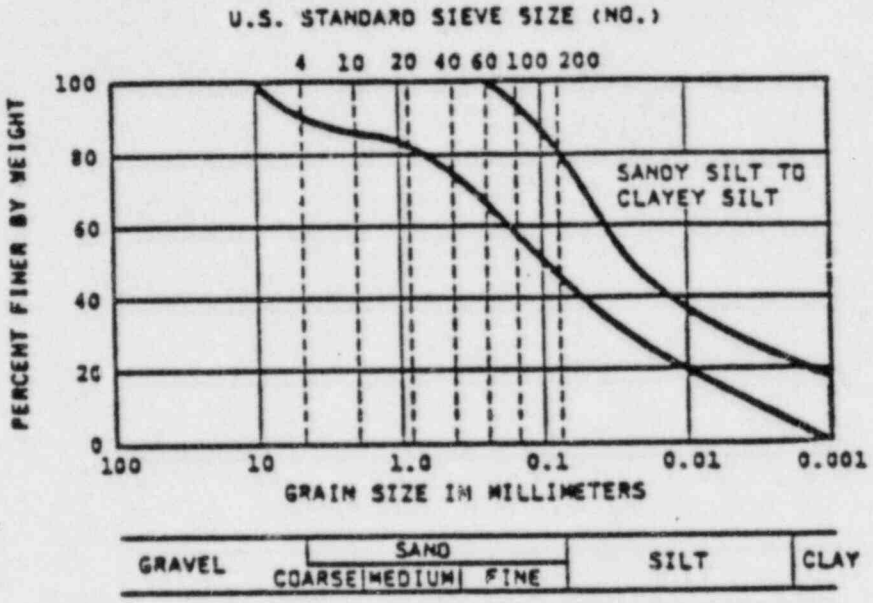
FSAR Figure 2.5-20

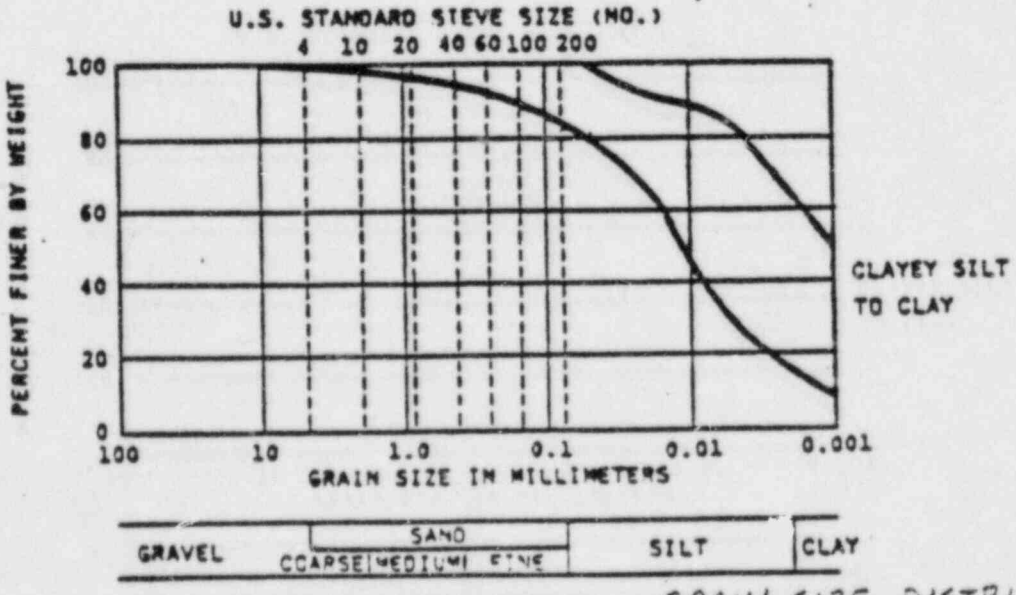
3/79

Revision 19


E 200
E 400
S 4600
S 4800
S 5000
S 5200
N
AUXILIARY BUILDING
REACTOR BUILDING UNIT I
REACTOR BUILDING UNIT II
SERVICE BUILDING
DIESEL GENERATING BUILDING
FILL (THICK)
FILL (THIN)







GRAIN SIZE DISTRIBUTION OF ON SITE MATERIAL

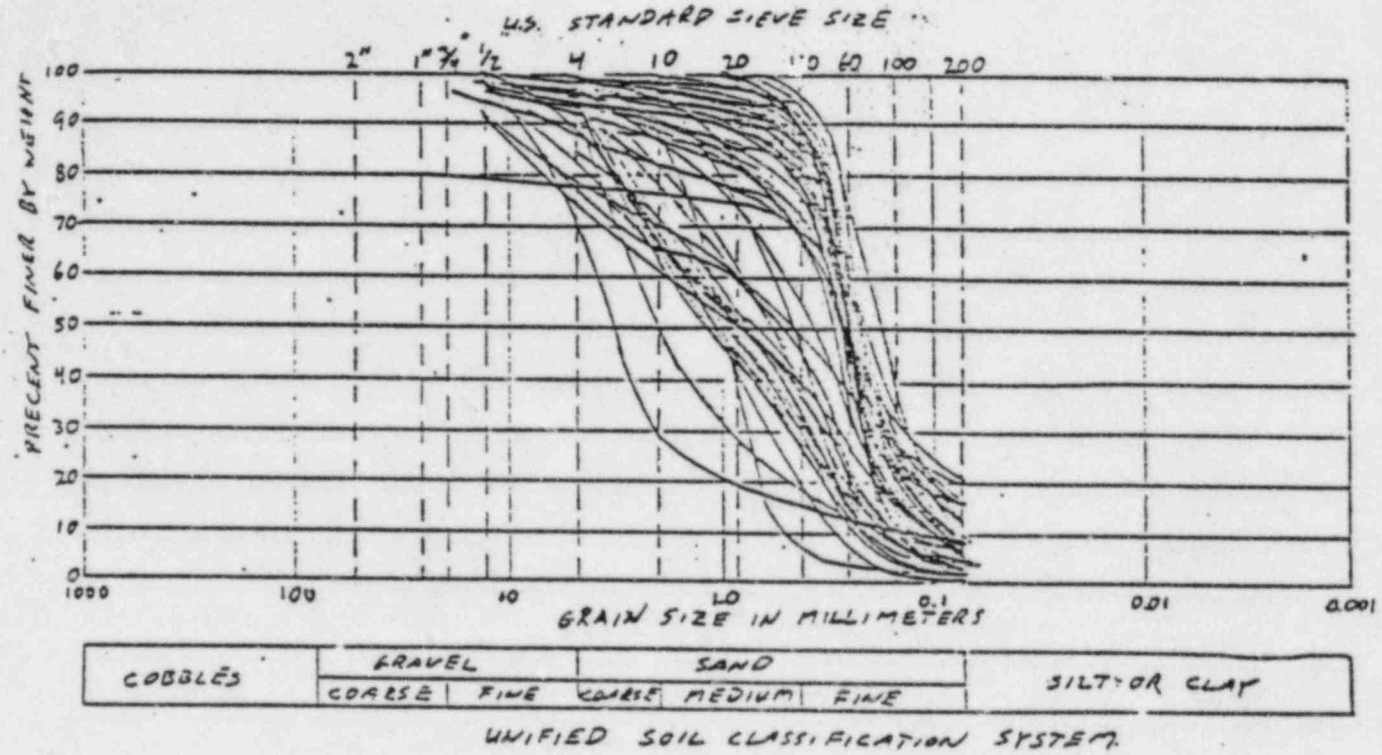


Fig. 1 Grain size distribution – Sand Fill

STRUCTURES	SUPPORTING ~~SOIL~~ FILL 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. TANKS	Medium to stiff sandy clay to clay.
E. DIESEL GENERATOR BUILDING	Soft to stiff clay and loose to dense sand.

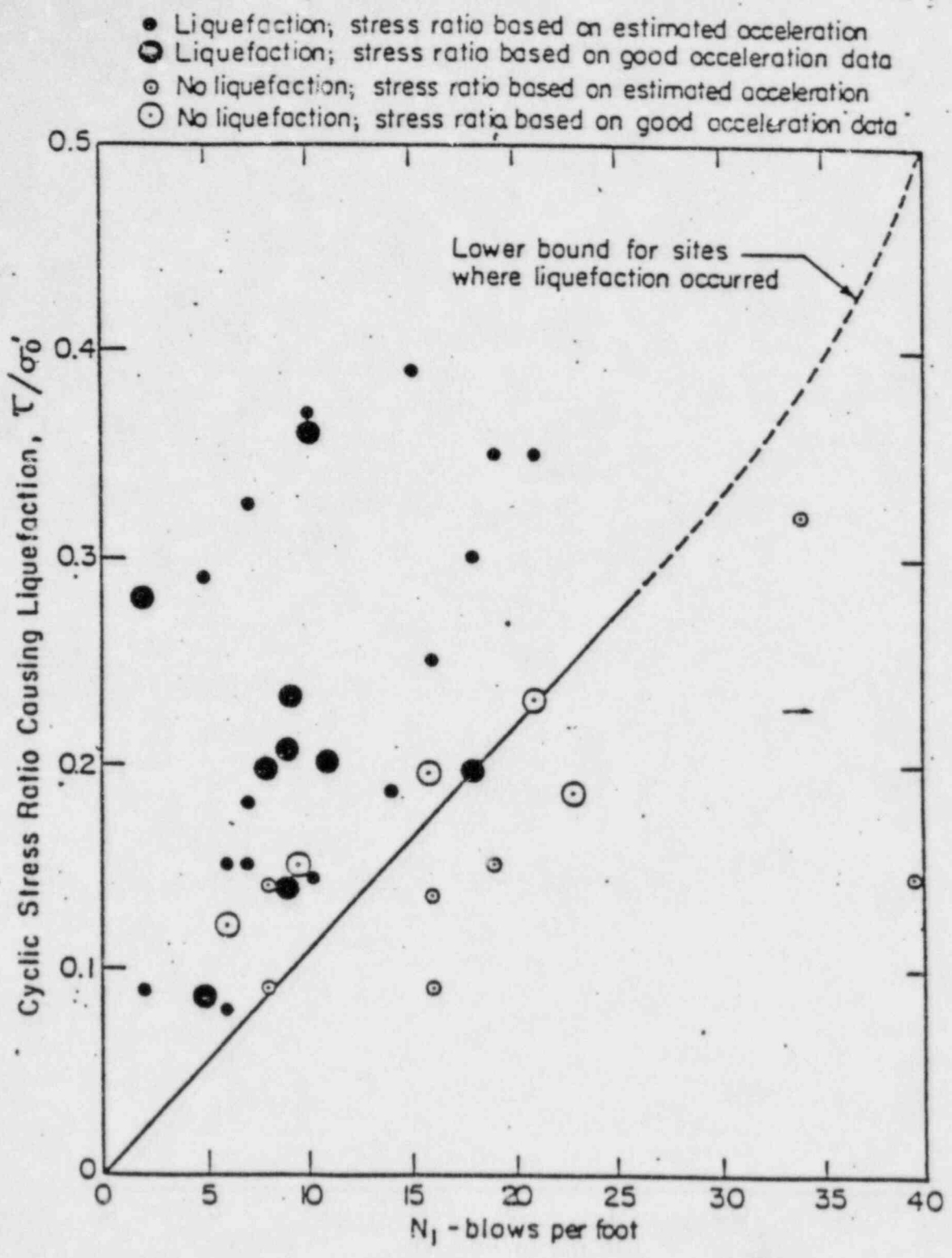
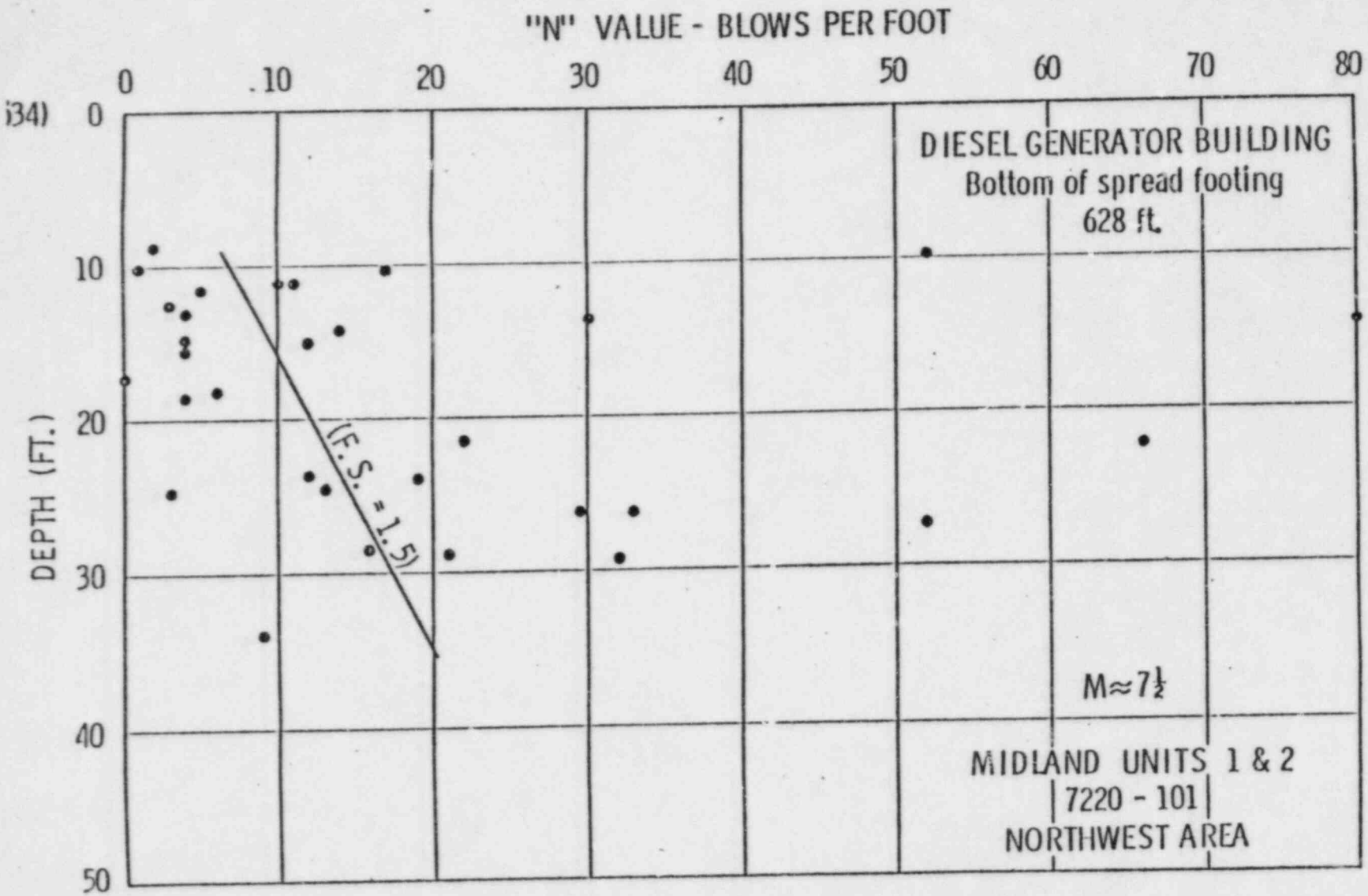
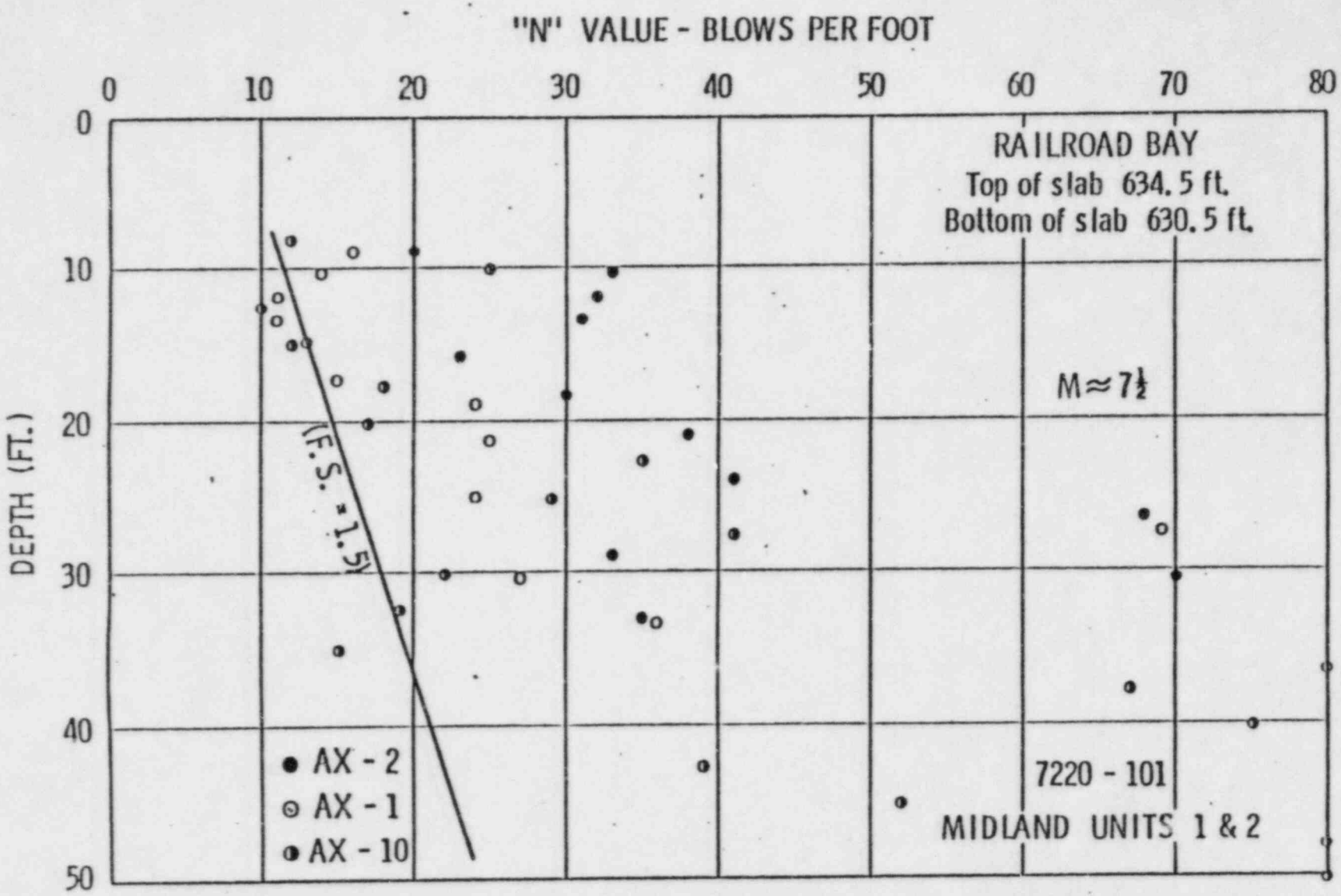


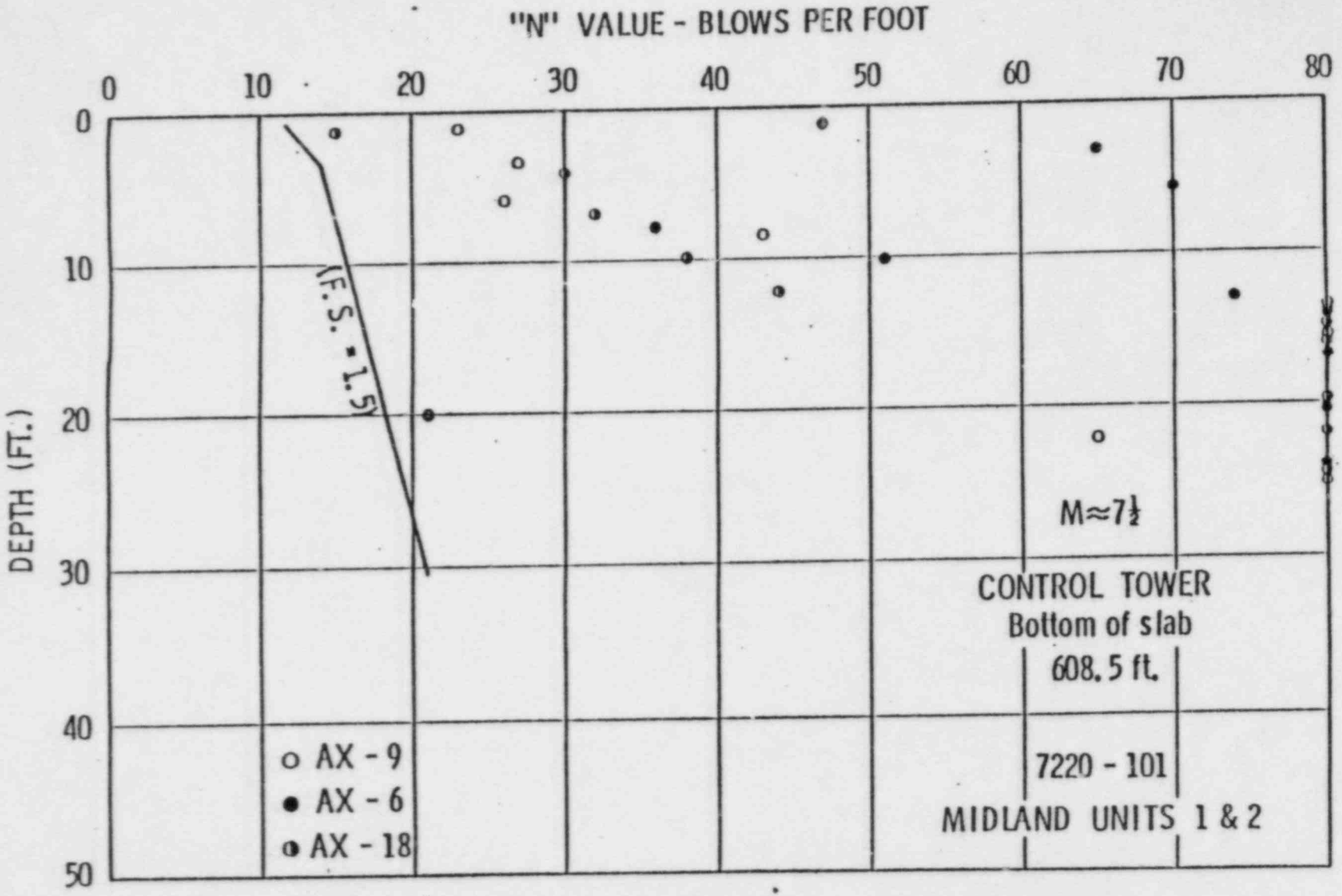
Fig. 2 CORRELATION BETWEEN STRESS RATIO CAUSING LIQUEFACTION IN THE FIELD AND PENETRATION RESISTANCE OF SAND. (after Seed et al)

9


"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
DEPTH (FT.)
0
10
20
30
40
50
(F.S. = 1.5)
DIESEL GENERATOR BUILDING
Bottom of spread footing
628 ft.
M≈7½
MIDLAND UNITS 1 & 2
7220 - 101
NORTHWEST AREA

-10


"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
DEPTH (FT.)
RAILROAD BAY
Top of slab 634.5 ft.
Bottom of slab 630.5 ft.
M≈7½
(F.S. = 1.5)
● AX - 2
⊙ AX - 1
◐ AX - 10
7220 - 101
MIDLAND UNITS 1 & 2


"N" VALUE - BLOWS PER FOOT
0
10
20
30
40
50
60
70
80
DEPTH (FT.)
0
10
20
30
40
50
(F.S. = 1.5)
M≈7½
CONTROL TOWER
Bottom of slab
608.5 ft.
○ AX - 9
● AX - 6
◑ AX - 18
7220 - 101
MIDLAND UNITS 1 & 2

GENERAL CORRECTIVE MEASURES FOR LIQUEFACTION by PERMANENT AREA DEWATERING

- ELIMINATE LIQUEFACTION POTENTIAL
- REDUCE SEISMIC SHAKEDOWN SUBSTANTIALLY

13

STRUCTURE	NO. of BORINGS	SUPPORTING FILL TYPE	PLANNED REMEDIAL MEASURES
A. AUXILIARY BUILDING			
1). CONTROL TOWER	3	SAND	NONE •
2). UNIT 1 ELECTRICAL PENETRATION AREA	2	SAND & CLAY	UNDERPINNING
3). UNIT 2 ELECTRICAL PENETRATION AREA	2	SAND & CLAY	UNDERPINNING
4). RAILROAD [illegible]	3	SAND	NONE
B. FEEDWATER ISOLATION VALVE PITS			
1). UNIT 1	2	SAND & CLAY	UNDERPINNING
2). UNIT 2	3	SAND & CLAY	UNDERPINNING
C. SERVICE WATER PUMP STRUCTURE - PORTION ON FILL	9	CLAY & SAND	UNDERPINNING

• GROUTING IS PLANNED BELOW MUD MAT AT AX - 9.

STRUCTURE	NO. of BORINGS	SUPPORTING FILL SOIL TYPE	PLANNED REMEDIAL MEASURES
D. TANKS			
1). DIESEL FUEL OIL STORAGE TANKS	7	CLAY	NONE
2). BORATED WATER STORAGE TANKS	6	CLAY	NONE
E. DIESEL GENERATOR BUILDING	32	SAND & CLAY	SURCHARGE
F. UTILITIES			
1). PIPING	50	SAND & CLAY	NONE
2). DUCT BANKS	38	SAND & CLAY	NONE
3). VALVE PITS	2	SAND & CLAY	NONE

ALTERNATIVE CORRECTIVE METHODS FOR DIESEL GENERATOR BUILDING

OPTION A - No correction plus grouting

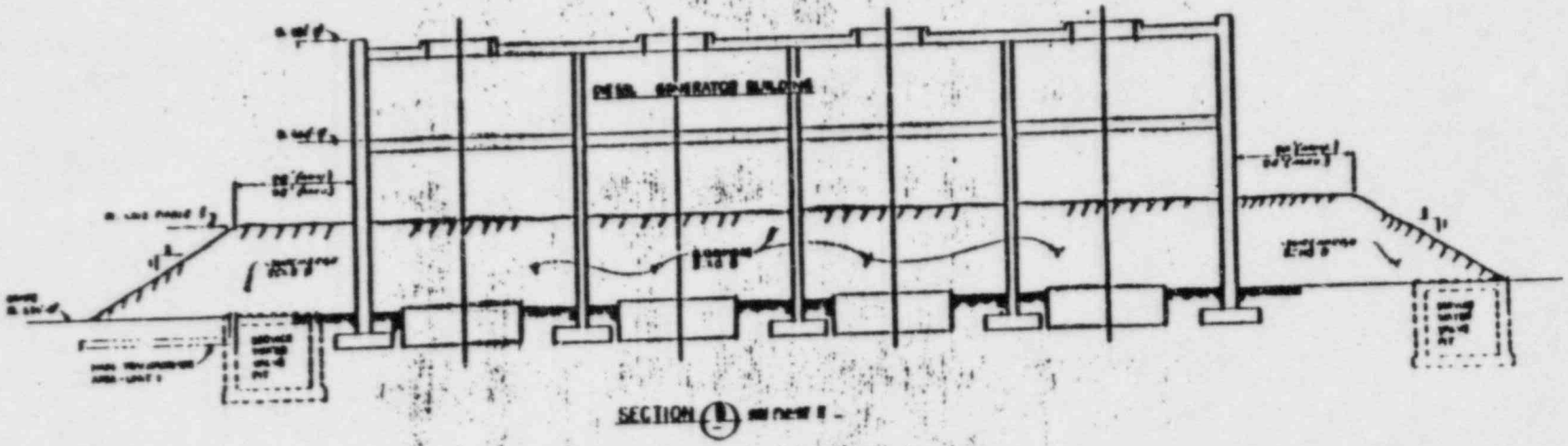
OPTION B - Modify the continuous footings to a mat foundation under the structure

OPTION C - Preload the area around the structure and within the structure

OPTION D - A combination of changing the footings to a mat and preloading

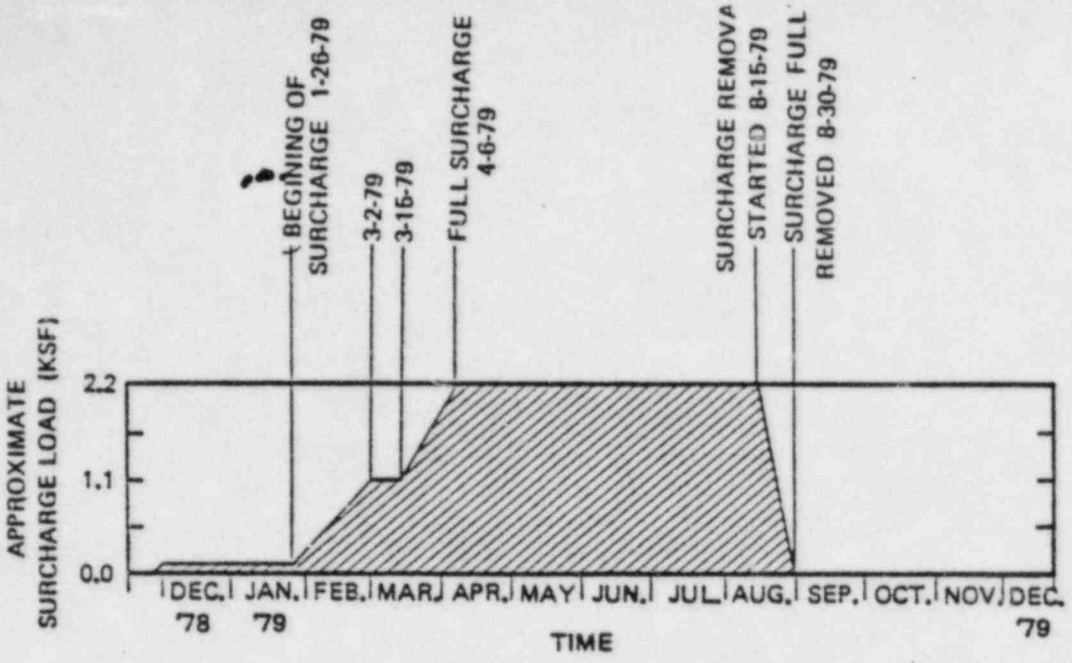
OPTION E - Underpinning the structure with piles or piers

OPTION F - Remove and replace the building

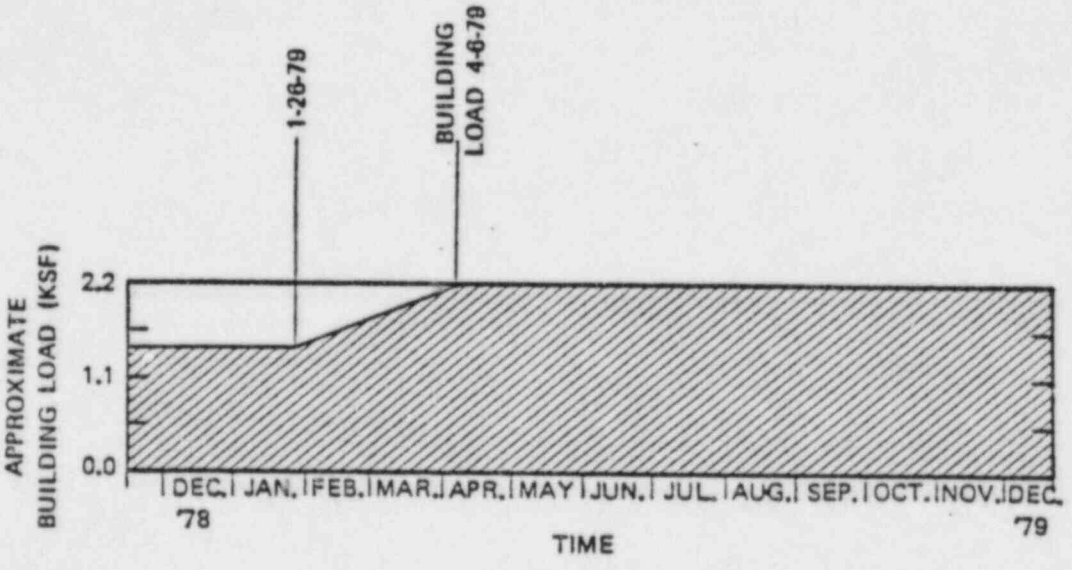


SECTION (1)

DIESEL GENERATOR BUILDING SURCHARGE

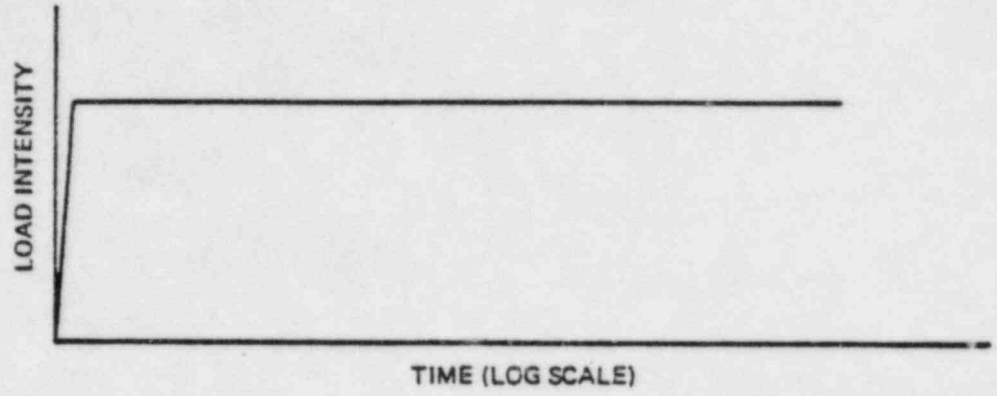


(A) IDEALIZED SURCHARGE LOAD HISTORY

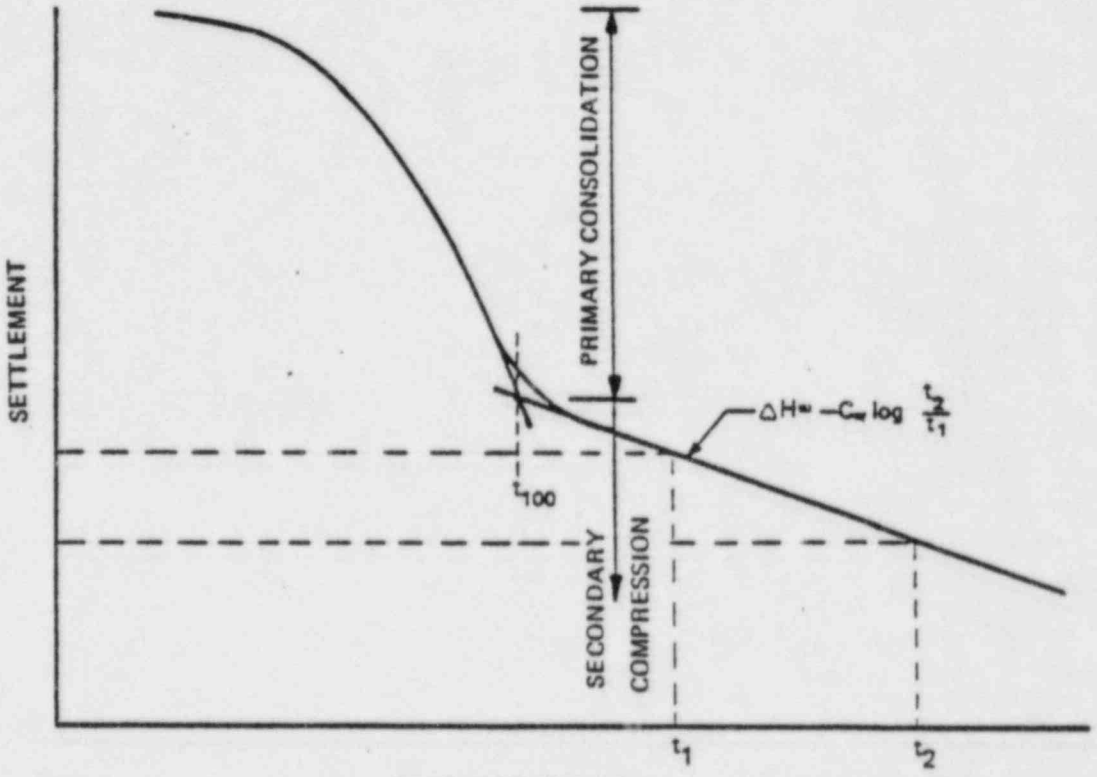


(B) IDEALIZED STATIC BUILDING LOAD HISTORY

BECHTEL ANN ARBOR			
MIDLAND POWER PLANT			
DIESEL GENERATOR BUILDING IDEALIZED SURCHARGE AND BUILDING LOAD HISTORIES			
	JOB NO.	DRAWING NO.	REV.
	7220	FIGURE 27-2	A



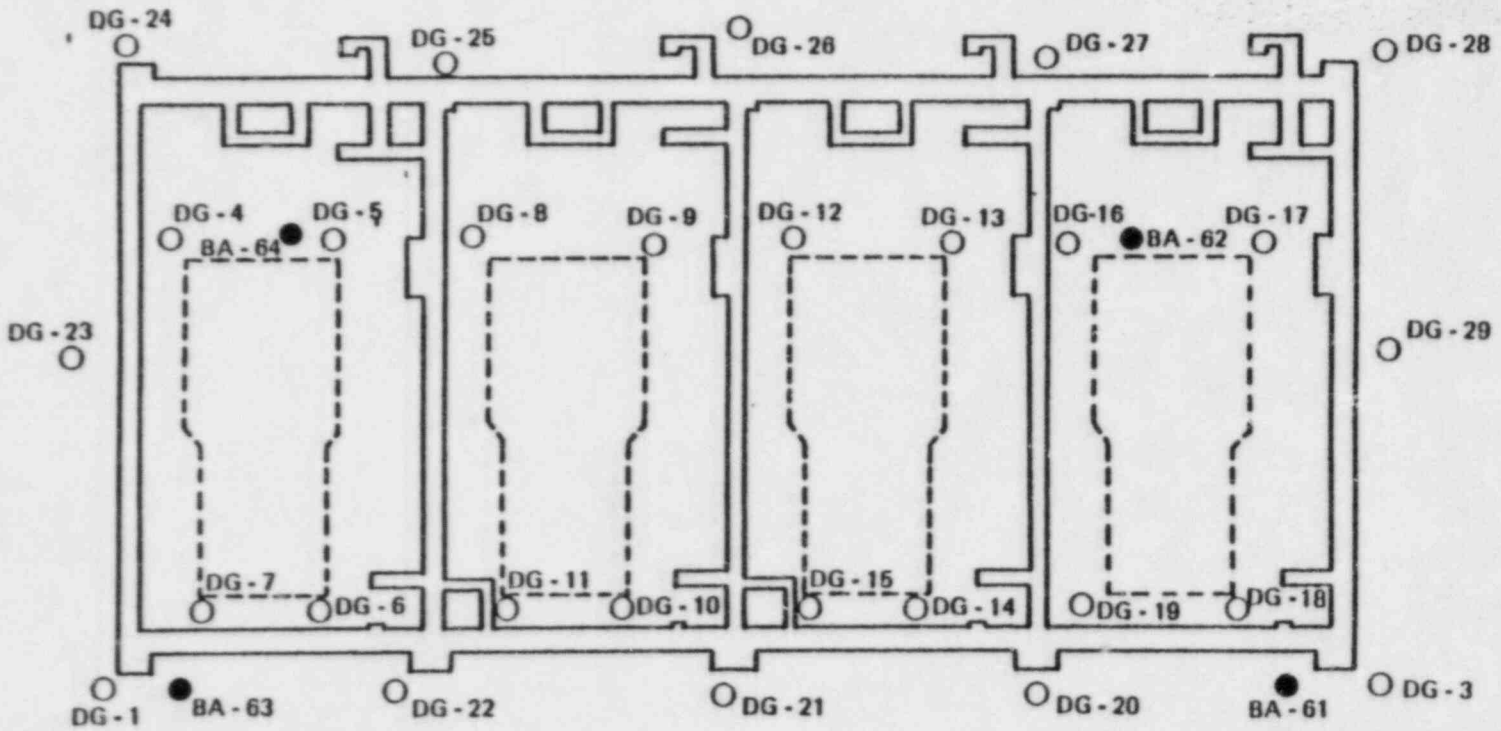
(A) LOAD HISTORY



(B) TIME - SETTLEMENT CURVE

BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
TYPICAL LABORATORY TIME-SETTLEMENT BEHAVIOR UNDER CONSTANT PRESSURE	
JOB NO. 7220	DRAWING NO. FIGURE 27-1

DIESEL GENERATOR BUILDING



19

LEGEND:

○ DG - 8 ← BUILDING/PEDESTAL SETTLEMENT MARKER

● BA - 61 ← REFERENCE (DEEP) BORROS ANCHORS (ANCHOR TIP ELEVATION 535.0')

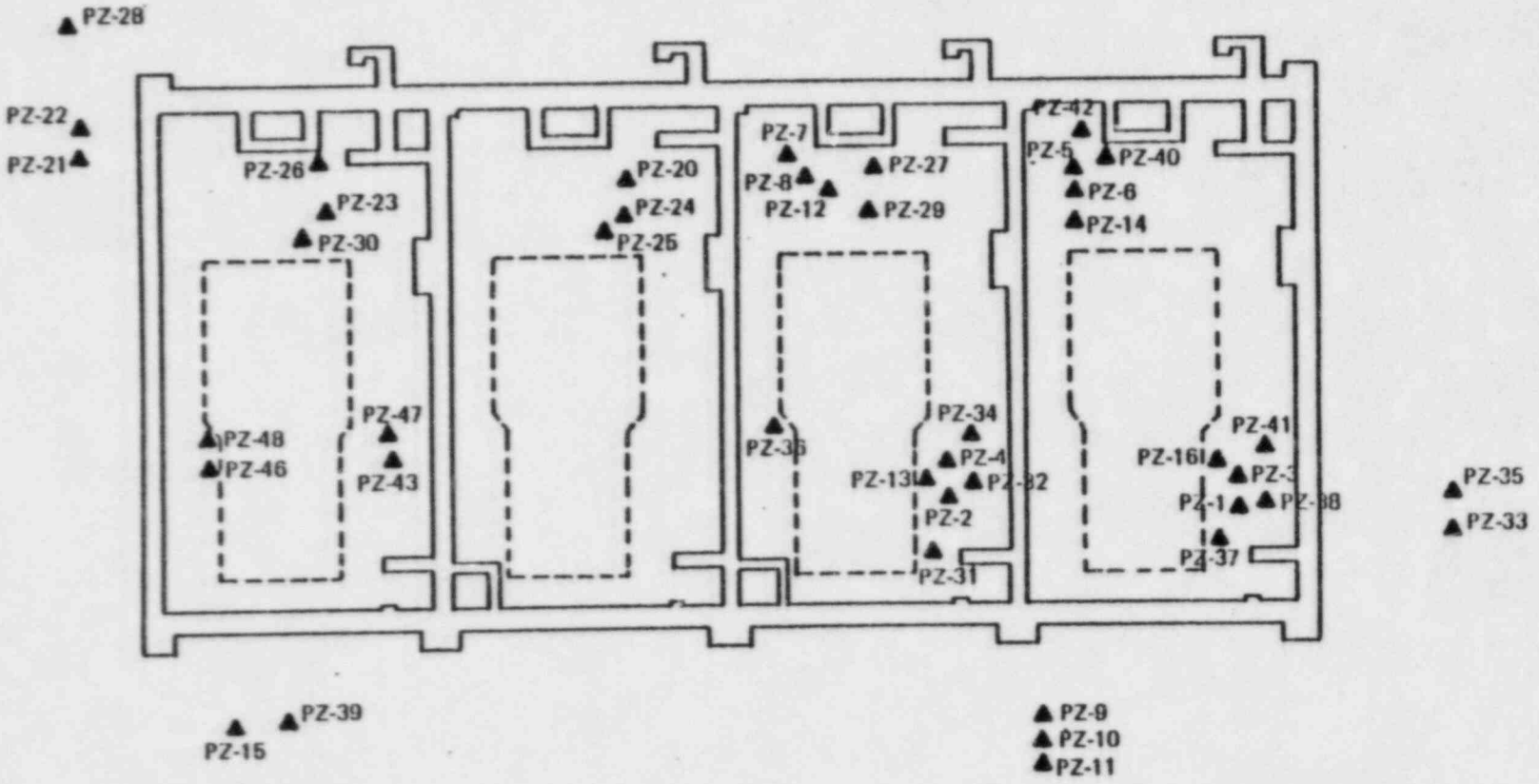
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

DIESEL GENERATOR BUILDING
LOCATIONS OF SETTLEMENT
MEASUREMENT POINTS

JOB NO.	DRAWING NO.	REV.
7220	FIGURE 27-3	A

DIESEL GENERATOR BUILDING



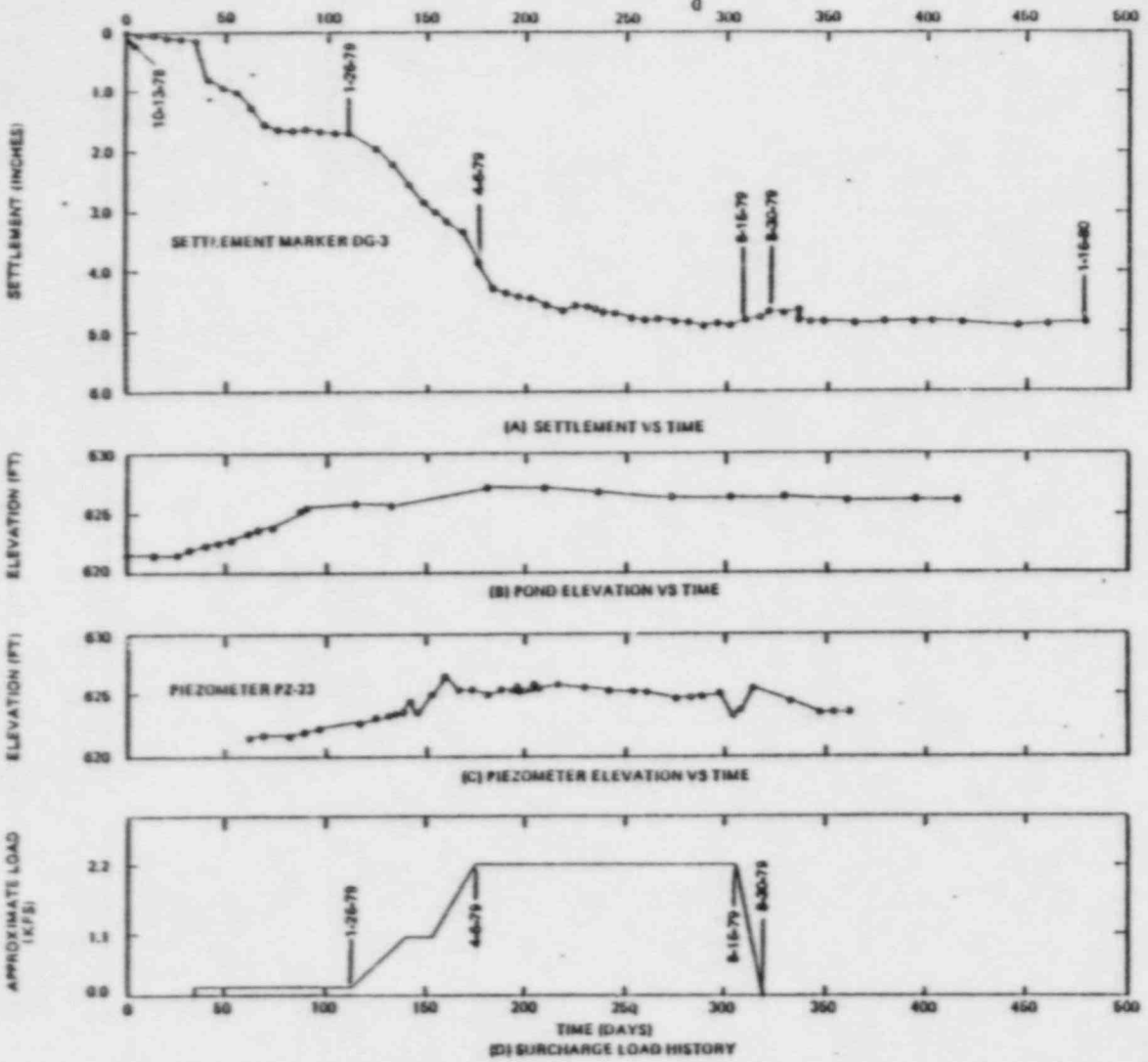
NOTE:

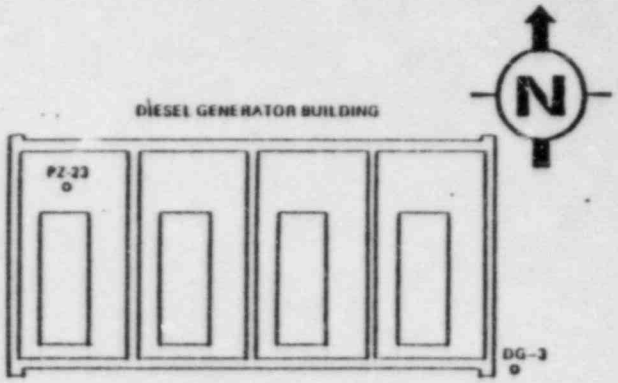
The piezometers were installed between elevations 621 ± and 589 ±

30

BECHTEL ANN ARBOR		
MIDLAND POWER PLANT		
DIESEL GENERATOR BUILDING PIEZOMETER LOCATIONS		
	JOB NO. 7220	DRAWING NO. FIGURE 27-4

Time - days





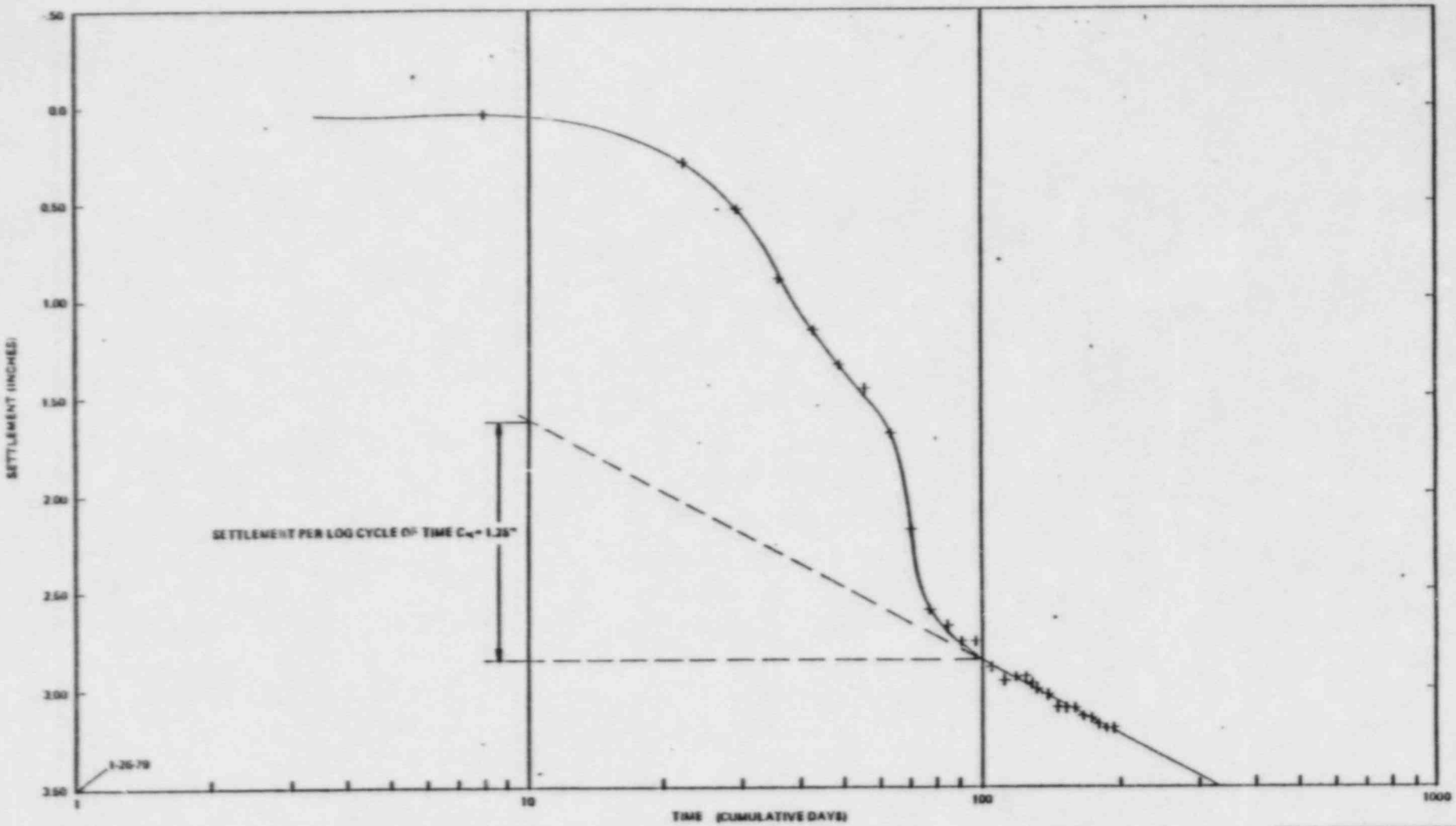
LOCATION PLAN
(NOT TO SCALE)

NOTE:

ON 10-13-78 THE MEASURED SETTLEMENT AT MARKEP DG-3 WAS 2.46 INCH

21

BECHTEL ANN ARBOR			
MIDLAND POWER PLANT			
DIESEL GENERATOR BUILDING TYPICAL SETTLEMENT, COOLING POND LEVEL, PIEZOMETER LEVEL, AND SURCHARGE LOAD HISTORY			
	JOB NO.	DRAWING NO.	REV.
	7220	FIGURE 27-6	A



2-21

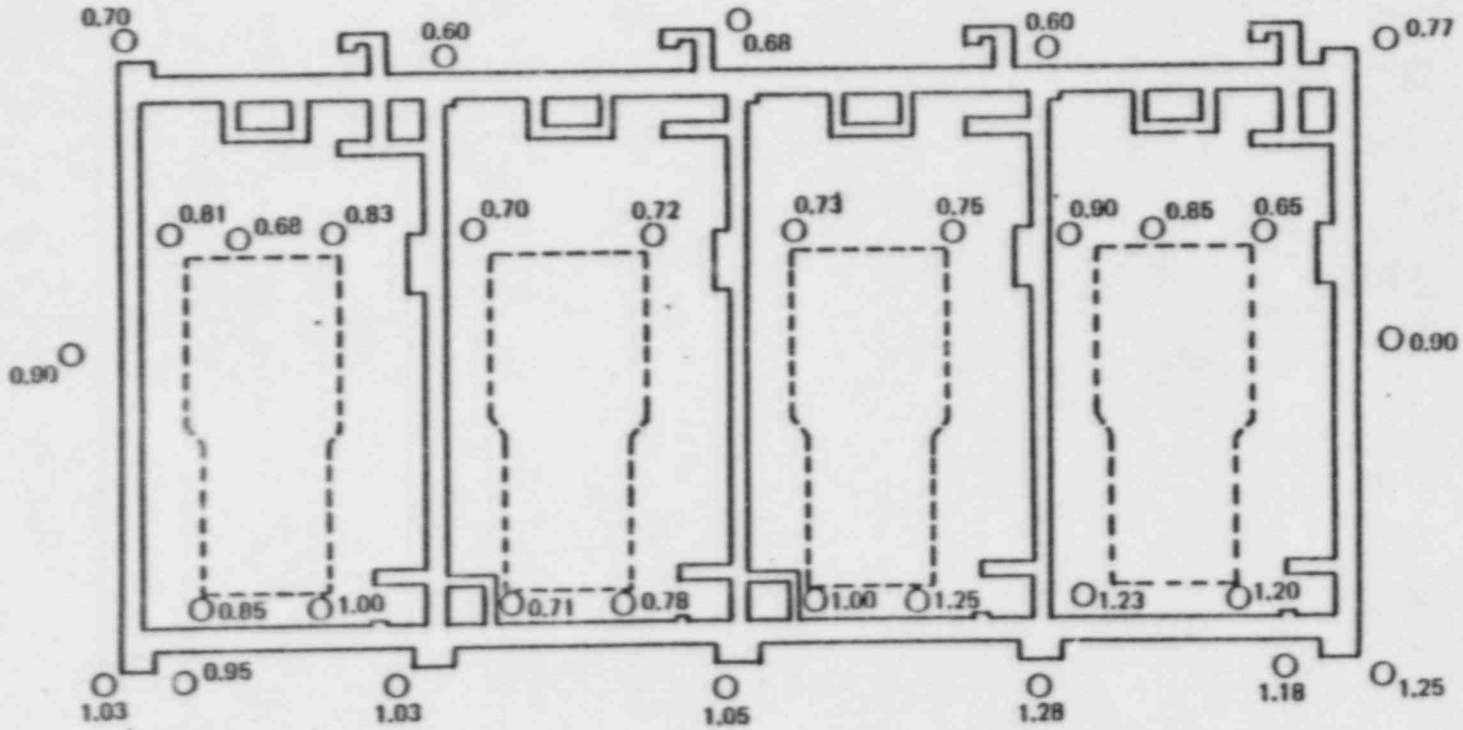
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

TYPICAL SETTLEMENT VERSUS LOGARITHUM OF TIME DURING SURCHARGE (MARKER DG-3)

JOB NO.	DRAWING NO.	REV
7220	FIGURE 2.1-8	A

DIESEL GENERATOR BUILDING



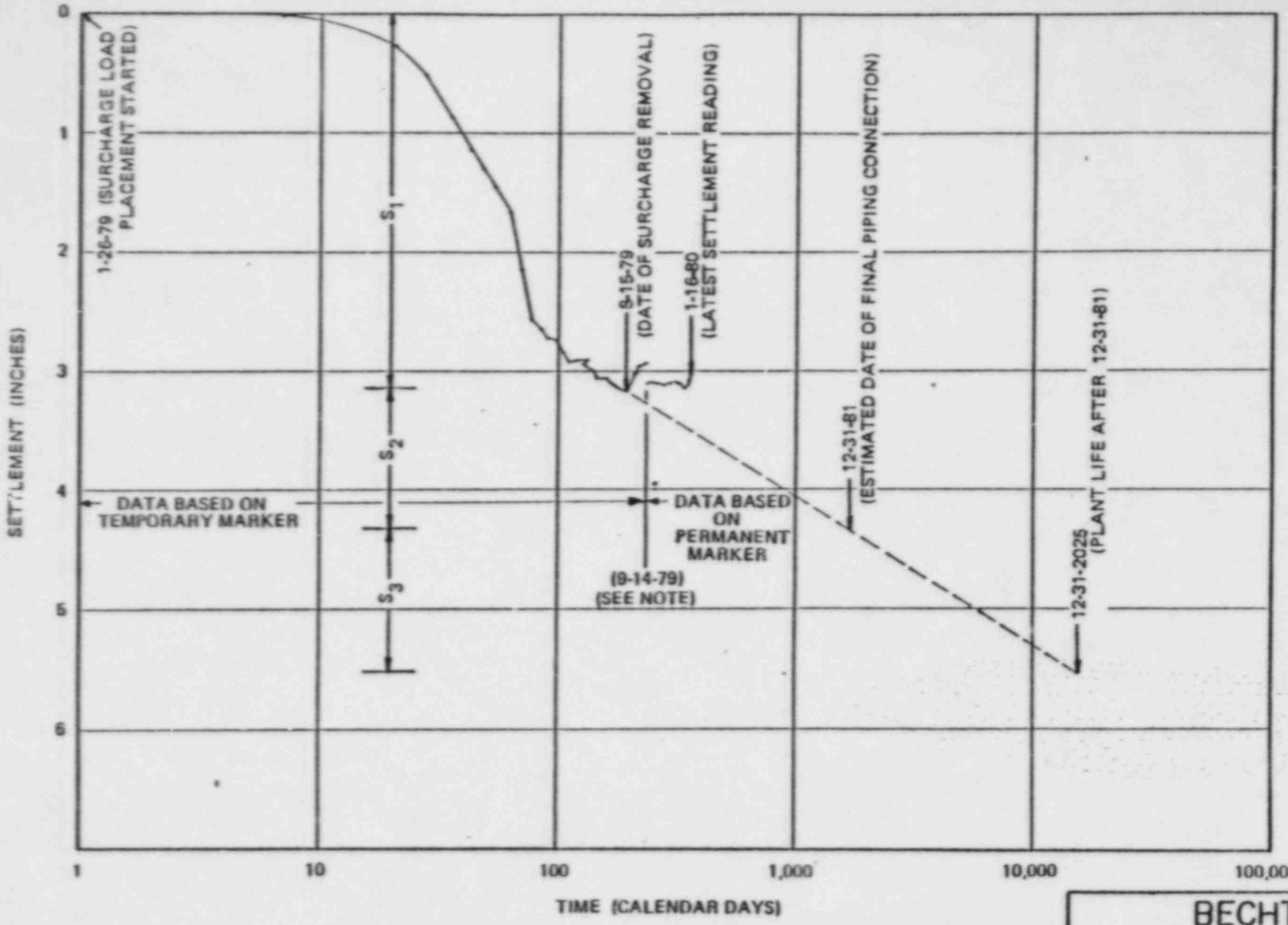
LEGEND:

O —— BUILDING/PEDESTAL SETTLEMENT MARKER

0.95 —— SETTLEMENT (INCHES PER LOG CYCLE)

2.3

BECHTEL ANN ARBOR		
MIDLAND POWER PLANT		
SECONDARY COMPRESSION SLOPES PER LOG CYCLE (C_α)		
	JOB NO. 7220	DRAWING NO. FIGURE 27-8



LEGEND

—— MEASURED SETTLEMENT

--- PREDICTED SECONDARY COMPRESSION SETTLEMENT ASSUMING SURCHARGE REMAINS

NOTE:
The permanent marker could not be monitored from 3-22-79 to 9-14-79 due to surcharge. Temporary markers at elevation 684'-0" ± were used during this period to estimate the settlement of the permanent markers. On 9-14-79 the settlement was again based directly upon the permanent markers

(Settlement Marker DG 3)

A-12

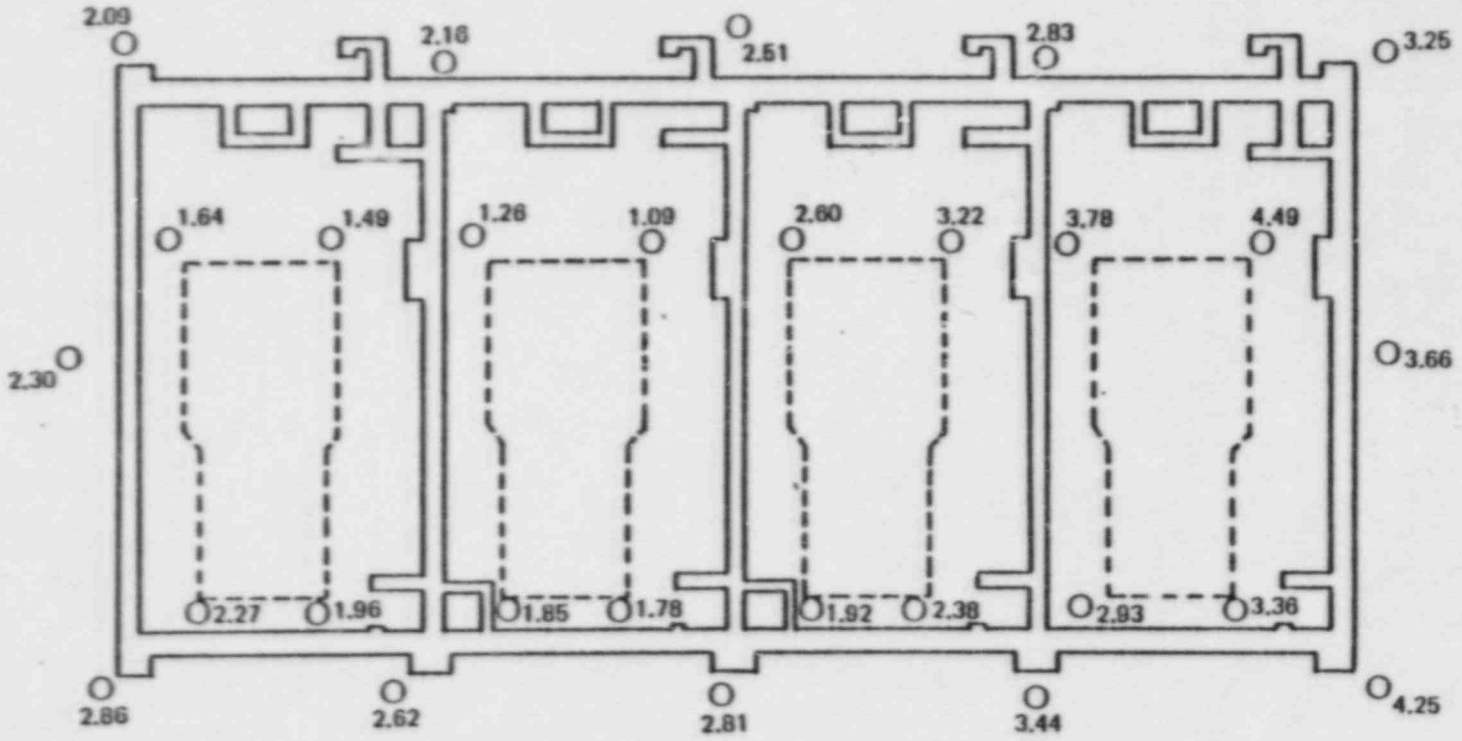
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

MEASURED AND PREDICTED SETTLEMENT VS LOG OF TIME

JOB NO.	DRAWING NO.	REV
7220	FIGURE 27-9	A

DIESEL GENERATOR BUILDING



LEGEND:

O——— BUILDING / PEDESTAL SETTLEMENT MARKER

2.86——— SETTLEMENT IN INCHES

NOTES:

1. On 3-28-78 the completed portion of the building consisted of the concrete pedestals and building walls to elevation 654'.
2. The settlements were measured while the building was being constructed. On 1-19-79 the completed portion of the building consisted of the concrete pedestals and building walls to mezzanine floor elevation 664'.
3. On 3-22-79 the building was completed.

25

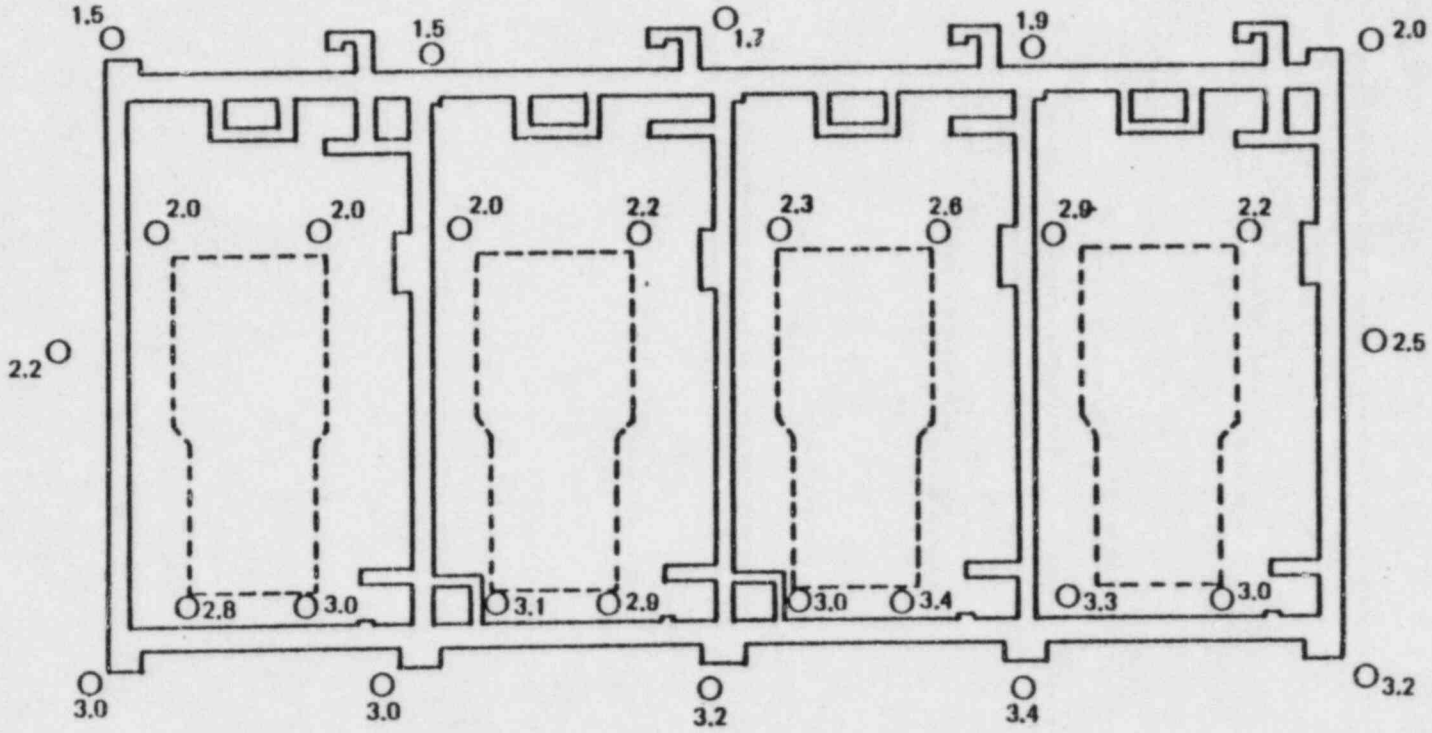
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

MEASURED SETTLEMENT S_o IN INCHES
BEFORE SURCHARGE
BETWEEN 3-28-78 TO 1-19-79

JOB NO.	DRAWING NO.
7220	FIGURE 27-10

DIESEL GENERATOR BUILDING



LEGEND:

O ——— BUILDING / PEDESTAL SETTLEMENT MARKER

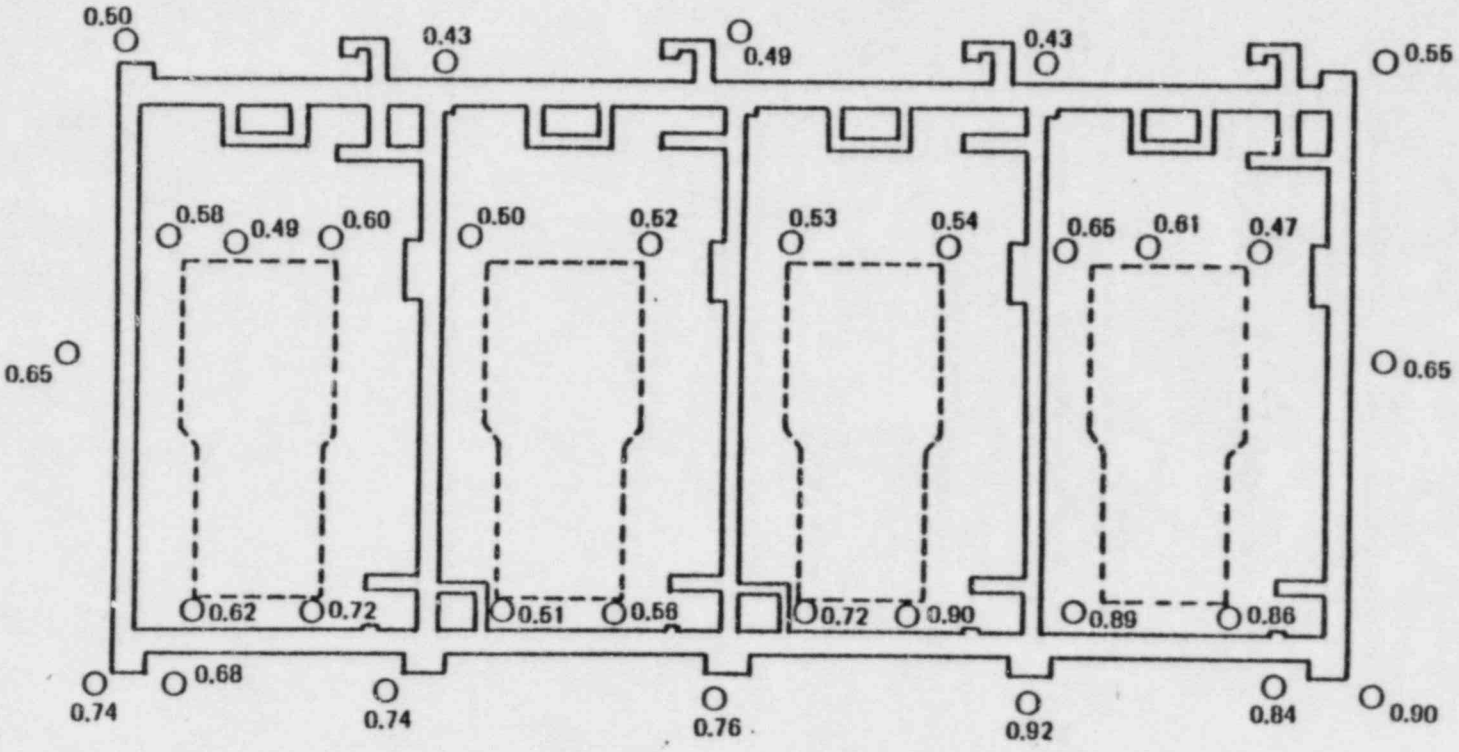
3.0 ——— SETTLEMENT IN INCHES

NOTES:

1. See Figure 27-9 for further definition of S_1.
2. See Figure 27-2 for approximate average loading histories during surcharge program.

BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
MEASURED SETTLEMENT S_1 INCHES DURING SURCHARGE FROM 1-26-79 TO 8-15-79	
JOB NO. 7220	DRAWING NO. FIGURE 27-11

DIESEL GENERATOR BUILDING



27

LEGEND:

O——— BUILDING / PEDESTAL SETTLEMENT MARKER

0.74 ——— SETTLEMENT IN INCHES

NOTES:

1. See Figure 27-9 for further definition of S_2.
2. See Figure 27-2 for approximate average loading histories during surcharge program.

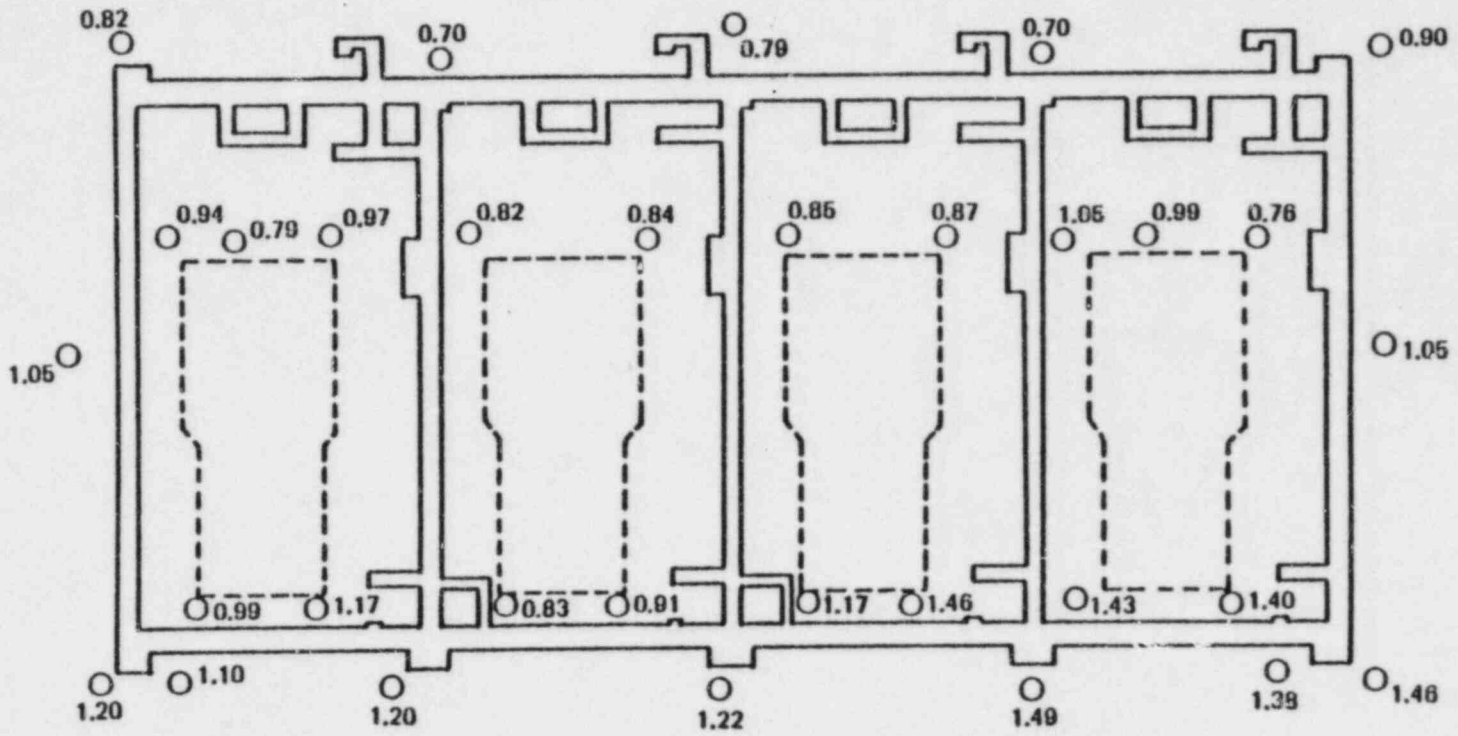
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

ESTIMATED SECONDARY COMPRESSION SETTLEMENT S_2 FROM 8-15-79 to 12-31-81 ASSUMING SURCHARGE REMAINS

JOB NO.	DRAWING NO.
7220	FIGURE 27-12

DIESEL GENERATOR BUILDING



LEGEND:

O——— BUILDING / PEDESTAL SETTLEMENT MARKER

1.20 ——— SETTLEMENT IN INCHES

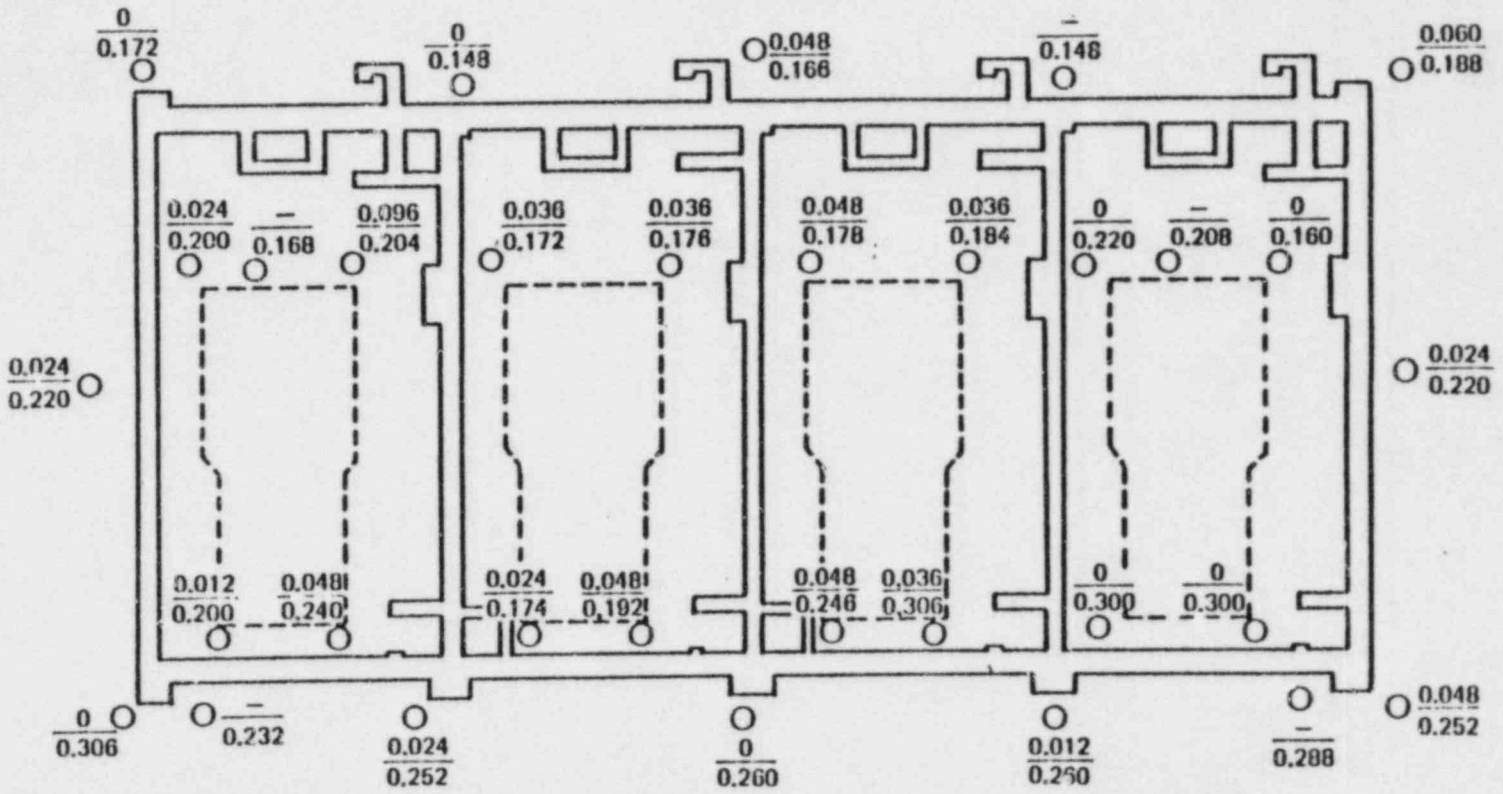
NOTES:

1. See Figure 27-9 for further definition of S_3.
2. See Figure 27-2 for approximate average loading histories during surcharge program.

BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
ESTIMATED SECONDARY COMPRESSION SETTLEMENT S_3 FROM 12-31-1981 to 12-31-2025 ASSUMING SURCHARGE REMAINS	
JOB NO. 7220	DRAWING NO. FIGURE 27-13

28

DIESEL GENERATOR BUILDING



LEGEND:

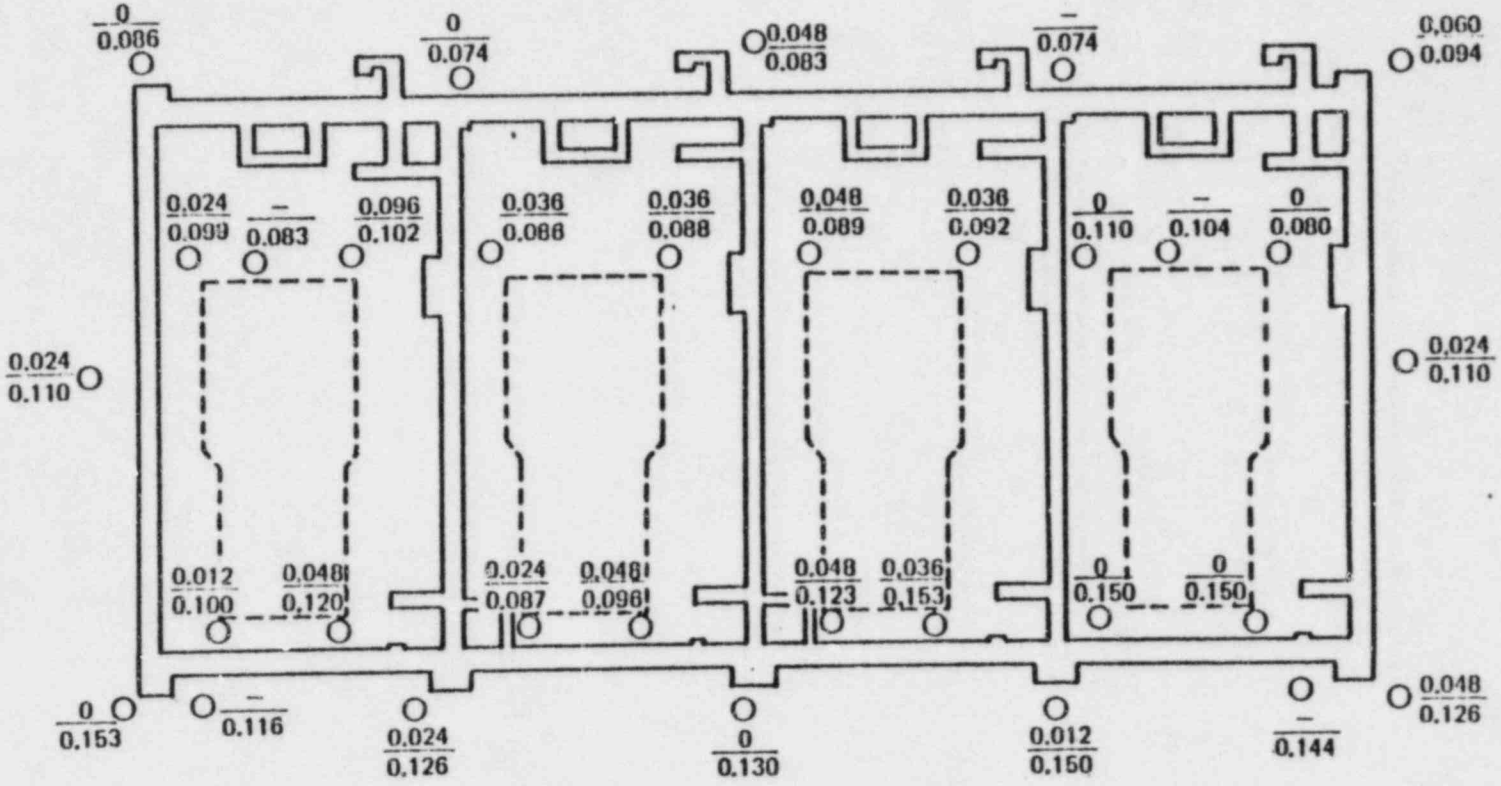
- ○ ——— BUILDING / PEDESTAL SETTLEMENT MARKER
- 0.024 ——— MEASURED SETTLEMENT BETWEEN 8-15-79 and 1-16-80 IN INCHES
- 0.176 ——— PREDICTED SETTLEMENT BETWEEN 8-15-79 and 1-16-80 IN INCHES ASSUMING SURCHARGE REMAINS DURING PLANT LIFE

NOTE:
The measured settlements do not include the heave observed approximately between 8-15-79 & 9-14-79

BECHTEL ANN ARBOR		
MIDLAND POWER PLANT		
MEASURED VERSUS PREDICTED SECONDARY COMPRESSION SETTLEMENT (8-15-79/1-16-80) ASSUMING SURCHARE REMAINS		
	JOB NO. 7220	DRAWING NO. FIGURE 27-15

27

DIESEL GENERATOR BUILDING



30

LEGEND:

- ○ ——— BUILDING / PEDESTAL SETTLEMENT MARKER
- 0.012 ——— MEASURED SETTLEMENT BETWEEN 8-15-79 and 1-16-80 IN INCHES
- 0.100 ——— PREDICTED SETTLEMENT BETWEEN 8-15-79 and 1-16-80 IN INCHES AFTER ACCOUNTING FOR SURCHARGE REMOVAL

NOTE:

The measured settlements do not include the heave observed approximately between 8-15-79 & 9-14-79

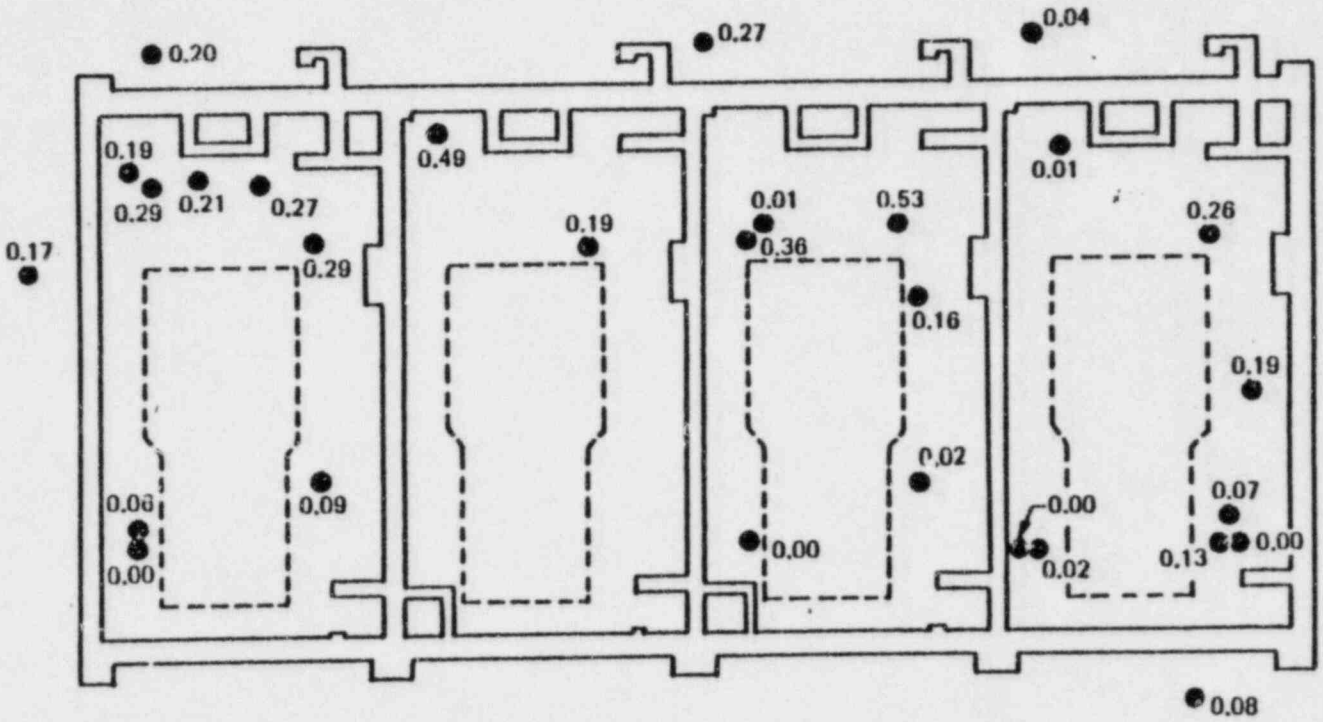
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

MEASURED VERSUS PREDICTED SECONDARY COMPRESSION SETTLEMENT (8-15-79/1-16-80) AFTER CORRECTION FOR SURCHARGE REMOV.

JOB NO.	DRAWING NO.
7220	FIGURE 27-16

DIESEL GENERATOR BUILDING



NOTE:

VERTICAL SETTLEMENT IN INCHES

BECHTEL ANN ARBOR		
MIDLAND POWER PLANT		
DIESEL GENERATOR BUILDING SHAKEDOWN SETTLEMENT OF SAND DUE TO SSE		
	JOB NO. 7220	DRAWING NO. FIGURE 27-14

TABLE 4-1A

SETTLEMENT SUMMARY OF DIESEL GENERATOR BUILDING

A. Settlement History (Building Loads Only)

Construction Stage	I	II	III	IV	V	VI
Time Period	Beginning of construction to 3/28/78	3/28/78 to 1/19/79	1/26/79 to 8/15/79	8/15/79 to 1/16/80	1/16/80 to 12/31/81	12/31/81 to 12/31/2025
Estimated Average Pressure (ksf)	0 to 0.8	0.8 to 1.4	1.4 to 4.4	2.2	2.2 to 3.0	3.0
	No Surcharge		Surcharge	No Surcharge		
Remarks	The completed portion of the building consisted of the concrete pedestals and building walls to el 654' on 3/28/78.	The completed portion of the building consisted of concrete pedestals and building walls to mezzanine floor el 664' on 1/19/79.	The building was completed on 3/22/79 (2.2 ksf). Surcharge commenced on 1/26/79. Surcharge was in place on 4/6/79 (3.2 ksf). Between 8/15/79 and 8/30/79, surcharge was removed.	Latest reading included in this response was taken on 1/16/80.	Date of final piping connections is estimated to be 12/31/81.	Plant life is estimated to extend to 12/31/2025.

Range of Settlement (inches)	S_0		S_0		S_1		S_2		S_2		S_3	
	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
Building	Not recorded	-	2.1 to 4.3	-	1.5 to 3.4	-	0 to 0.04	0.15 to 0.29	-	0.5 to 0.9	-	0.7 to 1.5
Pedestals	Not recorded	-	1.1 to 4.5	-	2.0 to 3.4	-	0 to 0.10	0.17 to 0.31	-	0.5 to 0.9	-	0.8 to 1.5

TABLE 4-1A

SETTLEMENT SUMMARY OF DIESEL GENERATOR BUILDING

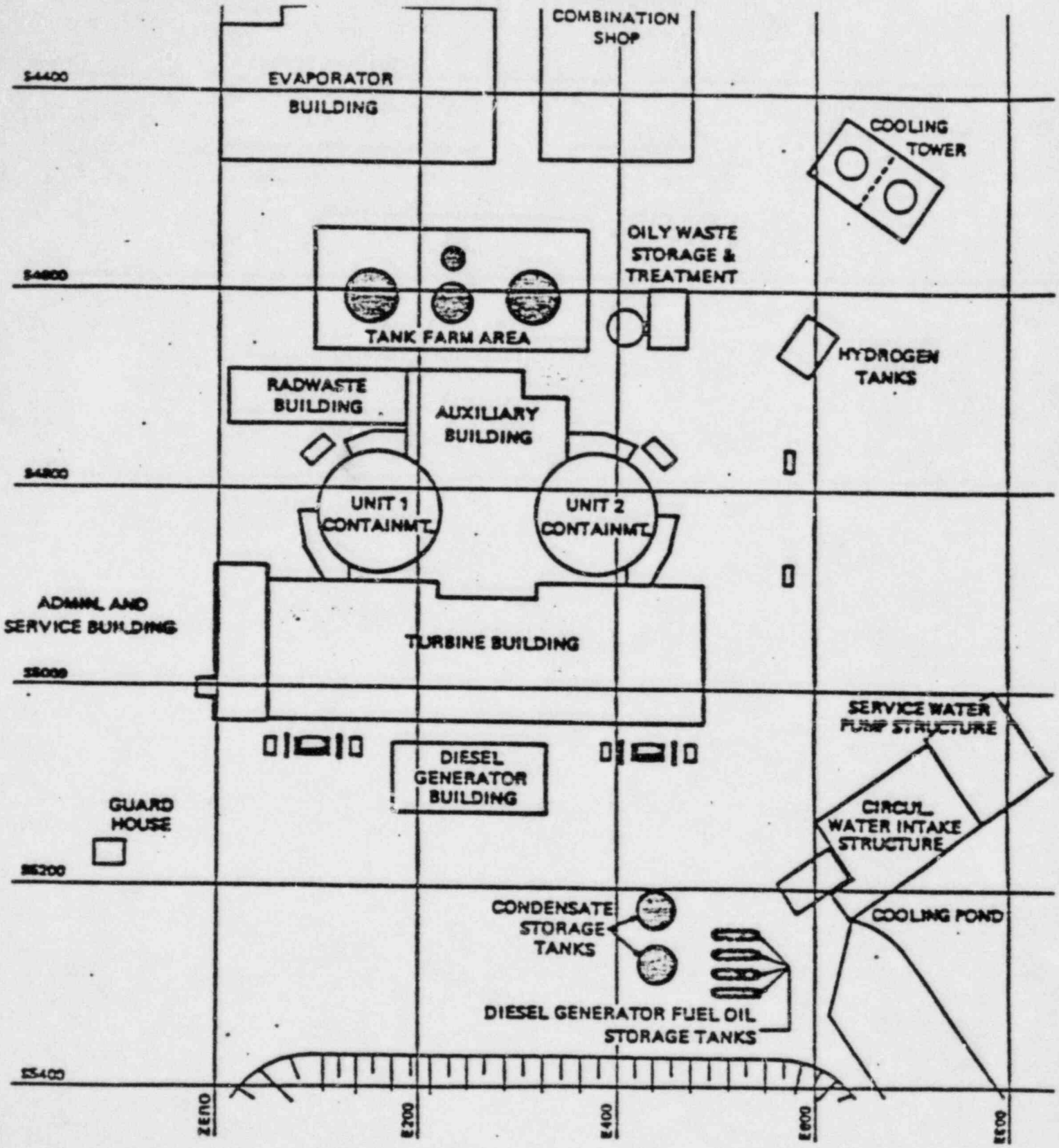
B. Fill Acceptance Criteria for Plant Life

(Predicted Settlement and Differential Settlement After the Final Piping Connections Are Made)

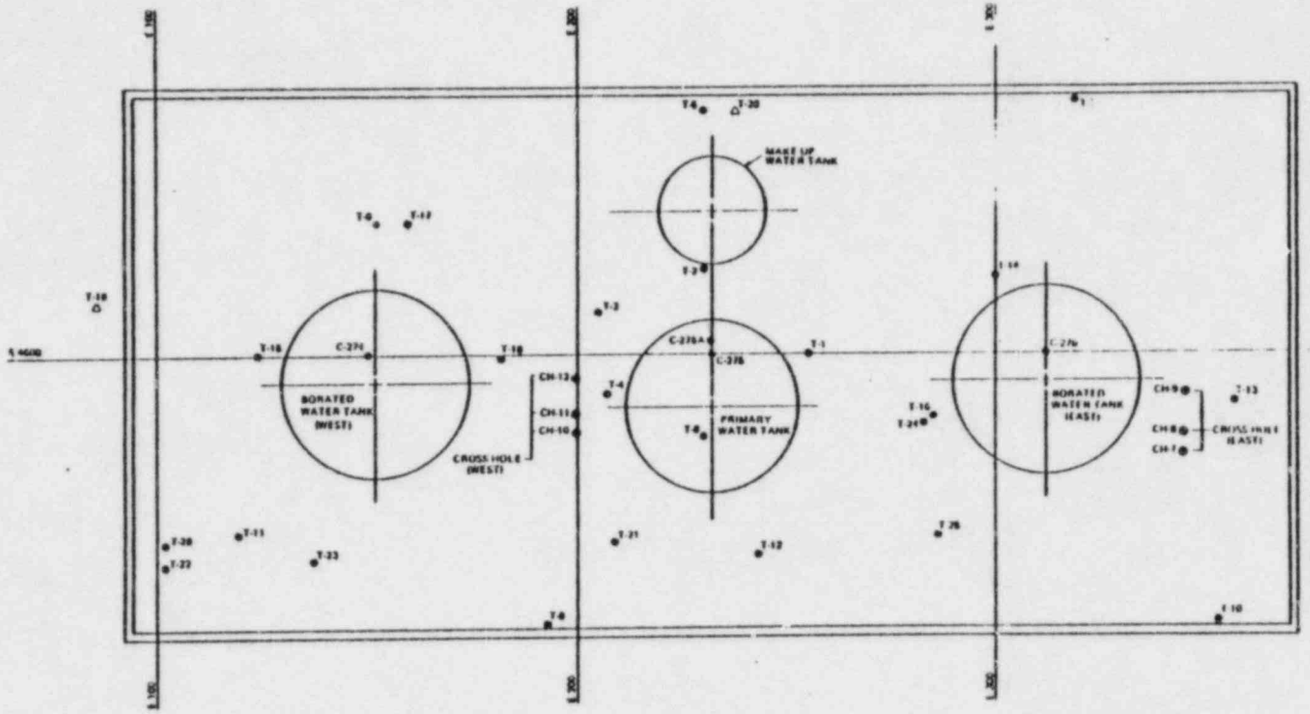
	Static (inches)			Seismic (inches)		
		ΔS			ΔS	
	S[1]	N-S[2]	E-W/W-E[3]	S	N-S[5]	E-W/W-E
Building	1-3/4	7/8	5/8	1/2	1/2	1/2
Pedestals	2[4]	1-1/8	1-1/8	1/2	1/2	1/4

Notes:

(1) The static settlements do not include the settlement from till (1/3 inch) due to permanent dewatering.
(2) From north to south with rigid body rotation
(3) From east to west or west to east with rigid body rotation
(4) Includes pedestal foundation vibration settlement
(5) From south to north



TANK LOCATIONS

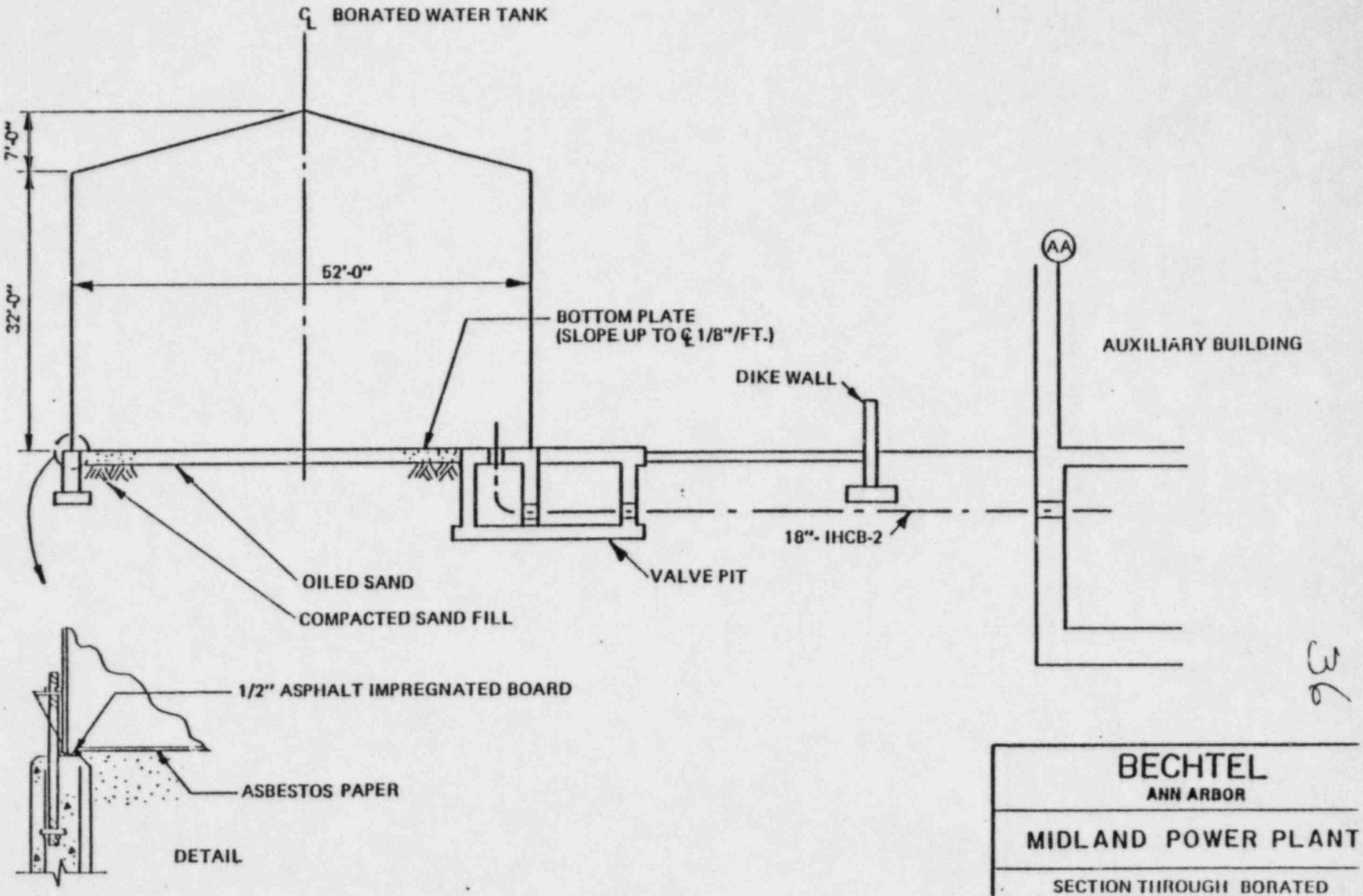


BECHTEL

MIDLAND POWER PLANT

TANK FARM BORING LOCATION PLAN

7220 FIGURE 31-2 A



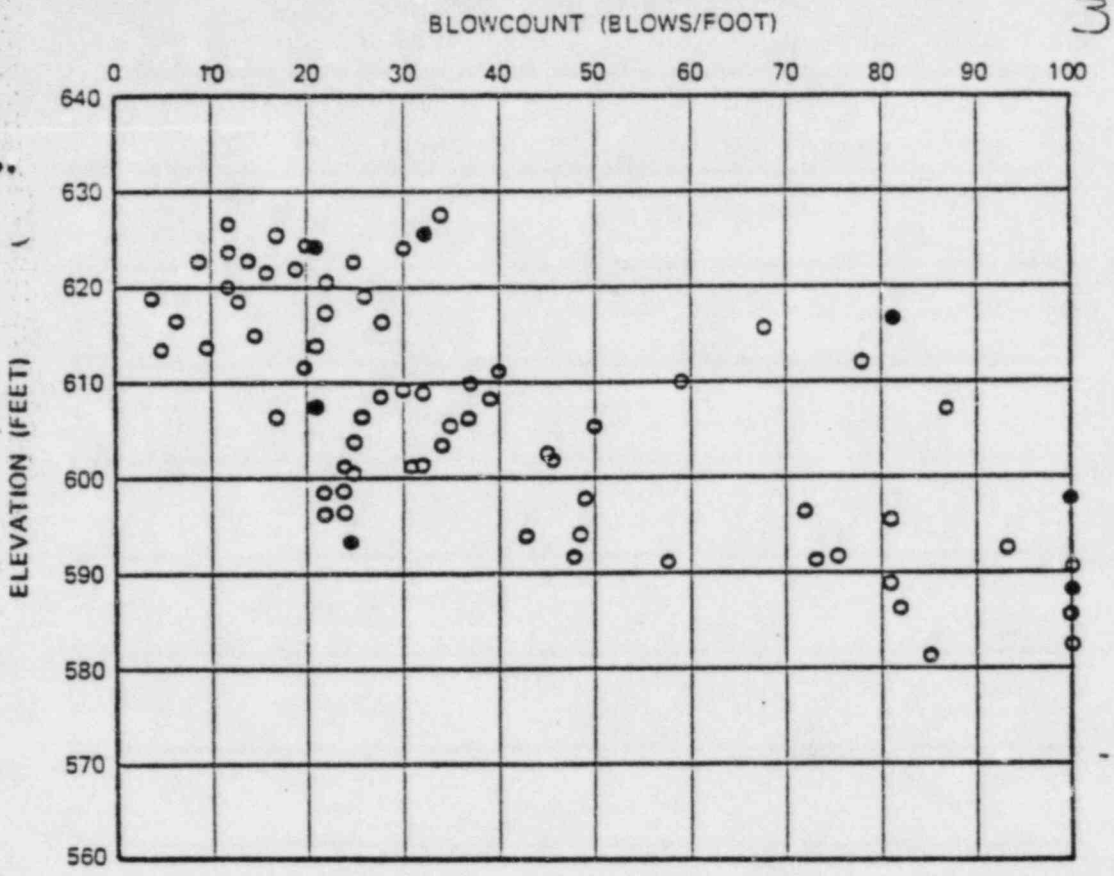
3
6

BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

SECTION THROUGH BORATED
WATER STORAGE TANK
FOUNDATION AND VALVE PIT

JOB NO.	DRAWING NO.	RE
7220	FIGURE 31-1	A



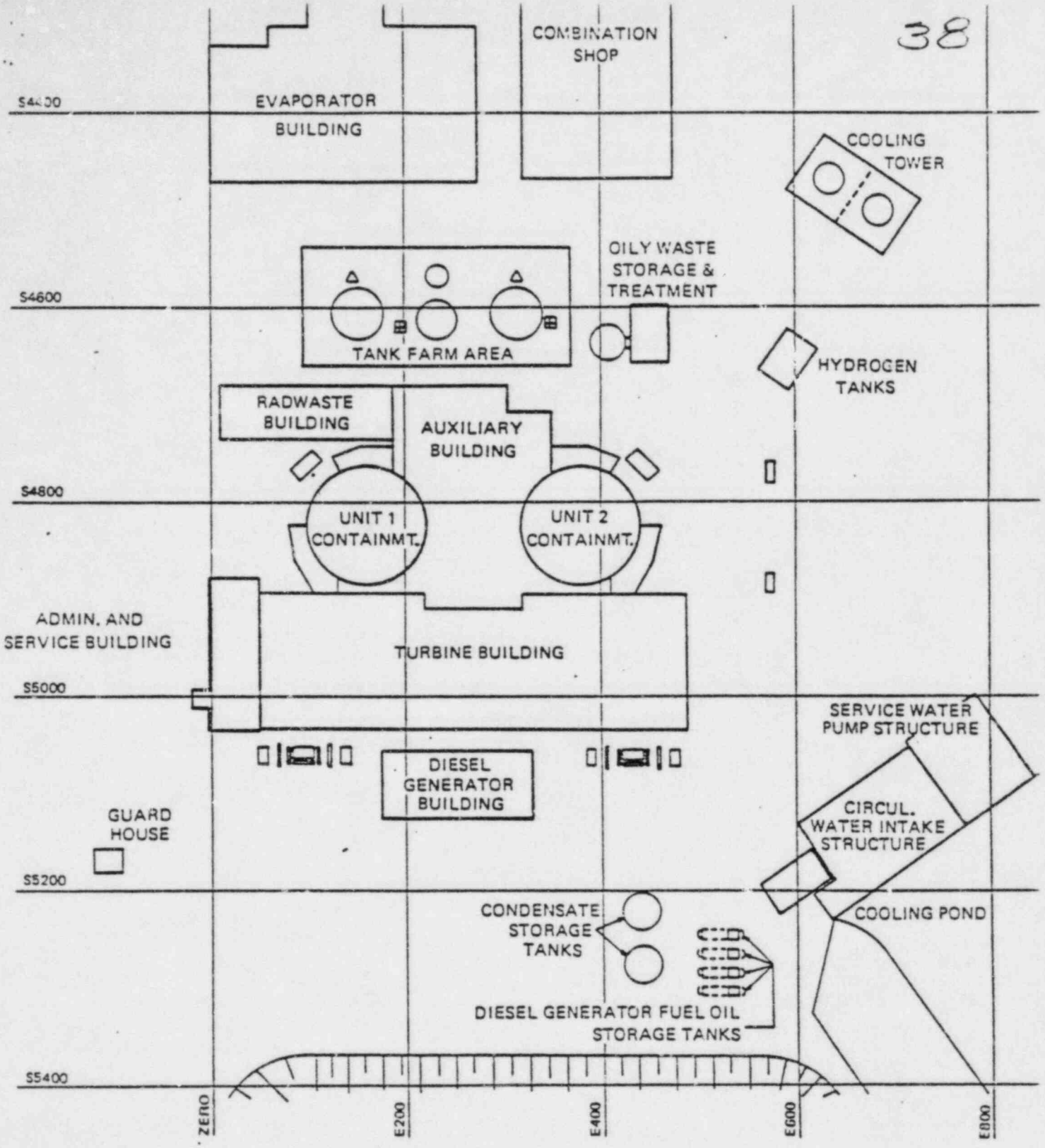
TEST BORINGS:

T-6, T-11, T-15, T-17, T-18, T-23, AND C-274

EXPLANATION

- ● SAND
- ○ CLAY

BECHTEL ANN ARBOR			
MIDLAND POWER PLANT			
BLOWCOUNT VS ELEVATION BORATED WATER TANK (WEST)			
	JOB NO.	DRAWING NO.	R
	7220	FIGURE 31-4	A



LEGEND:

⊞ CROSS HOLE SHEAR WAVE VELOCITY TESTS

△ LOCATION OF PLATE LOAD TESTS

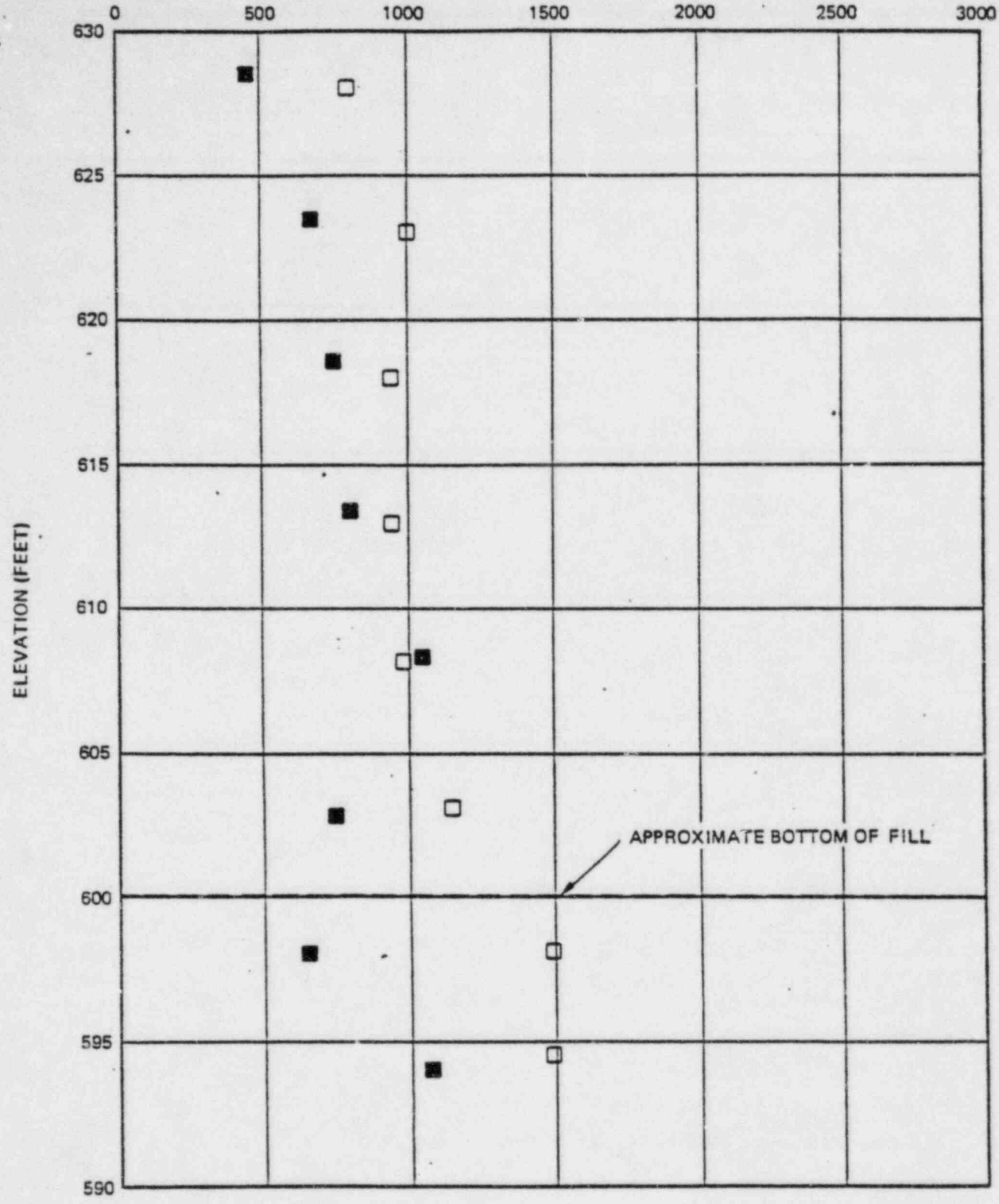
0 50 100 150 200
SCALE IN FEET

BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

PLATE LOAD TEST AND CROSS HOLE TEST LOCATIONS TANK FARM AREA

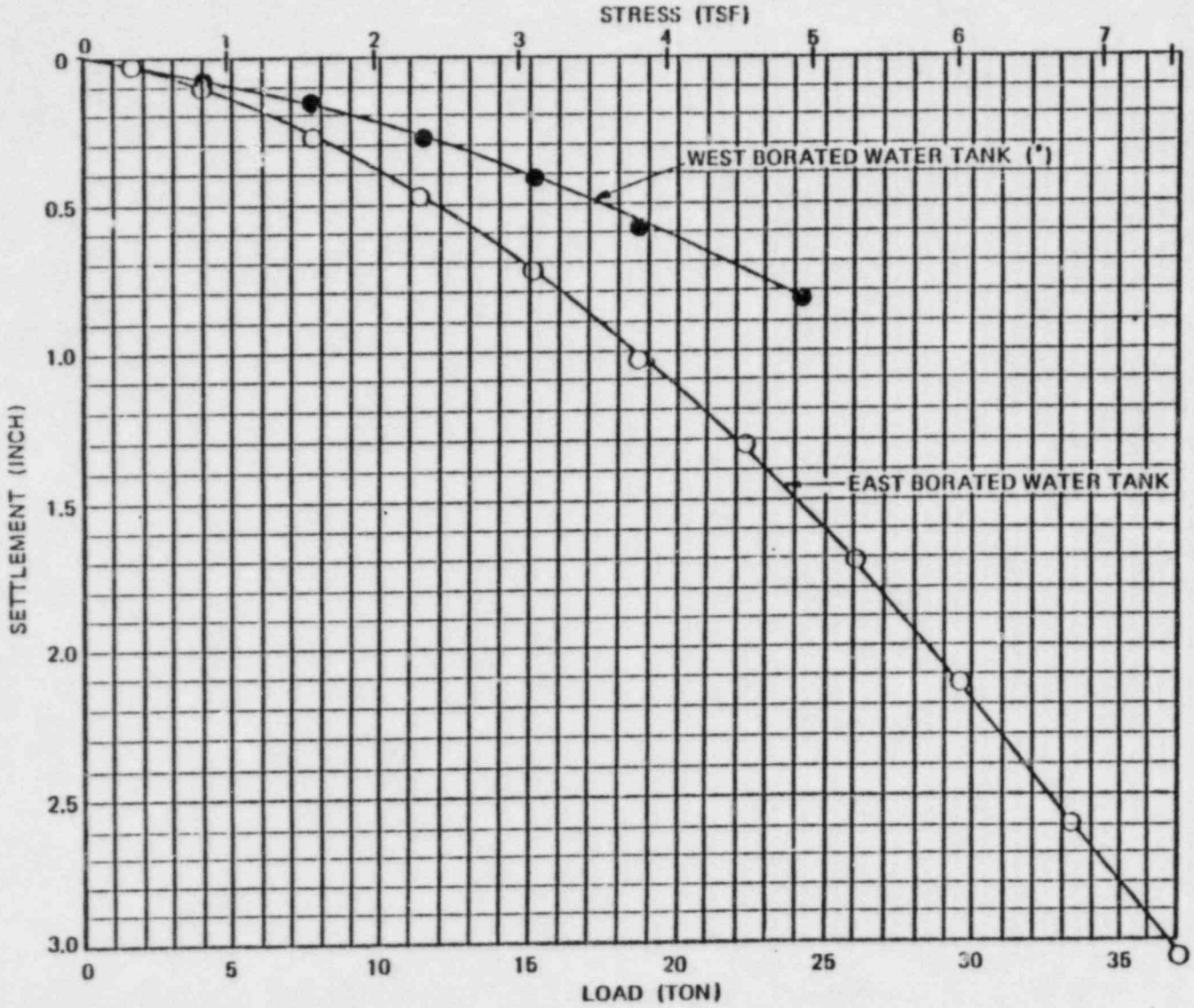
JOB NO. 7220 | DRAWING NO. FIGURE 31-9



LEGEND

- ■ CROSS HOLE TEST (EAST)
- □ CROSS HOLE TEST (WEST)

BECHTEL ANN ARBOR			
MIDLAND POWER PLANT			
SHEAR WAVE VELOCITY PROFILE BORATED WATER STORAGE TANKS AREA			
	JOB NO.	DRAWING NO.	REV.
	7220	FIGURE 31-11	A



TEST ELEVATIONS:

● 628.5 (WEST)

○ 627.7 (EAST)

NOTES:

1. All settlements calculated at end of loading interval.
2. Criteria for determining duration of loading intervals as follows:
   a) 0.001 inches (±) or less displacement in a 5 min. interval, or:
   b) Constant (±) rate of displacement after 3 hour interval.
   c) Minimum duration: 60 min.
3. Stress based on plate area of 4,909 ft^2 (30" Diam.)

* Test terminated prior to end of last load interval due to infiltration of rainwater.

BECHTEL ANN ARBOR			
MIDLAND POWER PLANT			
PLATE LOAD TESTS LOAD VS SETTLEMENT - TANK FARM			
	JOB NO.	DRAWING NO.	REV
	7220	FIGURE 31-10	A

TABLE 4-18

SETTLEMENT SUMMARY OF BORATED WATER STORAGE TANKS

A. Settlement History

Construction Stage	I	II	III	IV	V	VI
Time Period	Beginning of construction to 9/23/78	9/23/78 to 1/12/80	1/12/80 to 7/1/80	7/1/80 to 11/1/80	11/1/80 to 12/31/81	12/31/81 to 12/31/2025
Estimated Average Pressure (ksf)	-	-	-	-	-	-
	Empty Tank Dead Load Only			Estimated Period of Full Scale Test		
Remarks	The initial settlement readings were taken on 9/23/78 and 2/27/79 for the west tank and on 11/4/78 and 4/17/79 for the east tank.	Latest reading included in this response was taken on 1/12/80.			Date of final piping connections is estimated to be 12/31/81.	Plant life is estimated to extend to 12/31/2025.

Range of Settlement (inches)	S_0		S_0		S_1		S_1		S_2		S_3	
	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
East Tank	Not recorded	-	0.04 to 0.19	-	-	-	-	3	-	0.5	-	1
West Tank	Not recorded	-	0.34 to 0.90	-	-	-	-	3	-	0.5	-	1

TABLE 4-1B

SETTLEMENT SUMMARY OF BORATED WATER STORAGE TANKS

B. Fill Acceptance Criteria for Plant Life

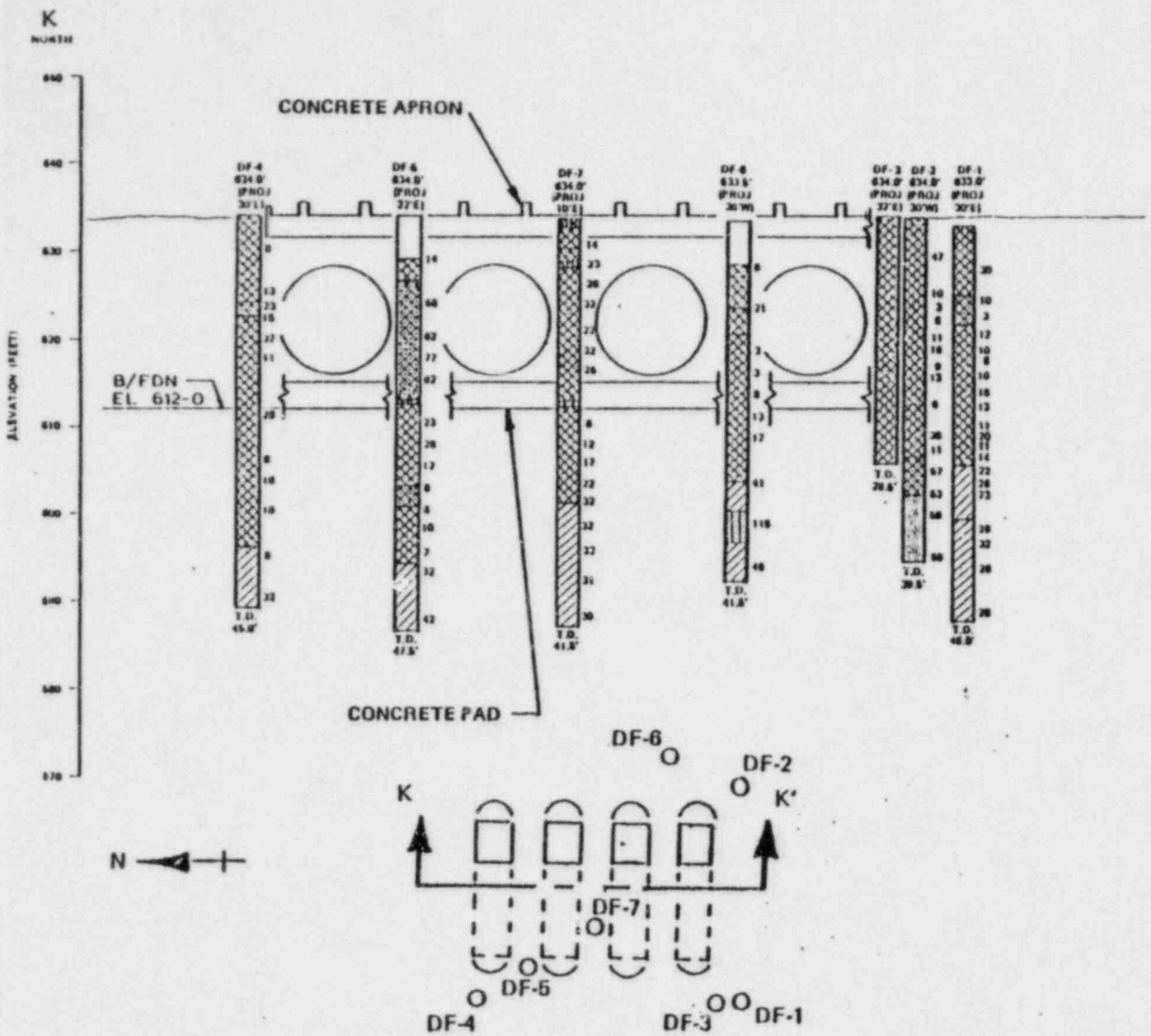
(Predicted Settlement and Differential Settlement After the Final Piping Connections Are Made)

Static (inches)			Seismic (inches)		
	ΔS			$\Delta\delta$	
S	N-S/S-N	E-W/W-E	δ	N-S	E-W/W-E
1-1/2	3/4	3/4	N/A	N/A	N/A

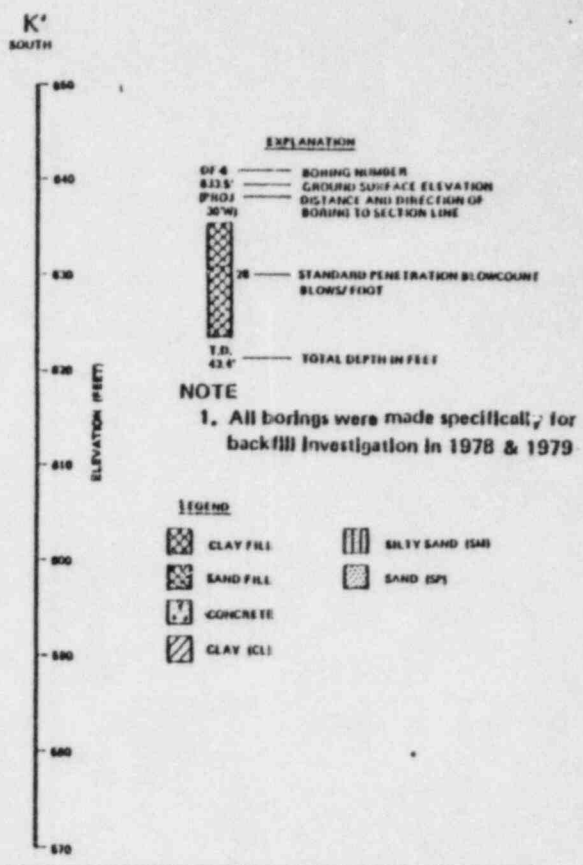
Note: The static settlements do not include the settlement from till (1/3 inch) due to permanent dewatering.

5

42



PLAN VIEW



BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
DIESEL FUEL OIL STORAGE TANKS CROSS-SECTION K-K'	
JOB NO. 7220	DRAWING NO. FIGURE 33-1

TABLE 4-1D

SETTLEMENT SUMMARY OF DIESEL FUEL TANKS

A. Settlement History

Construction Stage	I	II	III	IV	V
Time Period	Beginning of construction to 3/9/79	3/9/79 to 11/12/79	11/12/79 to 7/1/80	7/1/80 to 12/31/81	12/31/81 to 12/31/2025
Estimated Average Pressure (ksf)	-	-	-	-	-
	Empty Tank Dead Load Only	Tank Was Full	Empty Tank Dead Load Only	Tank will be Filled with Fuel	Tank in Operating Condition
Remarks	The initial settlement readings were taken on 3/9/79.	The tanks were filled with water during the period between 3/9/79 and 11/12/79.	Latest reading included in the response was taken on 1/12/80.		Plant life is estimated to extend to 12/31/2025.

Range of Settlement (inches)	S_0		S_1		S_1		S_2		S_3	
	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
All Tanks	Not recorded	-	0.00 to 0.17	-	-	-	-	0.25	-	1

TABLE 4-1D

SETTLEMENT SUMMARY OF DIESEL FUEL TANKS

B. Fill Acceptance Criteria for Plant Life

(Predicted Settlement and Differential Settlement)

Static (inches)			Seismic (inches)		
	ΔS			ΔS	
S	N-S/S-N	E-W/W-E	S	N-S/S-N	E-W/W-E
1-3/4	1	1	N/A	N/A	N/A

Note: The static settlements do not include the settlement from till (1/3 inch) due to permanent dewatering.

5

4

TABLE 4-1C

SETTLEMENT SUMMARY OF CONDENSATE WATER STORAGE TANKS

A. Settlement History

Construction Stage	I	II	III	IV	V	VI
Time Period	Beginning of construction to 9/16/78	9/16/78 to 12/12/79	12/12/79 to 7/1/80	7/1/80 to 11/1/80	11/1/80 to 12/31/81	12/31/81 to 12/31/2025
Estimated Average Pressure (ksf)	-	-	-	-	-	-
	Empty Tank Dead Load Only		Hydrotest	Estimated Time Period for Filling the Tank		Tank in Operating Condition
Remarks	The initial settlement readings were taken on 9/16/78.		The tanks are presently under hydrotests which were started on 12/12/79.		Date of final piping connections is estimated to be 12/31/81.	Plant life is estimated to extend to 12/31/2025.

Range of Settlement (inches)	S_0		S_0		S_1		S_2		S_2		S_3	
	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted	Measured	Predicted
North Tank	-	-	0.42 to 1.93	-	0.91 to 1.06	-	-	3	-	0.5	-	1
South Tank	-	-	1.21 to 2.17	-	0.76 to 1.3	-	-	3	-	0.5	-	1

TABLE 4-1C

SETTLEMENT SUMMARY OF CONDENSATE WATER STORAGE TANKS

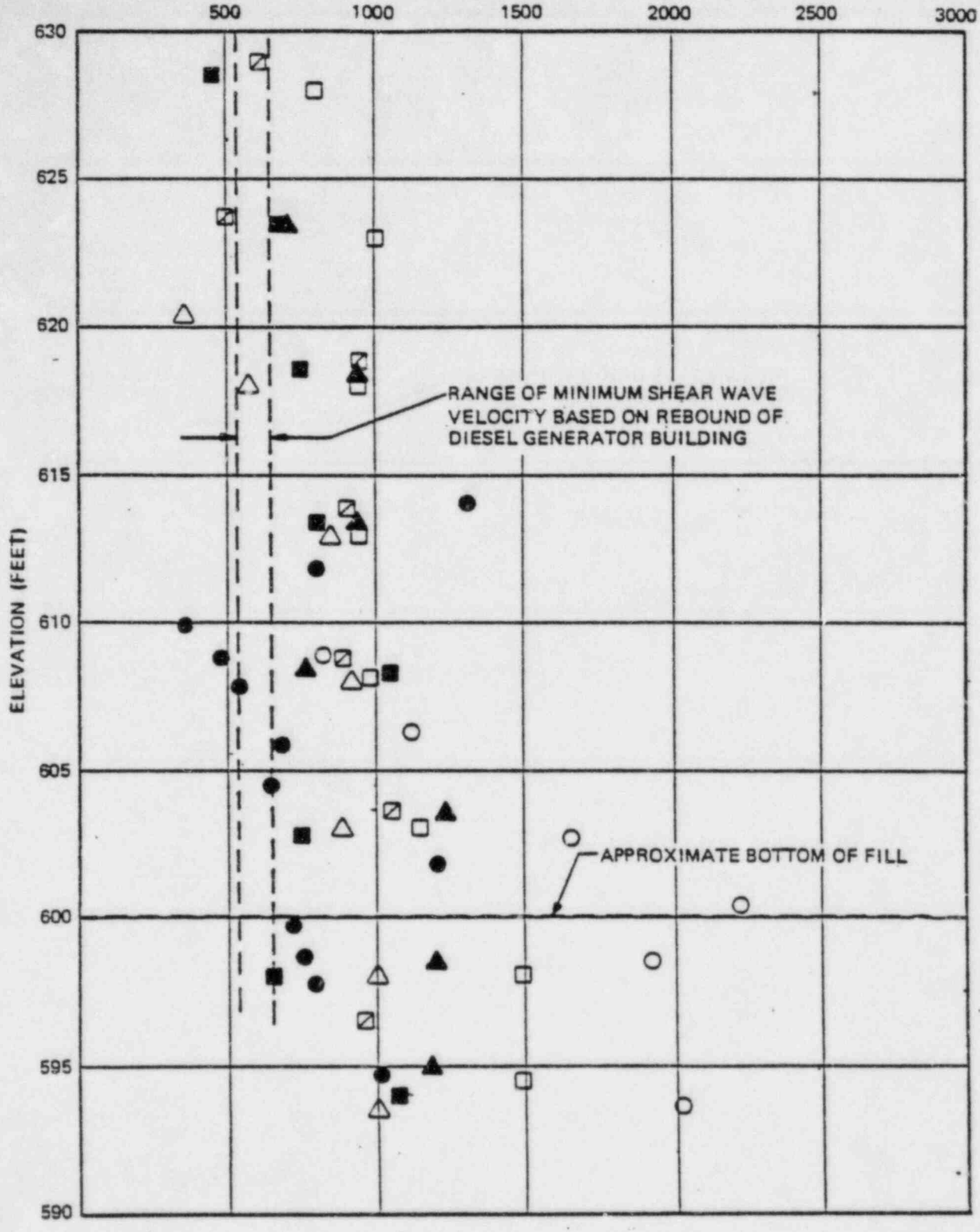
B. Fill Acceptance Criteria for Plant Life

(Predicted Settlement and Differential Settlement After the Final Piping Connection Are Made)

Static (inches)			Seismic (inches)		
	ΔS			ΔS	
S	N-S/S-N	E-W/W-E	S	N-S/S-N	E-W/W-E
1-1/2	3/4	3/4	N/A	N/A	N/A

Note: The static settlements do not include the settlement from till (1/3 inch) due to permanent dewatering.

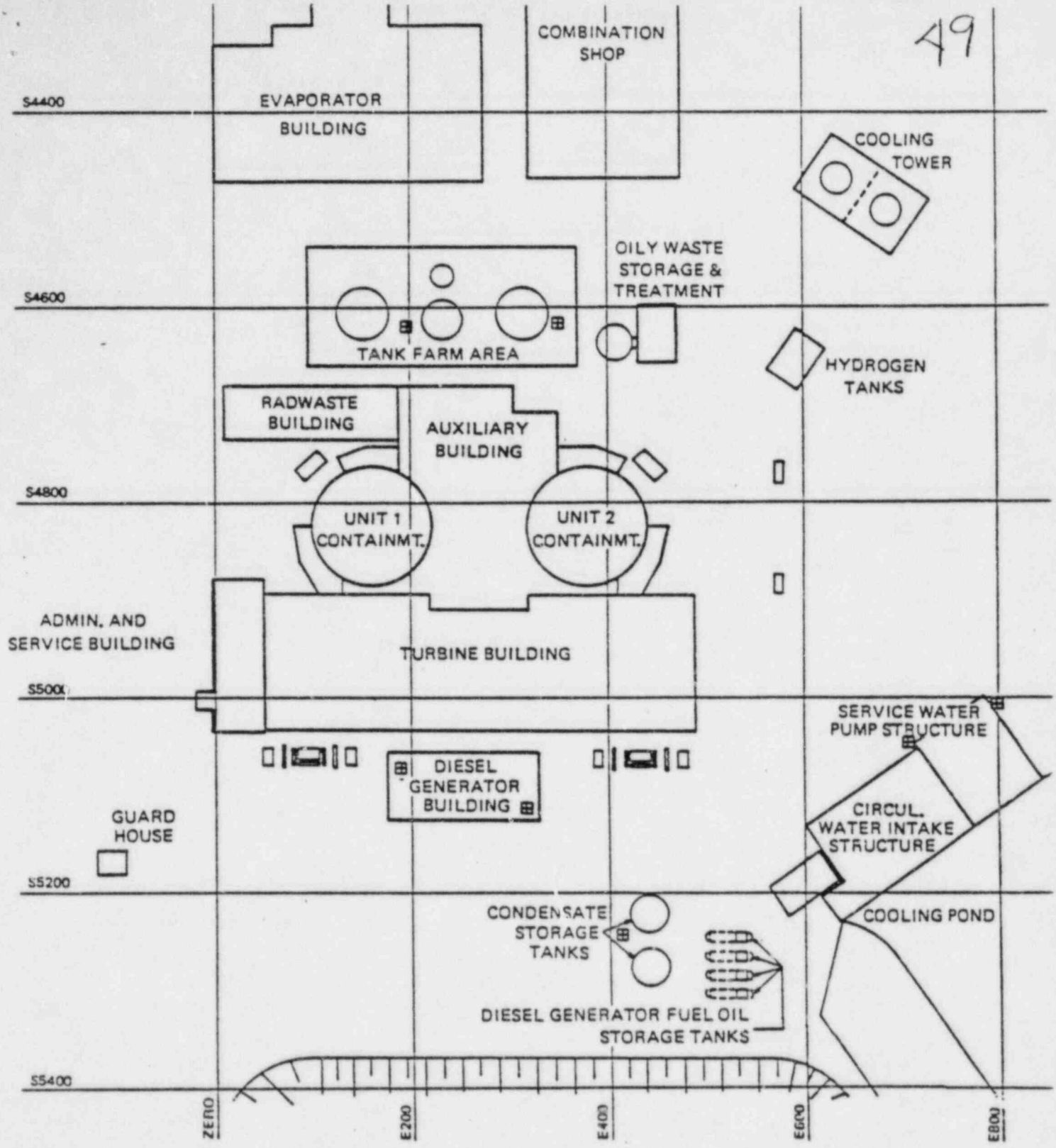
5



LEGEND:

- CONDENSATE TANKS AREA
- BORATED WATER STORAGE TANKS AREA
- SERVICE WATER PUMP STRUCTURE
- DIESEL GENERATOR BUILDING

BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
SHEAR WAVE VELOCITY PROFILE PLANT AREA FILL	
JOB NO.	DRAWING NO.
7220	FIGURE 35-2

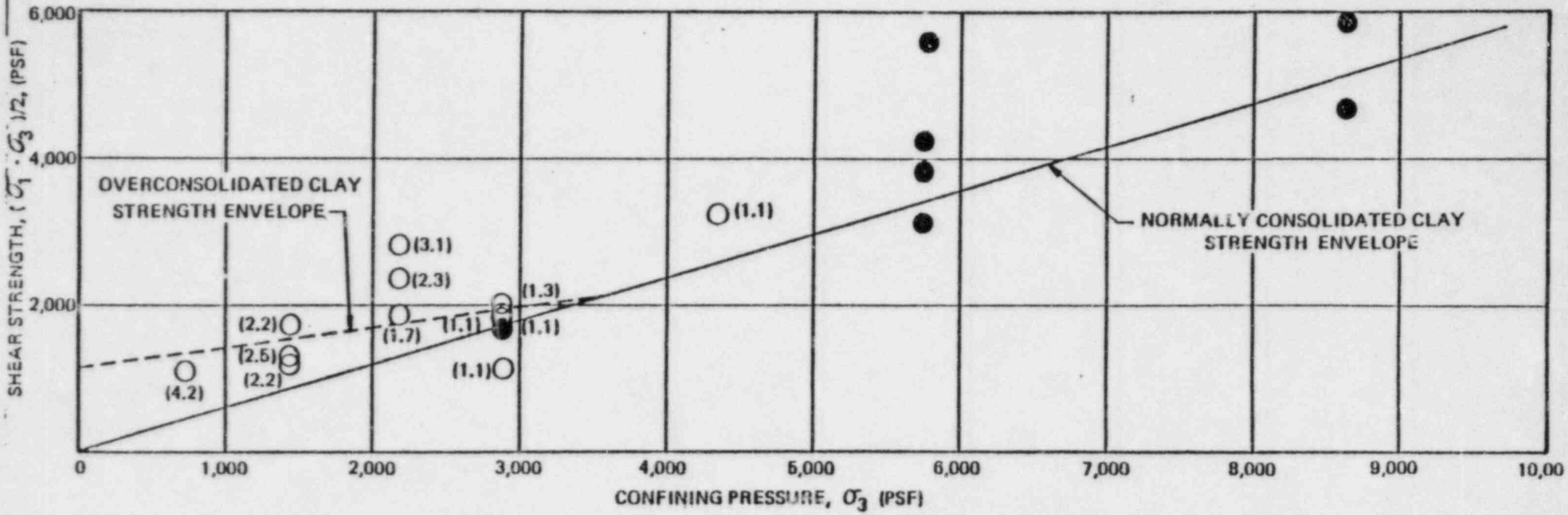


LEGEND:

⊞ CROSS HOLE SHEAR WAVE VELOCITY TESTS

0 50 100 150 200
SCALE IN FEET

BECHTEL ANN ARBOR	
MIDLAND POWER PLANT	
CROSS HOLE TEST LOCATIONS	
JOB NO. 7220	DRAWING NO. FIGURE 35-1



LEGEND

● NORMALLY CONSOLIDATED SOIL SAMPLES

(2.5)○ OVERCONSOLIDATED SOIL SAMPLES
OVER CONSOLIDATION RATIO (OCR)

NOTE:

CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TESTS ON PLANT AREA FILL

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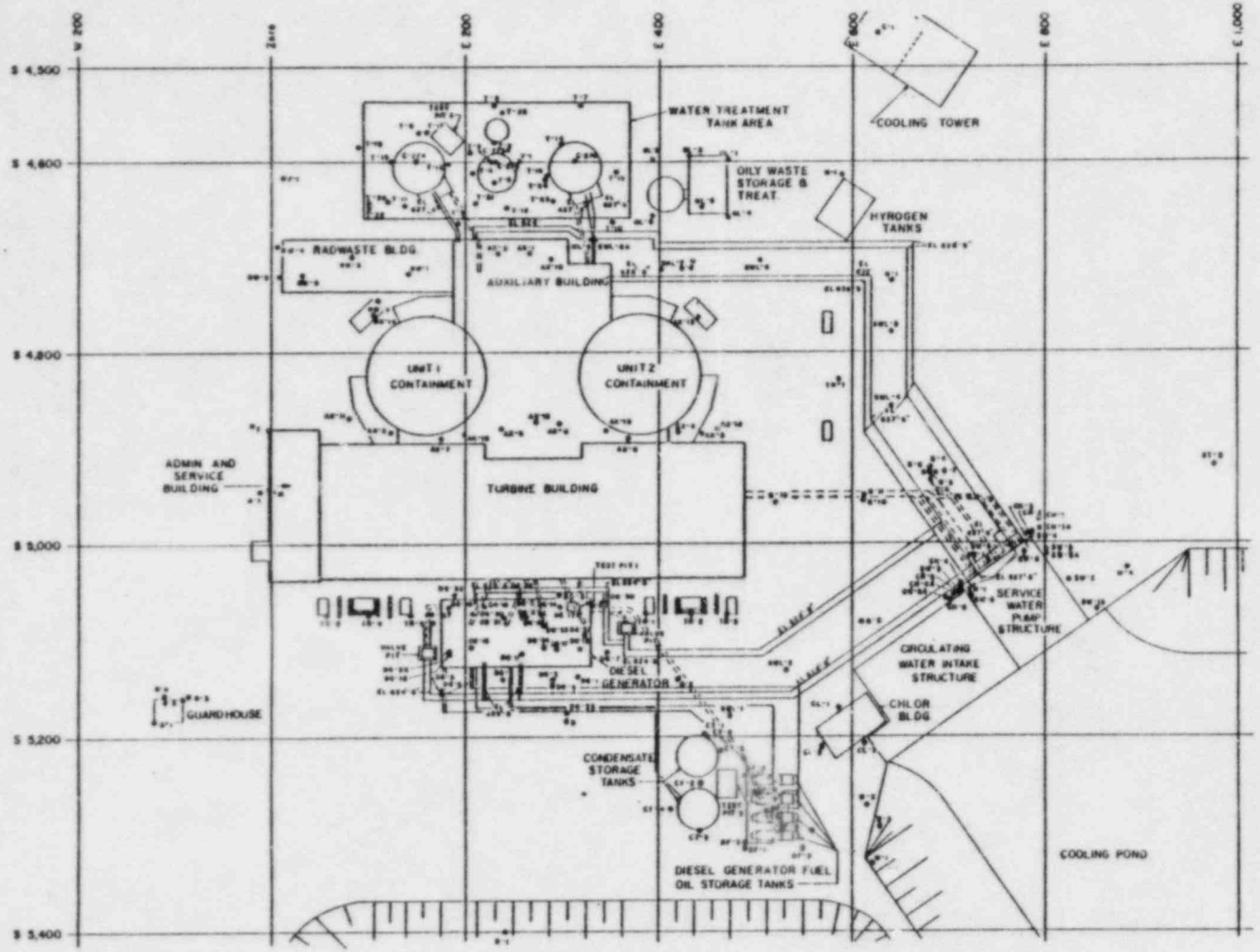
BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

CONFINING PRESSURE
VS
SHEAR STRENGTH

JOB NO.	DRAWING NO.
7220	FIGURE 35-3



EXPLANATION

- BECHTEL BORINGS 1977 & 1978
- BECHTEL BORINGS, JULY THROUGH OCTOBER, 1978 & 1979

NOTE

Information of piping obtained from project drawings M-166 rev 3, 10-19-78, M-167 rev 5, 8-29-78, M-168 rev 2, 8-29-78, M-169 rev 3, 8-29-78, & M-58 Sht rev 4, 1-11-78, & M-58 Sht2 rev 3, 1-31-79

N

0 10 20 100 150 200
SCALE IN FEET

BECHTEL
SAN FRANCISCO

MIDLAND POWER PLANT

UNDERGROUND UTILITIES

7220	FIGURE	A

SK-A-520

NRC UPDATE

I. REVIEW OF INVESTIGATIONS

- A. BORING — VG-PLAN OF SITE
- B. TANK FARM INVESTIGATION
- C. TEST PITS — VG-TEST PIT
- D. PLATE LOAD TEST
- E. CROSS HOLE SHOTS
- F. PUMP TESTS

II. QUALIFICATION OF COMPACTION EQUIPMENT

- A. TEST PADS
- B. STATUS OF REPORT

III. BUILDING SETTLEMENT

- A. STATUS — VG-TABLE

I.A. SLIDE

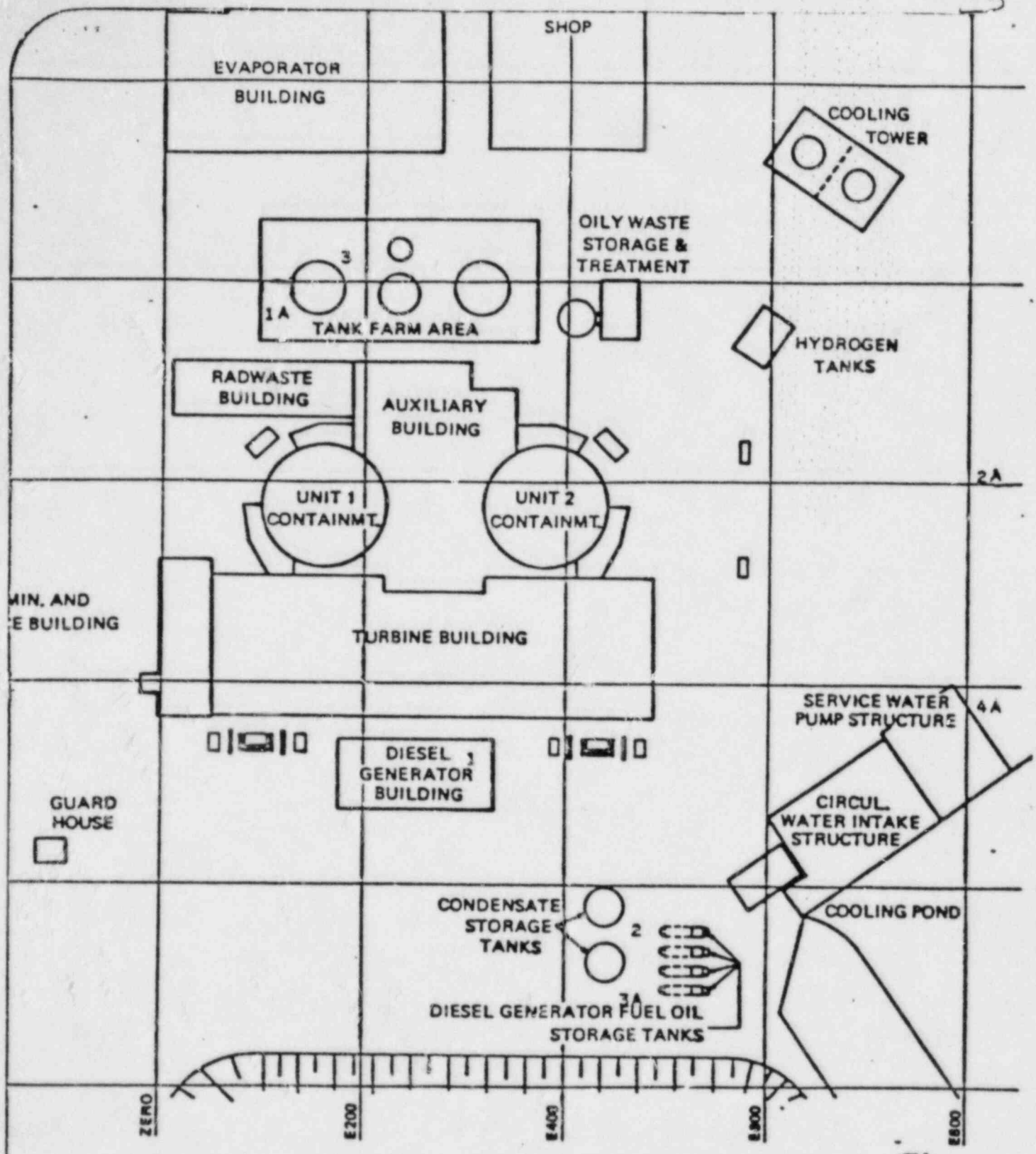
I.B. COMPLETE PROJECT REVIEW

I.C. COMPLETE GZD TO PROJECT

I.D. COMPLETE GZD TO PROJECT

I.E. COMPLETE U. OF M. S. S. AFIFI LATER

I.F. PUMP TEST W. C. PARIS LATER



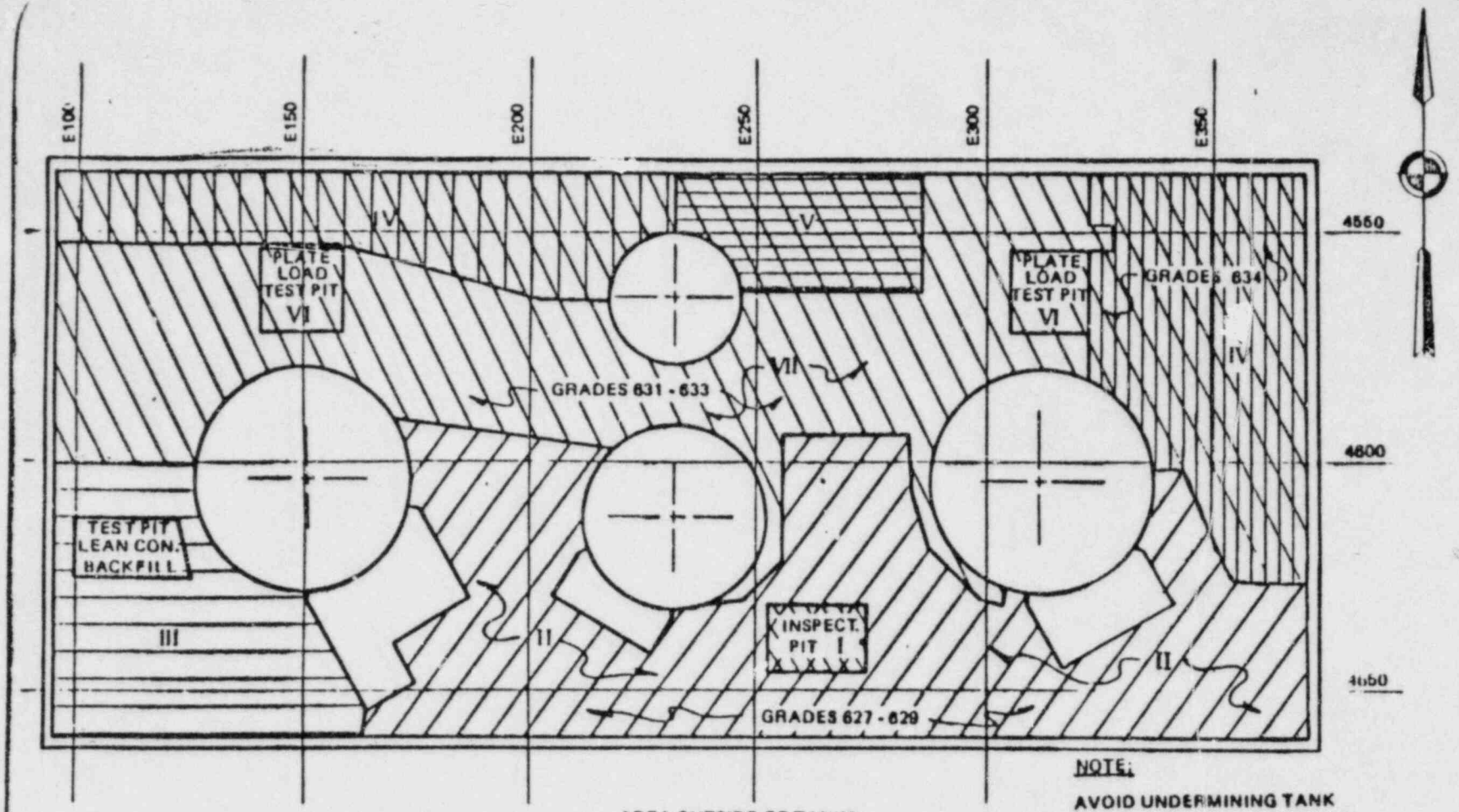
LOCATION OF TEST PITS

0 50 100 150 200

BECHTEL
ANN ARBOR

MIDLAND POWER PLANT

SITE PLAN



AREA OUTSIDE OF TANKS
TANK FARM

NOTE:

AVOID UNDERMINING TANK OR WALL FOOTINGS, STAY AT LEAST 3' AWAY AND MAINTAIN 1 - 1 (H - V) SLOPE FOR DEPTH BELOW FOOTING.

NOT TO SCALE

AREA	INSTRUCTION
I	REMOVE TEMP. FILL – BACKFILL TO EXISTING GRADE W/LEAN CONCRETE
II, VII	CLEANUP & REMOVE TO SUITABLE SUBGRADE
III, IV V, VI	REMOVE SOIL TO GRADES IN TABLE AT LEFT, OR LOWER WHERE NECESSARY TO SUITABLE SUBGRADE

MINIMUM CUT DEPTHS	
AREA	ELEV.
III	626.5
IV	632.5
V	627.5
VI	BOTTOM OF TEMP. FILL

BECHTEL
ANN ARBOR

MIDLAND POWER PL

TANK FARM CLEAN UP AND INSPECTION PLAN

JOB NO. 7220 DRAWING FIGURE

BUILDING	DATE	SETTLEMENT FEET MAXIMUM	SETTLEMENT FEET MINIMUM	NUMBER OF POINTS
CONDENSATE				
TANK-NORTH	(1) 11-9-78	.045	.018	4
	(2) 11-16-79	.159	.000	
TANK-SOUTH	11-9-78	.064	.038	4
	11-16-79	.178	.129	
TANK FARM				
BORATED-EAST*	01-8-79	.002	.000	3
	11-16-79	.015	.000	
BORATED-WEST*	11-9-78	.000	.000	3
	11-16-79	.077	.025	
PRIMARY	11-9-78	.011	.005	3
	11-16-79	.013	.000	
UTILITY	01-8-79	.000	.000	3
	11-16-79	.000	.000	
DIESEL FUEL	5-12-79	.013	.000	4
	11-16-79	.012	.000	
*UNDER CONSTRCTION STEEL				
SERVICE WATER				
PUMP STRCTURE	7-22-78	.024	.010	4
	11-16-79	.016	.000	
CIRCULATING WATER				
INTAKE STRUCTURE	7-22-78	.020	.004	4
	11-16-79	.008	.000	
CHLORINATION	11-9-78	.060	.012	4
	11-16-79	.066	.017	
RADWASTE	11-9-78	.015	.002	4
	11-16-79	.080	.023	

(1) Initial settlement

(2) Total settlement to date shown

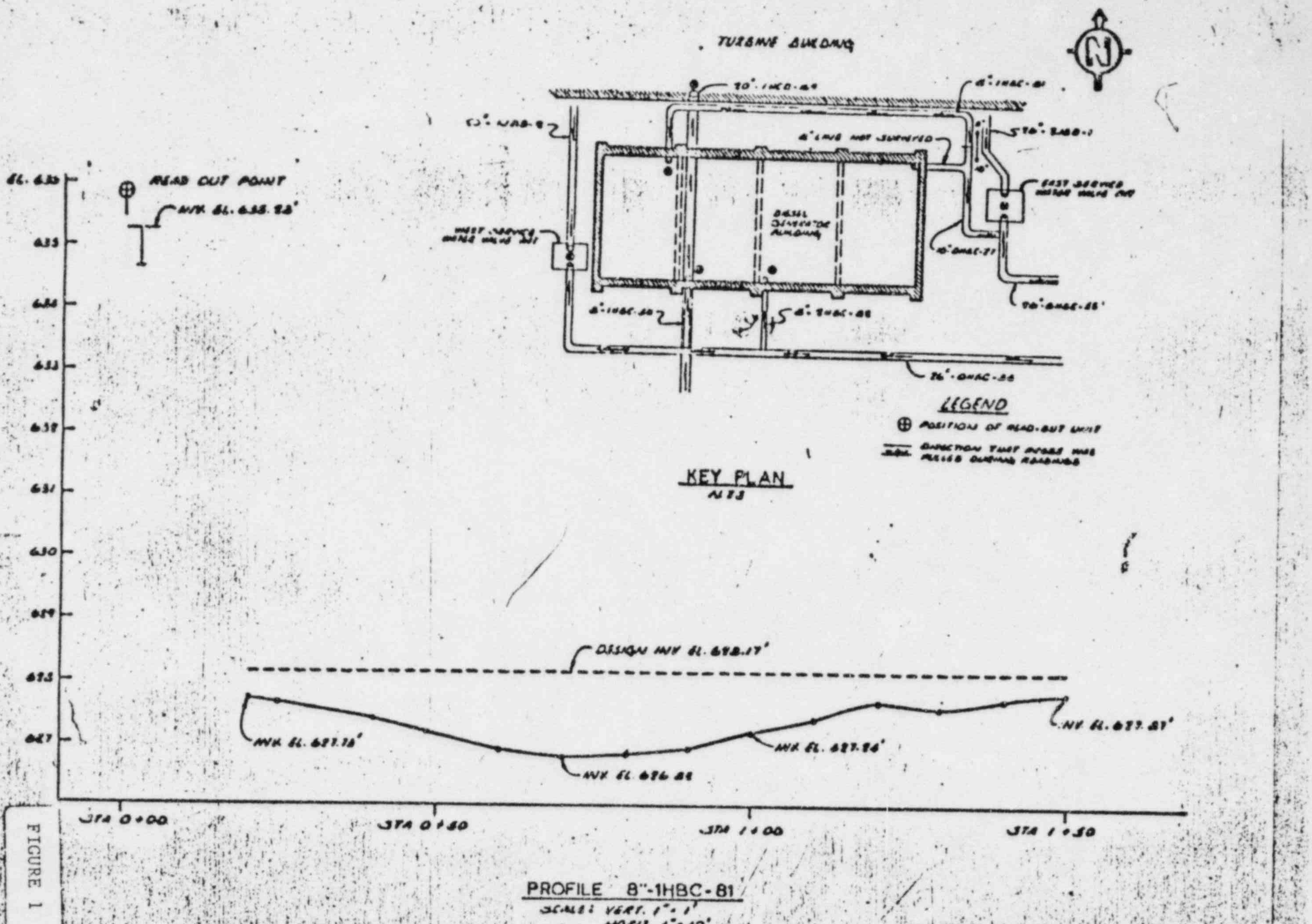
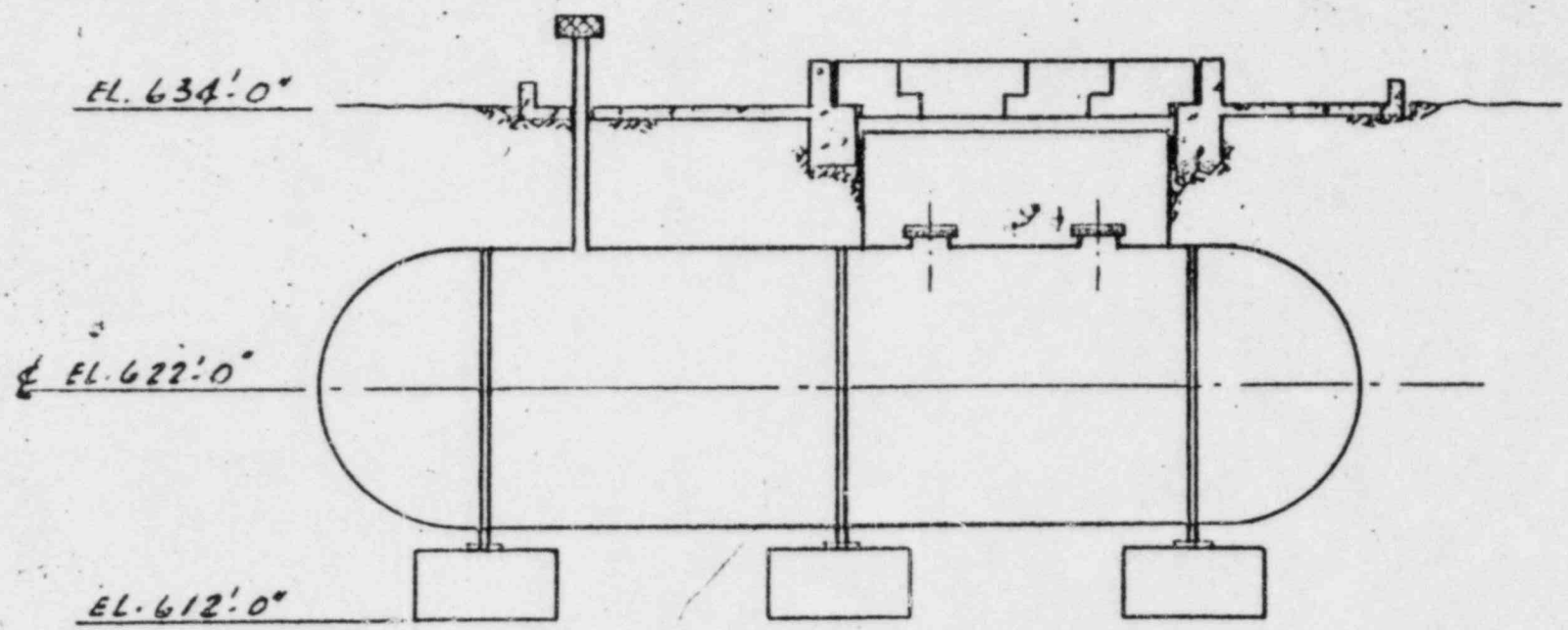

TURBINE BUILDING
READ OUT POINT
KEY PLAN
NTS
LEGEND
POSITION OF READ-OUT UNIT
DESIGN INV EL. 628.17'
STA 0+00
STA 0+50
STA 1+00
STA 1+50
PROFILE 8"-1HBC-81
SCALE: VERT. 1" = 1'
HORIZ. 1" = 10'

FIGURE 1



ELEVATION

EMERGENCY DIESEL FUEL OIL STORAGE TANKS (Q)

FIGURE 2

G-0817-04

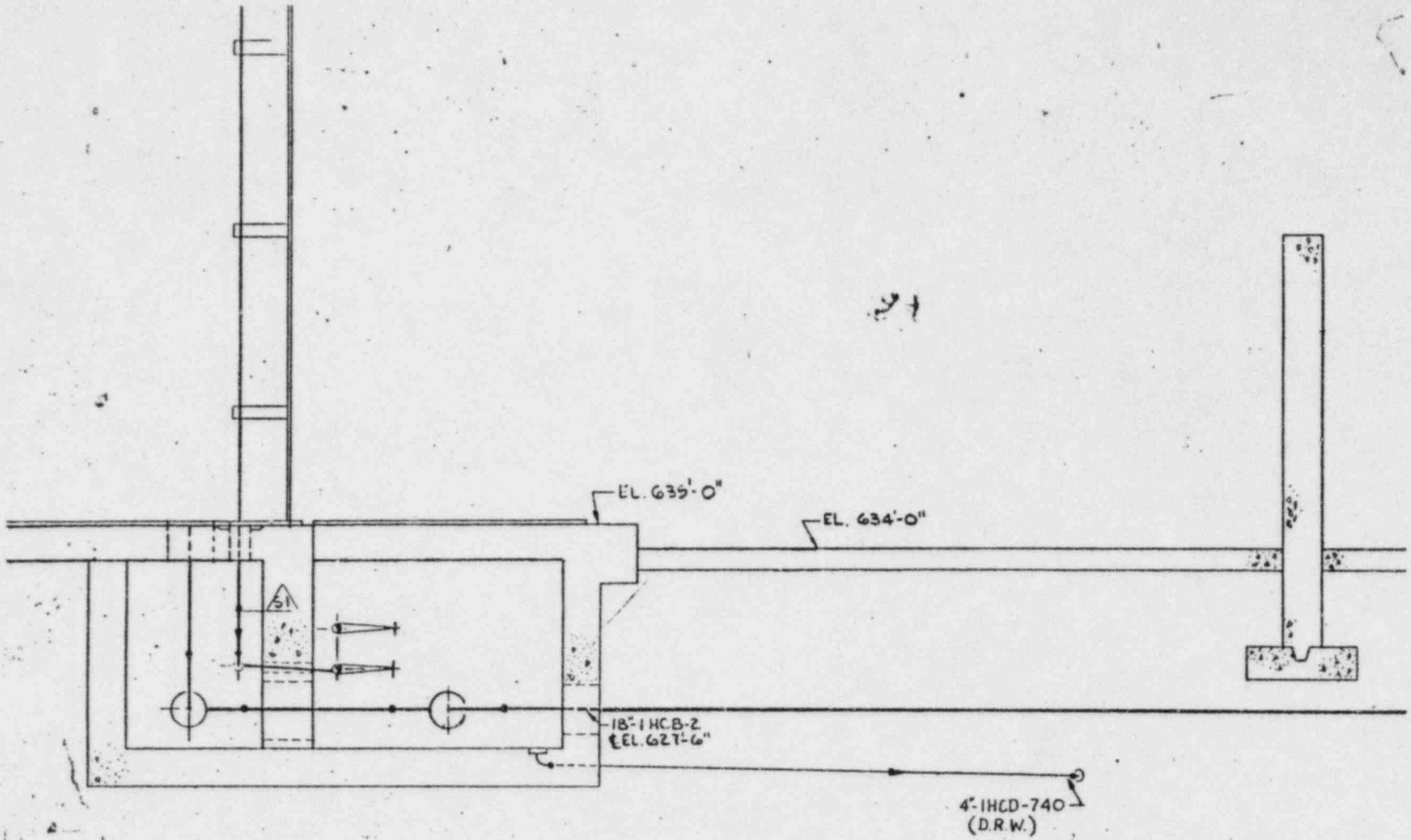


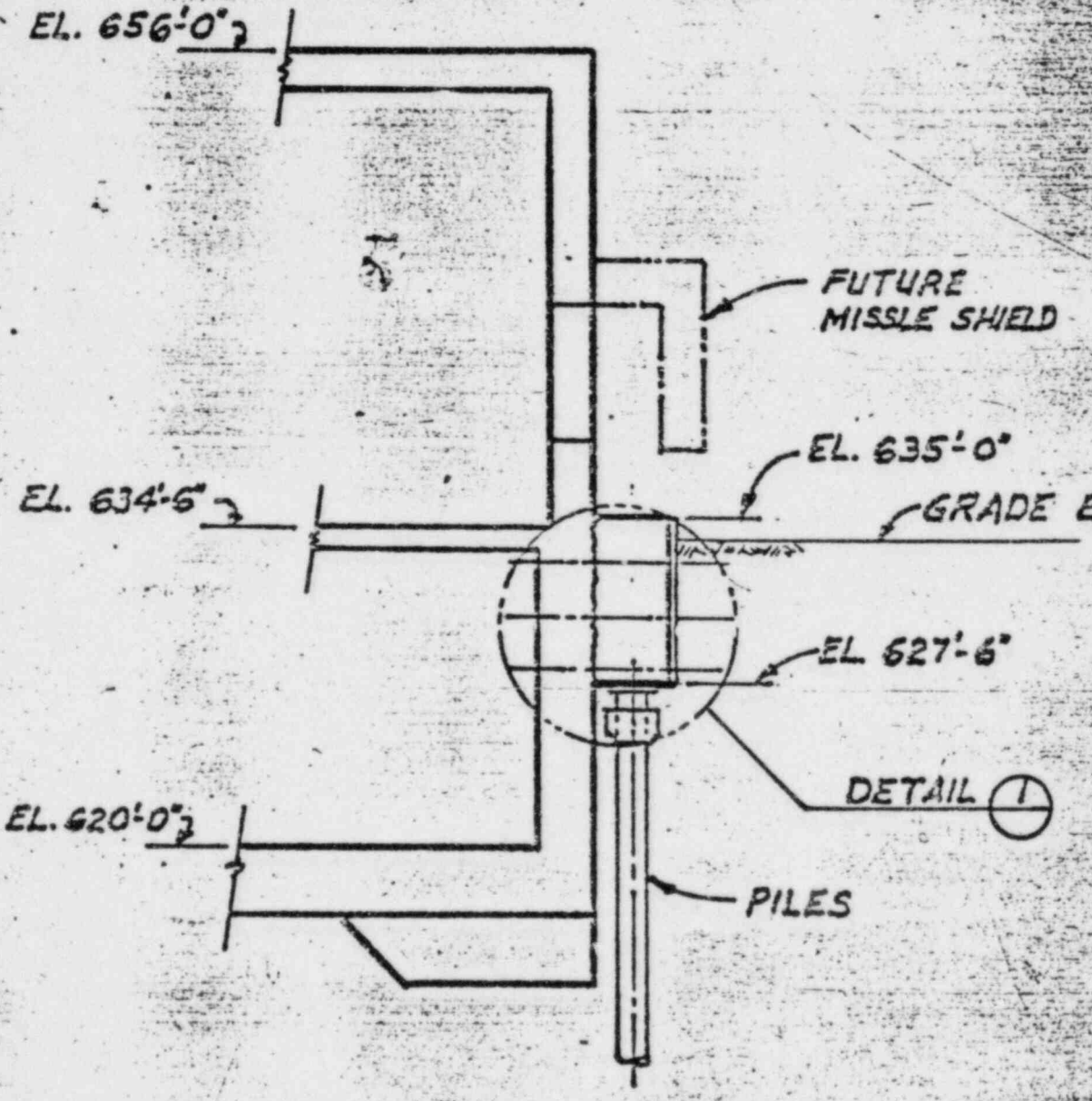
FIGURE 3

SECTION "A-A"

BORATED WATER STORAGE TANK
FOUNDATION & VALVE PIT

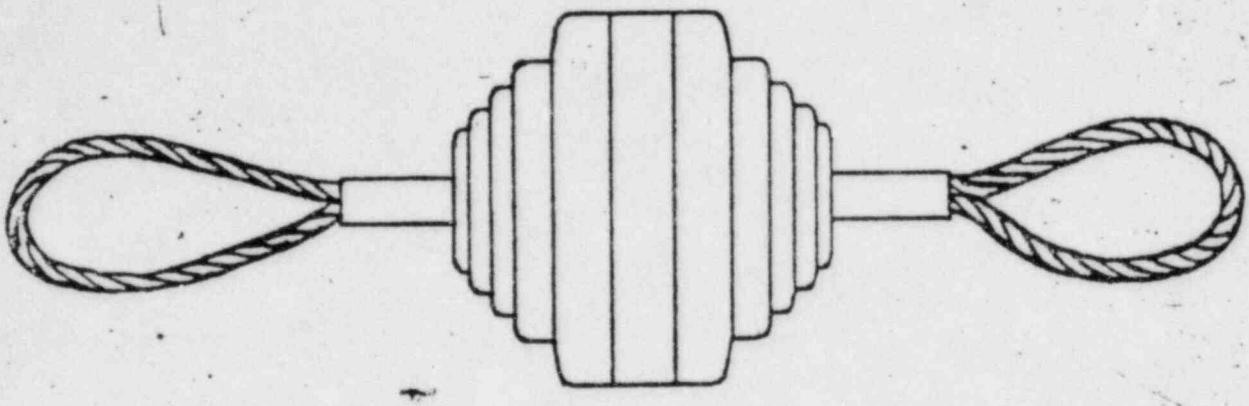
DL+LL+EQ = 2790^{K}

16 PILES @ 100^{Tons}/PILE = 3200^{K}



SECTION B

FIGURE 4



INSIDE DIAMETER OF CONDUIT = $4\frac{1}{4}$"
OUTSIDE DIAMETER OF MANDREL = $3\frac{3}{4}$"

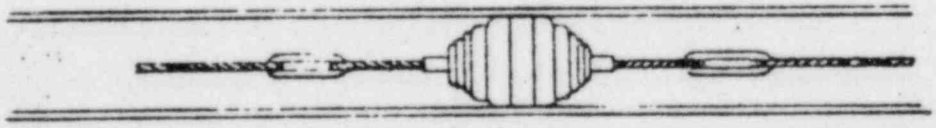
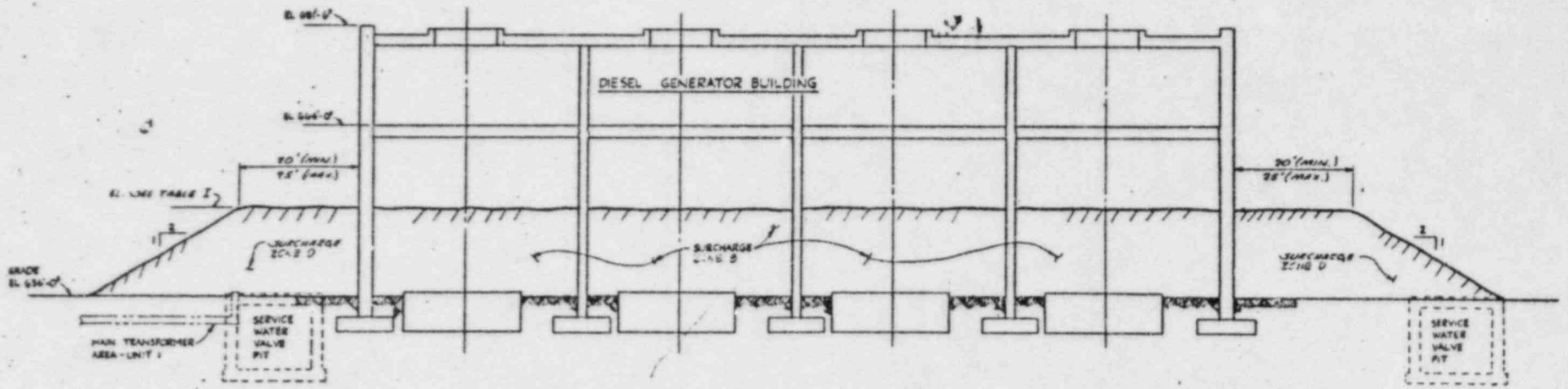


DIAGRAM OF MANDREL (RABBIT) USED TO CHECK CONDUITS

MIDLAND PLANT UNITS 1 & 2 CONSUMERS POWER COMPANY
RABBIT FOR ELECTRICAL DUCT
FIGURE 5 | DATE 4-24-79



SECTION (B) SEE FIGURE 11

FIGURE 6

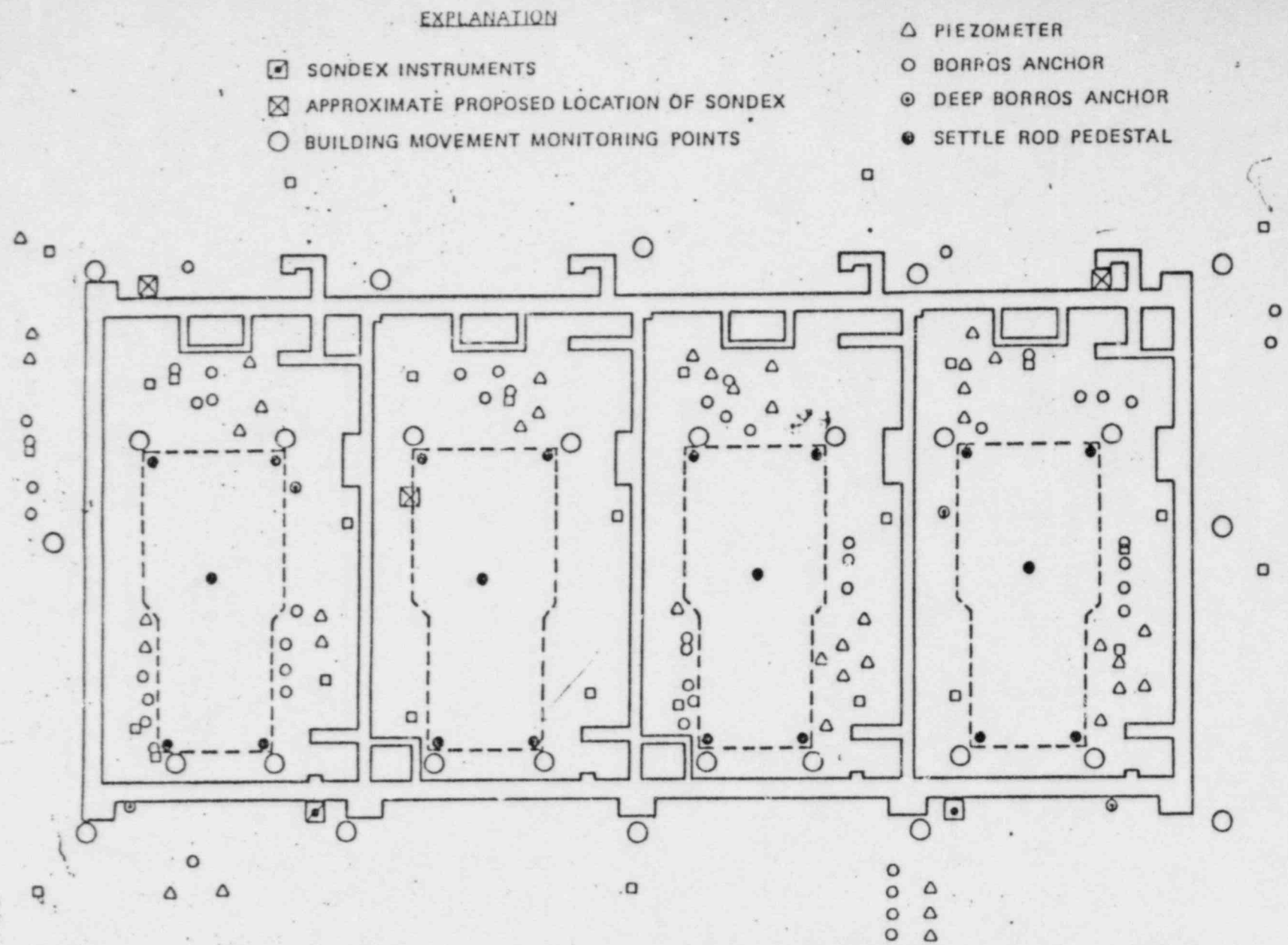
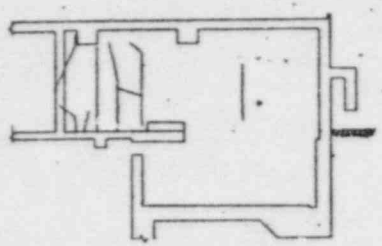
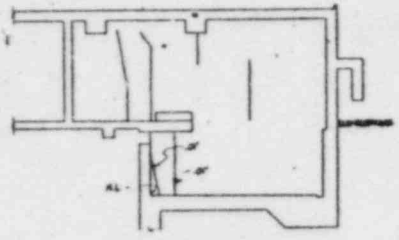

EXPLANATION
SONDEX INSTRUMENTS
APPROXIMATE PROPOSED LOCATION OF SONDEX
BUILDING MOVEMENT MONITORING POINTS
PIEZOMETER
BORROS ANCHOR
DEEP BORROS ANCHOR
SETTLE ROD PEDESTAL

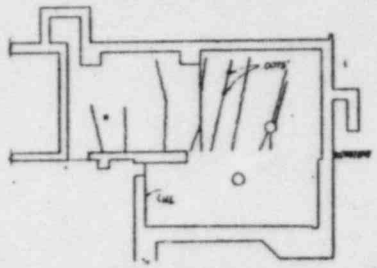
FIGURE 7



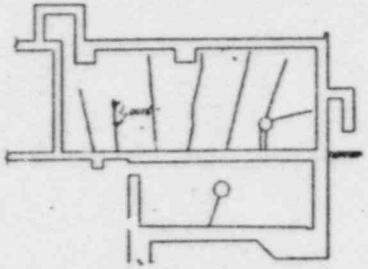
EAST WALL EAST FACE
LOOKING WEST



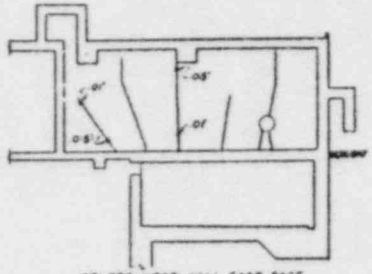
EAST WALL-WEST FACE
LOOKING WEST



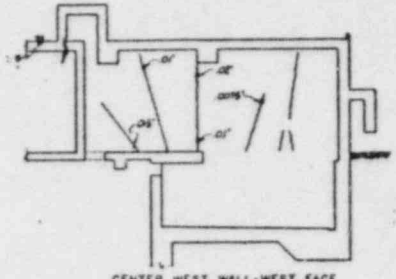
CENTER EAST WALL-EAST FACE
LOOKING WEST



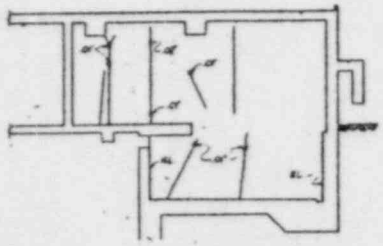
CENTER EAST WALL-WEST FACE
LOOKING WEST



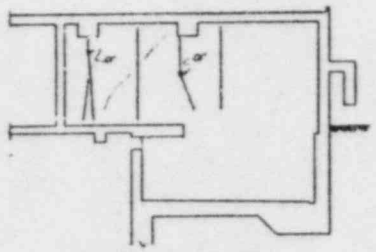
CENTER WEST WALL-EAST FACE
LOOKING WEST



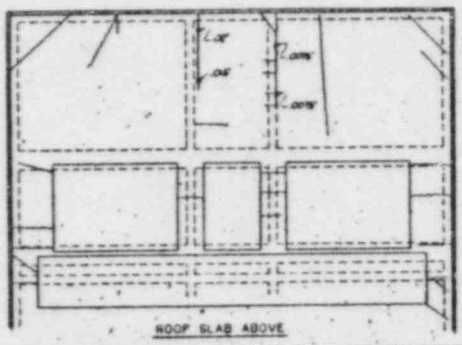
CENTER WEST WALL-WEST FACE
LOOKING WEST



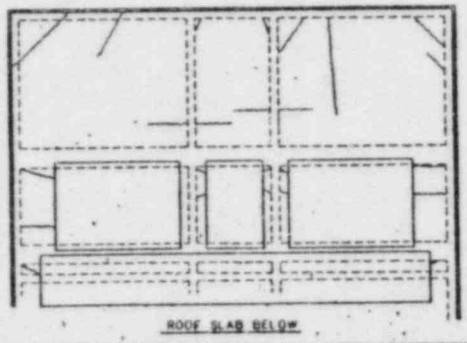
WEST WALL-EAST FACE
LOOKING WEST



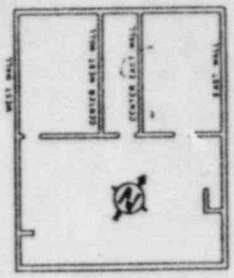
WEST WALL-WEST FACE
LOOKING WEST



ROOF SLAB ABOVE



ROOF SLAB BELOW



KEY PLAN

NOTES

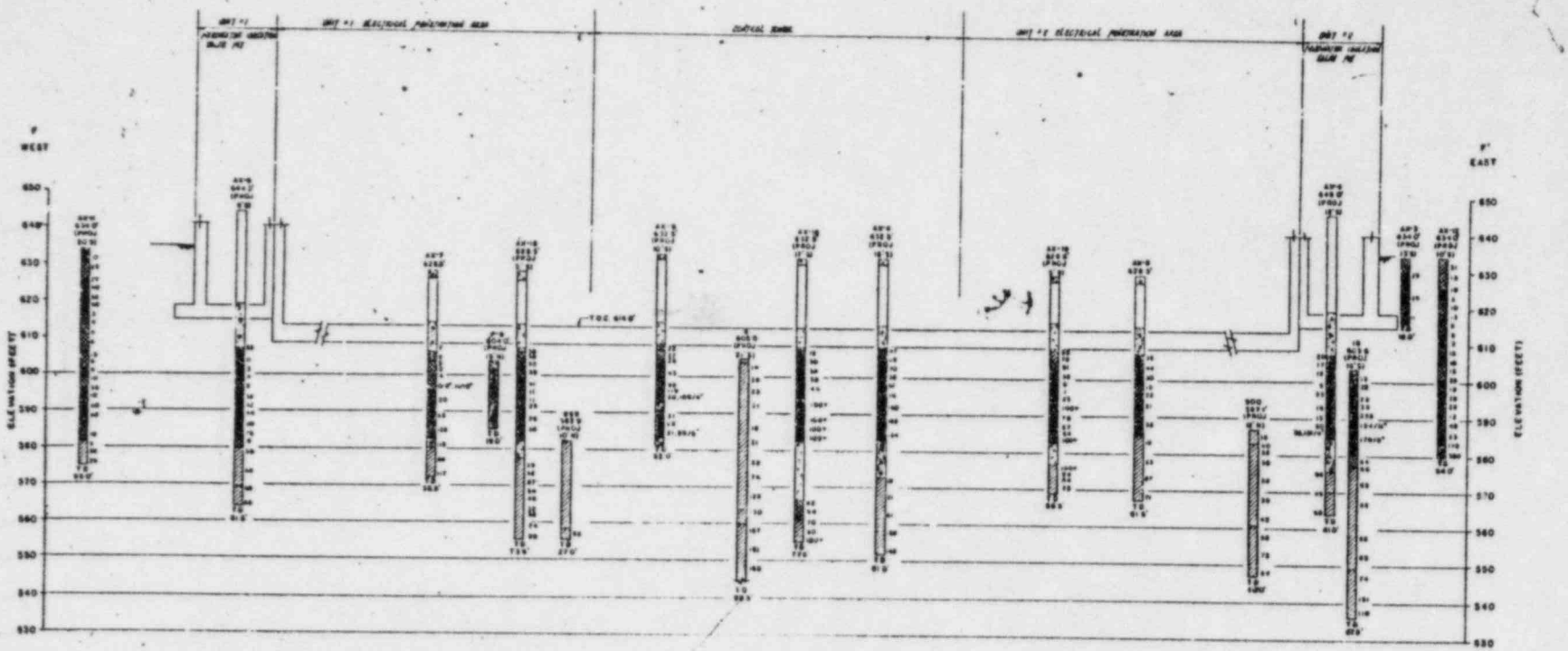
1. ALL CRACKS ARE HAIRLINE OR LESS THAN 1/64" THICK UNLESS NOTED

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY

SERVICE WATER PUMP STRUCTURE

CRACK MAPPING

FIGURE 8



LEGEND

- CLAY FILL
- SAND FILL
- SANDY GRAVEL (GW)
- CONCRETE
- CLAY (CL)
- SAND (SP)
- SILT (ML)

EXPLANATION

- BORING NUMBER
- GROUND SURFACE ELEVATION
- DISTANCE AND DIRECTION OF BORING TO SECTION LINE
- STANDARD PENETRATION BLOWCOUNT BLOWS/FOOT
- TOTAL DEPTH IN FEET

NOTES:

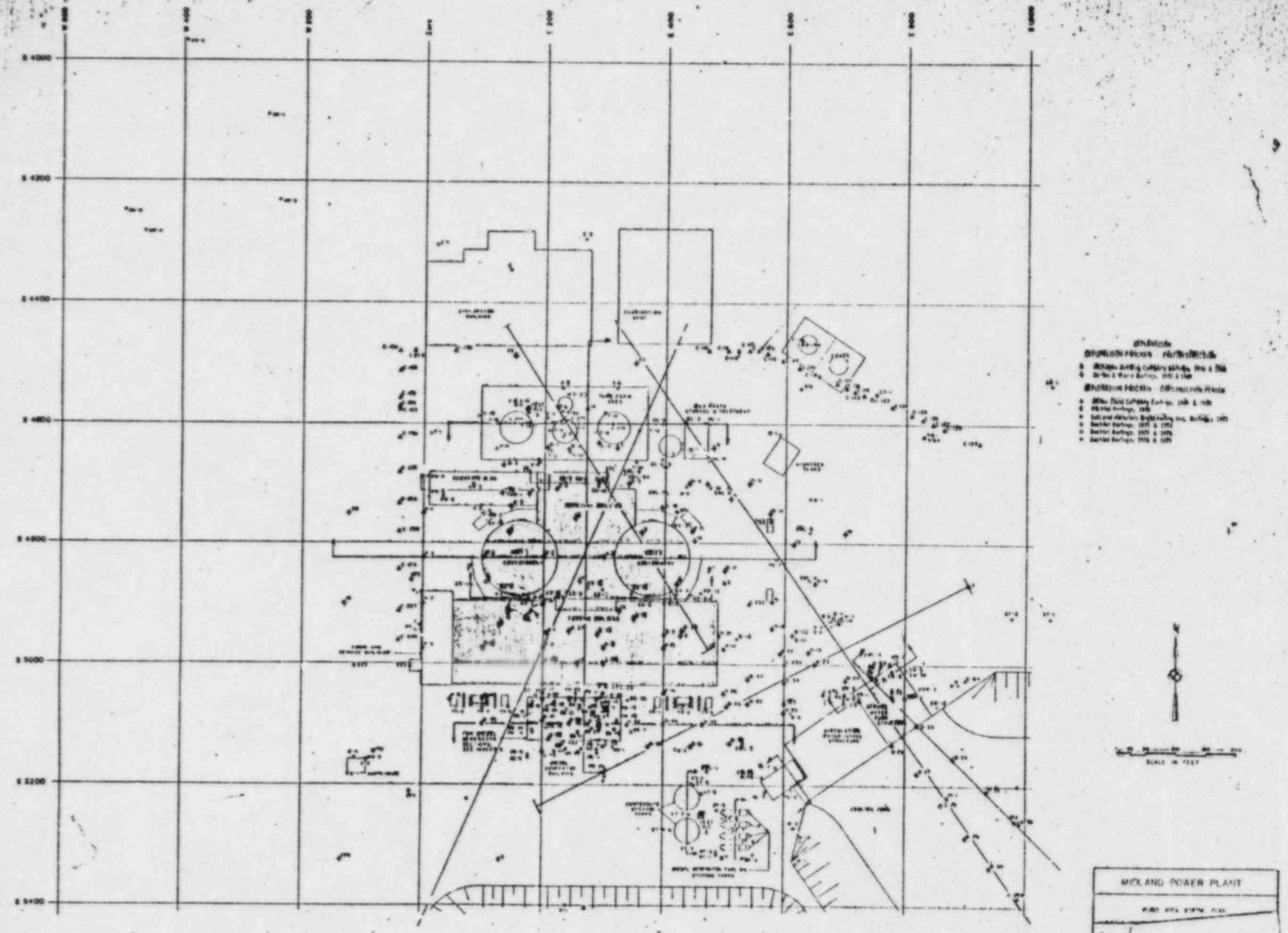
1. Borings P-8,4,15,899,& 900 were made for preconstruction exploration program before 1969. The remaining borings were made specifically for backfill investigation in 1978 & 1979.

SCALE IN FEET

MIDLAND POWER PLANT

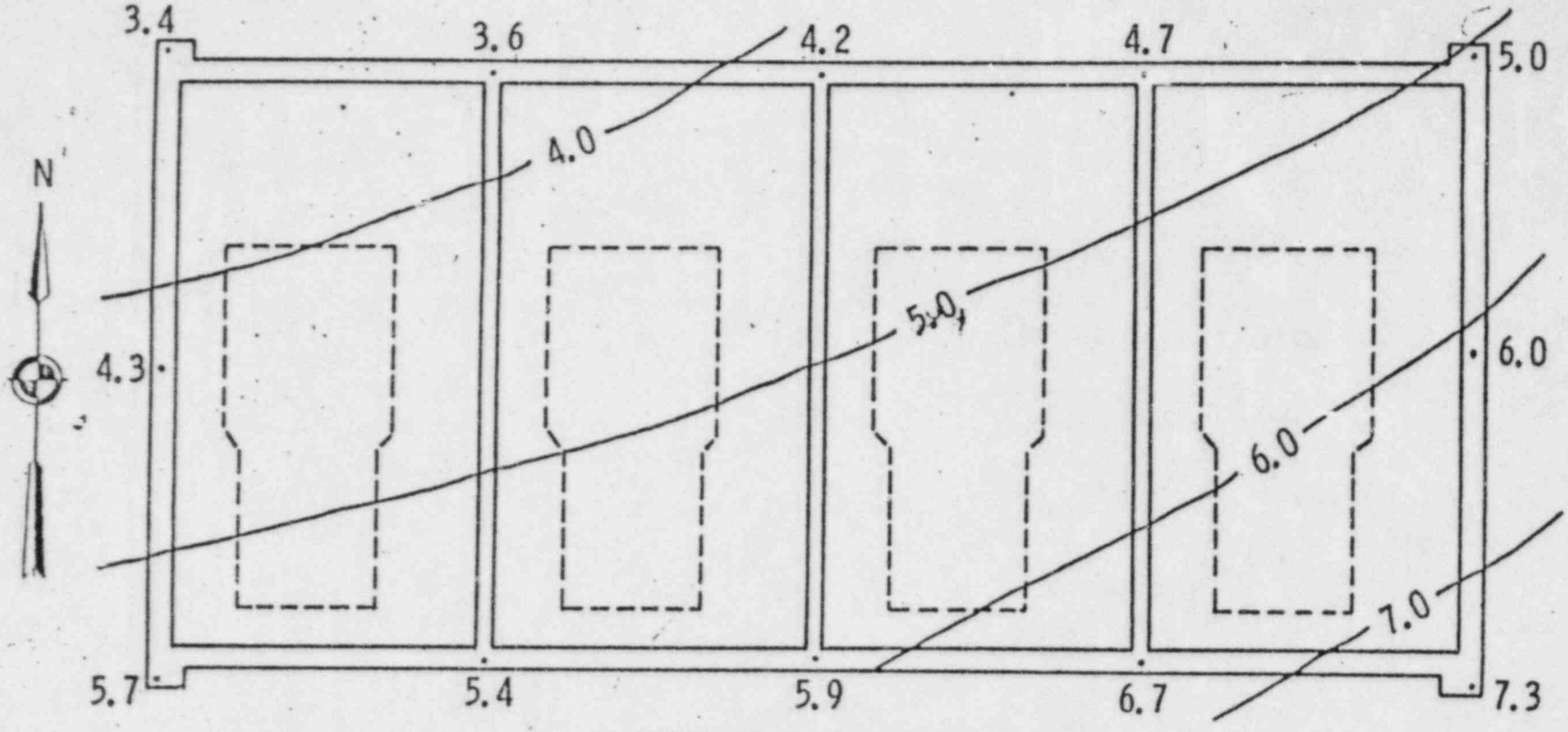
CROSS-SECTION F-F'
AUXILIARY BUILDING SOUTH

FIGURE 9



MIDLAND POWER PLANT

FIGURE 10

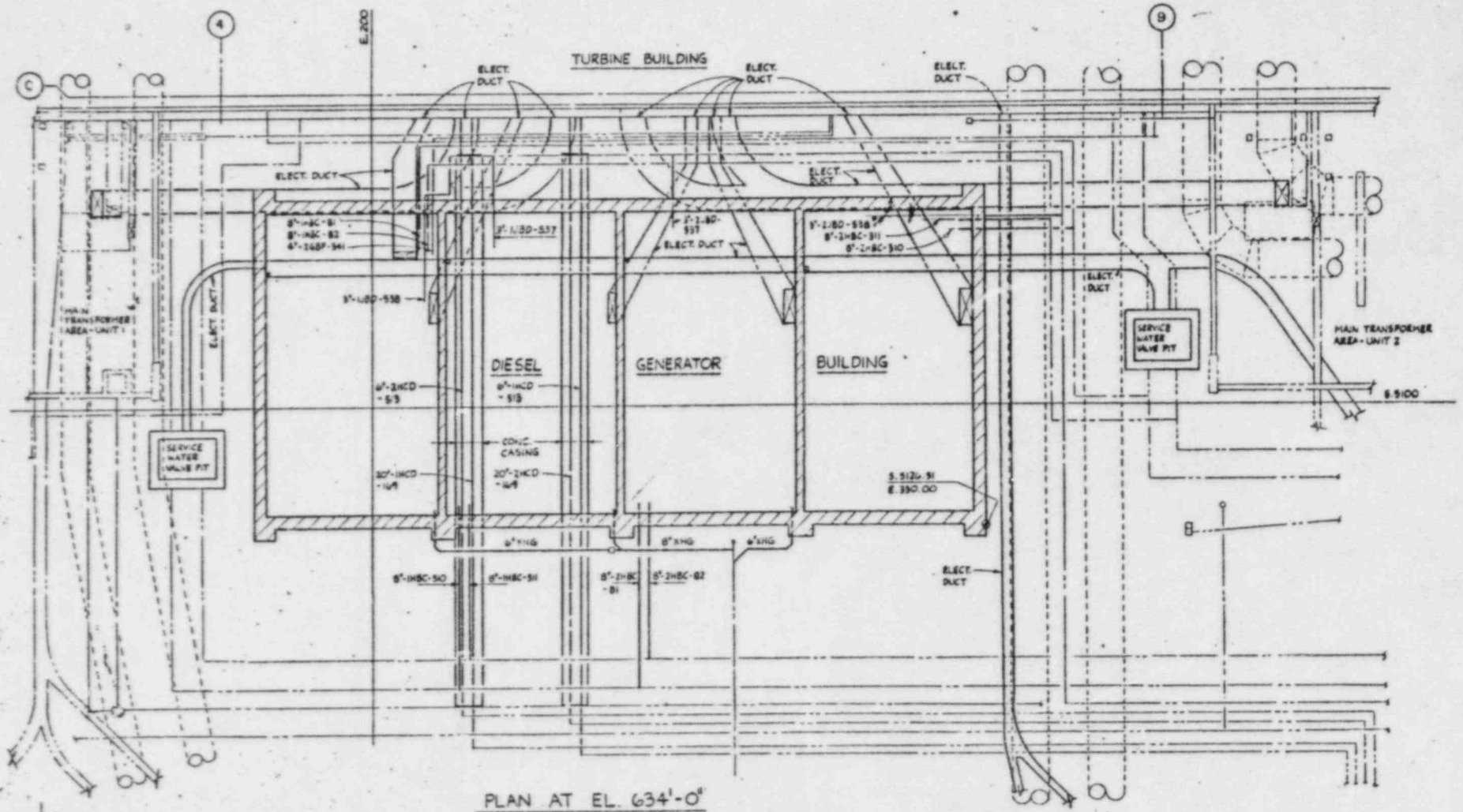


DIESEL GENERATOR BUILDING

TOTAL SETTLEMENT OF WALLS FROM 7-14-78 TO 6-29-79 IN INCHES

(20 FEET OF SURCHARGE)

FIGURE 11



PLAN AT EL. 634'-0"

FIGURE 12

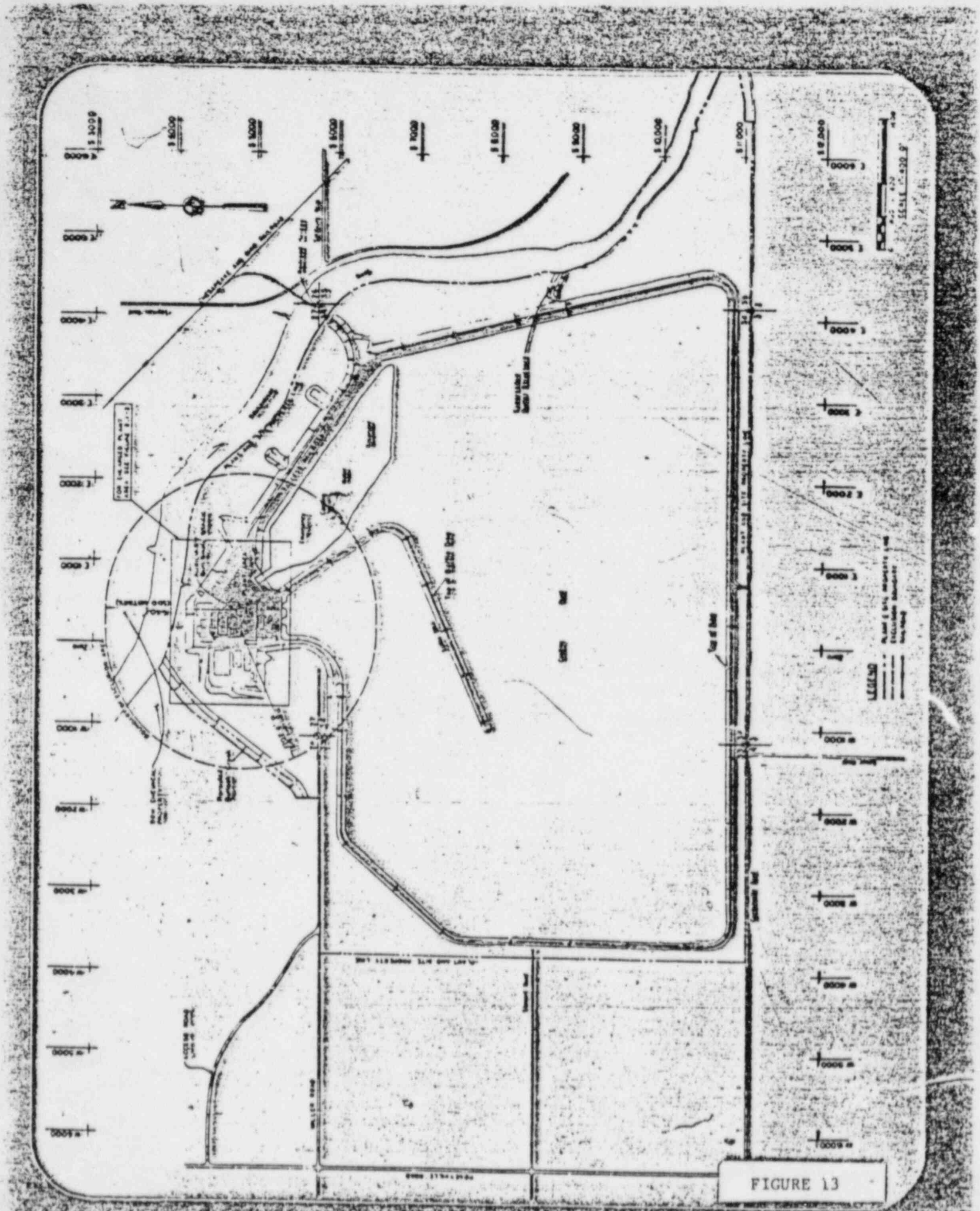


FIGURE 13

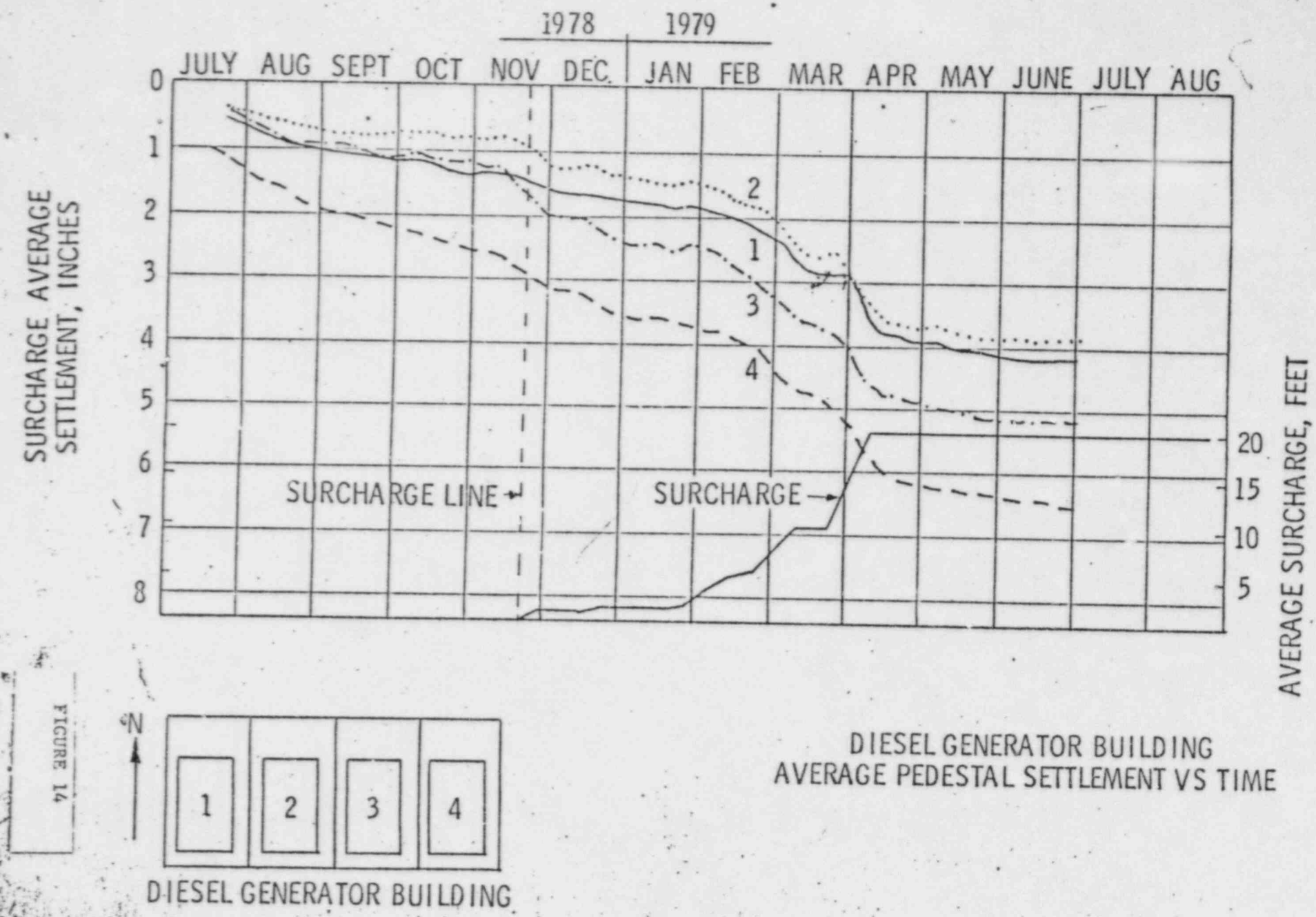
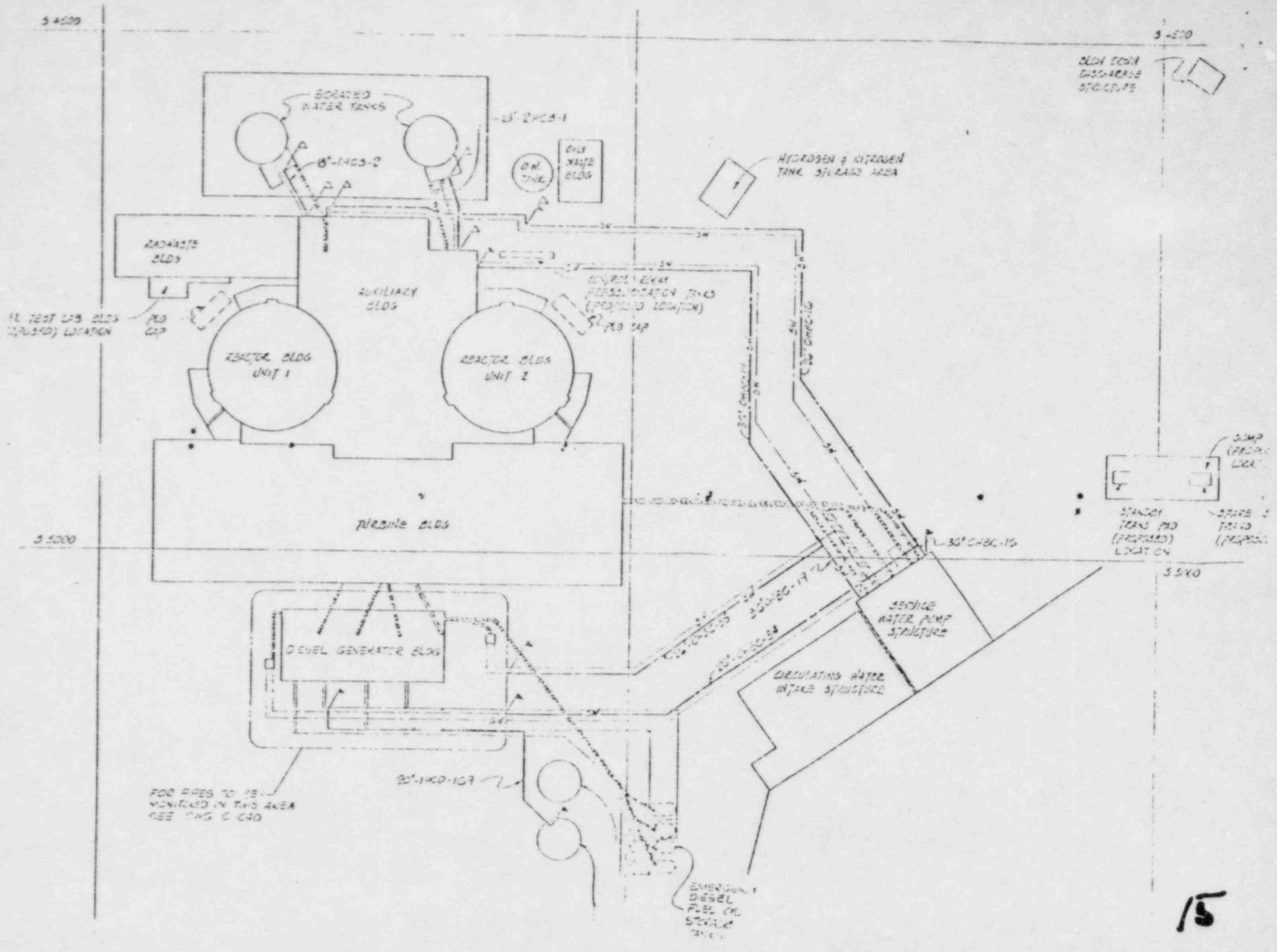
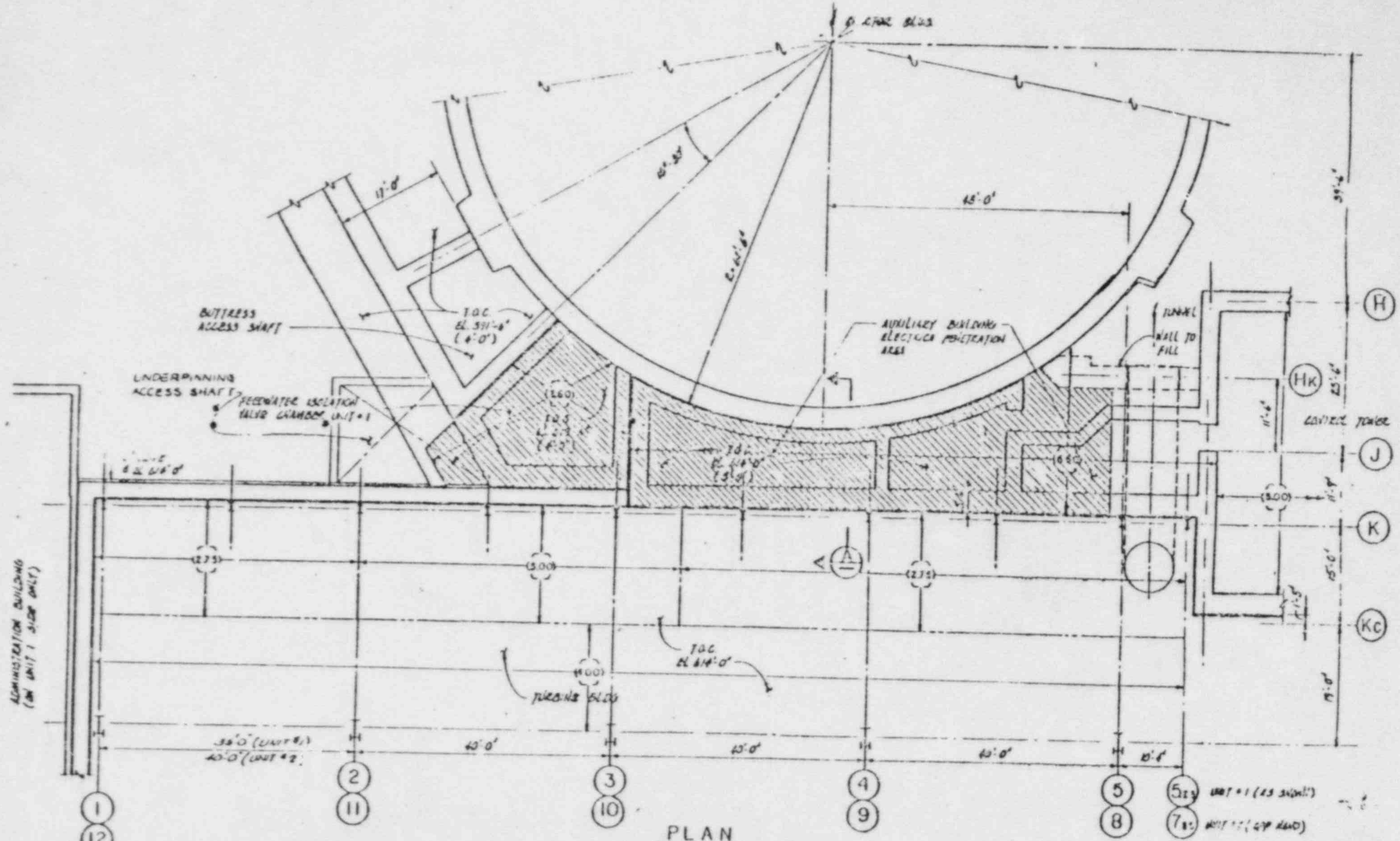


FIGURE 14

DIESEL GENERATOR BUILDING
AVERAGE PEDESTAL SETTLEMENT VS TIME

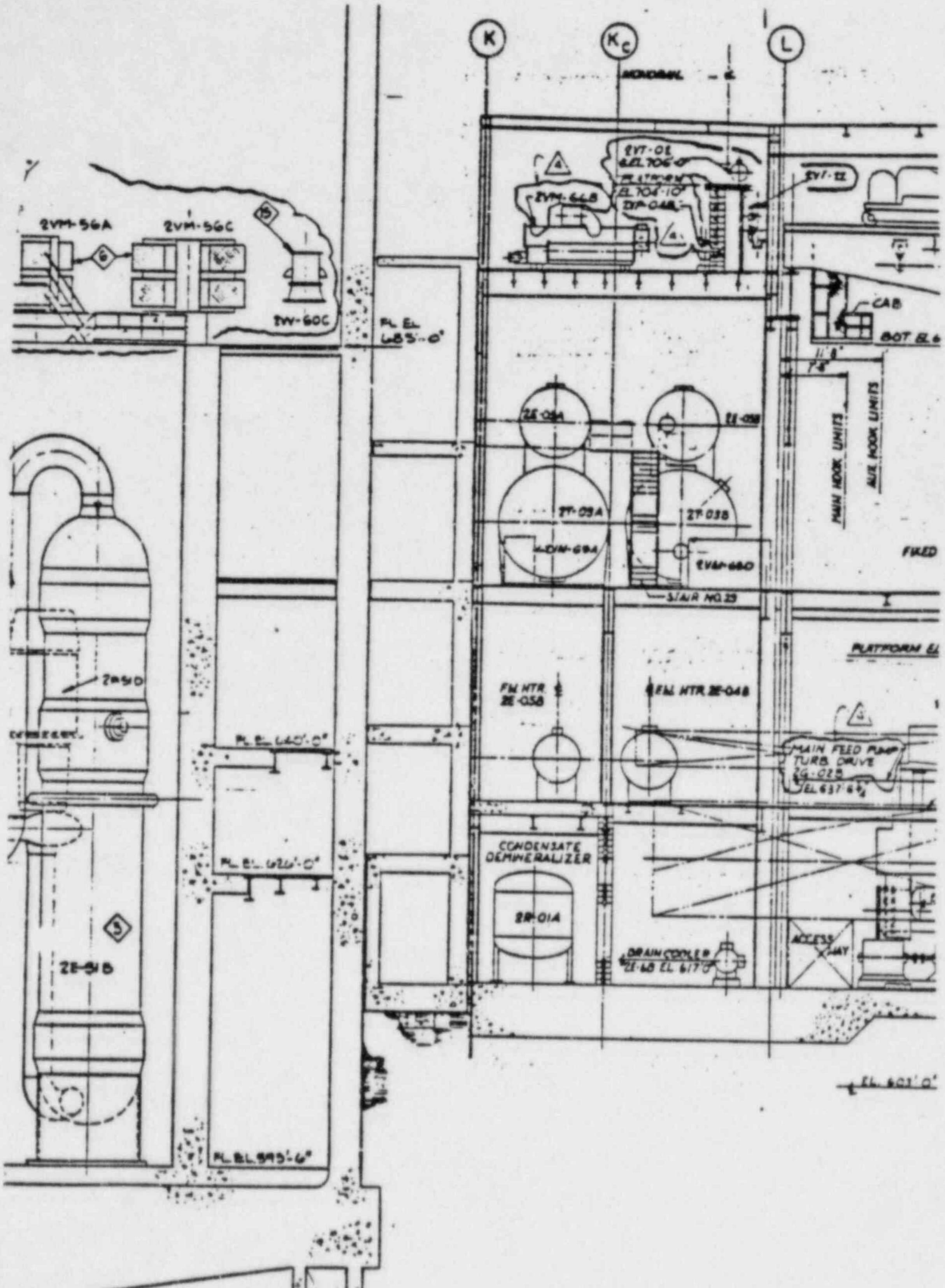

BORATED WATER TANKS
8"-1HCB-2
AUXILIARY BLDG
RADWASTE BLDG
REACTOR BLDG UNIT 1
REACTOR BLDG UNIT 2
TURBINE BLDG
DIESEL GENERATOR BLDG
O.W. TANK
OILY WASTE BLDG
HYDROGEN & NITROGEN TANK STORAGE AREA
BLOW DOWN DISCHARGE STRUCTURE
PLD CAP
SERVICE WATER PUMP STRUCTURE
CIRCULATING WATER INTAKE STRUCTURE
STANDBY TRANS PAD (PROPOSED) LOCATION
EMERGENCY DIESEL FUEL OIL STORAGE TANKS
FOR PIPES TO BE MONITORED IN THIS AREA SEE DWG C-C40
36"-OHBC-16
S 5000
S 4500
15



PLAN
SCALE: 1/8"=1'-0"

FIG. 29

16A


K
Kc
L
2VT-01
EL 706'-0"
EL 704'-10"
2VM-56A
2VM-56C
2VV-60C
FL EL 685'-0"
CAB
MAIN HOOK UNITS
AUX HOOK UNITS
2T-03A
2T-03B
STAIR NO. 23
FIXED
PLATFORM EL
FW HTR 2E-05B
FW HTR 2E-04B
MAIN FEED PUMP TURB DRIVE 2G-02B
FL EL 640'-0"
FL EL 626'-0"
CONDENSATE DEMINERALIZER
2R-01A
DRAIN COOLER
ACCESS WAY
2E-51D
2E-51B
FL EL 595'-6"
EL 603'-0"
TENDON GALLERY

16B

MEETING WITH NRC ON MIDLAND PLANT FILL STATUS AND RESOLUTION

February 27 & 28, 1980

Midland Site

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

ATTENDEES

Consumers Power

G. S. Keeley
T. C. Cooke
T. Thiruvengadam

Bechtel

Harris Burke
Sherif Afifi
Don Riat
Bimal Dhar
Bill Paris
Julius Rotc
Jim Wanzeck
Karl Wiedner
John Rutgers
Lynn Curtis
Al Boos
Chuck McConnel

Consultants

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

NRC

L. Heller
R. Jackson
J. Kane
T. Cappucci
F. Rinaldi
R. Gonzalis
F. Schauer
D. Hood
G. Gallagher
R. Cook

US Corp Of Engineers

N. Gehring
J. Grundstrom
B. Otto
W. Lawhead
P. Hadala

E-TEC

P. Chen
J. Brammer

US Navy Weapons Center

P. Huany
J. Matra

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

OCT 16 1979

Docket Nos. 50-329
and 50-330

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 & 2

SUBJECT: SUMMARY OF JULY 18, 1979 MEETING ON SOIL DEFICIENCIES AT THE MIDLAND PLANT SITE

On July 18, 1979, the NRC staff met in Bethesda, Maryland with Consumers Power Company and the Bechtel Corporation to discuss deficiencies in the fill used at the site for Midland Plant, Units 1 & 2. Also present were representatives of the ACRS staff. Meeting attendees are listed in Enclosure 1.

In response to NRC requests, the applicant has documented in detail the presentations given during this meeting. The presentations are contained in S. H. Howell's letter to J. G. Keppler dated August 10, 1979. In view of the August 10, 1979 letter, no summary of the presentations is contained herein. Rather, additional discussion consisting of comments and questions given during and following the presentations are summarized.

During the presentation regarding remedial work in progress or planned (item 3 of the presentations), the staff noted that underground piping from the borated water storage tanks and service water lines pass under railroad tracks, and that these and other piping are subject to loads due to construction cranes and other traffic. The staff requested the applicant to describe the design features and other measures which assure that such piping is not subjected to excessive loads. The applicant will respond at a later date.

The applicant noted that it is performing laboratory investigations of the stainless steel piping removed from the condensate storage tank. This underground piping was found to be heavily corroded. It was noted that the injection piping from BWST is of the same composition and is also unprotected from electro-chemical attack. The test-pits in the tank farm area which are being dug to investigate the effect of the air discharged from underground pneumatic lines was also described. Results will be reported shortly.

NOV 9 1979

The staff noted that the response to its 10 CFR 50.54 requests for acceptance criteria for remedial actions (e.g., questions 4, 6, etc.) had not resulted in identification of criteria in advance of the remedial action. Rather the reply notes that the criteria will be determined during or after the remedial action. The staff stated that this approach by the applicant does not provide for timely staff feedback at the outset, but rather the staff must await results of the program to determine what acceptance criteria were used and if they are acceptable. Thus, the remedial action is being conducted entirely at the applicant's own risk.

The applicant's presentation of the permanent site dewatering system (presentation item 3.8) noted that the system is not designed to seismic Category I requirements, but that the monitoring aspects of the system are safety grade. The NRC staff noted that acceptance criteria for the dewatering system are given in the Standard Review Plan (Section 2.4.13, Revision 1) and requested that the applicant address Branch Technical Position HMB/GSB 1, "Safety Related Permanent Dewatering Systems", Revision 1, attached thereto. The applicant will respond in the near future. The quality assurance plan for implementing the dewatering system will also be provided in future reports.

Bechtel described the structural and seismic analytical investigations being performed or planned for the affected structures (item 4 of the presentations). The staff noted that further review of the acceleration (g) value used for site design has been impacted by staff manpower restructuring for the TMI-2 investigations and that use of outside contractors for the Midland seismic review is presently being considered. The staff also noted that its present review indicates some areas of disagreement with the applicant's proposed loads combinations and design criteria for SSE and differential settlement, and with the treatment of cracks in structural walls. The staff will further document these and other positions at a later date.

Bechtel reported (item 7 of the presentations) the results of its investigations into the cause of insufficient compaction of the plant area fill, and identified five causes considered to be the most probable. The applicant noted its agreement with the Bechtel findings. Bechtel noted that personnel were not included as a most probable cause because its review of qualifications and experience of both Bechtel and US Testing personnel had shown presence of sufficient education, experience, and training to carry out the tasks assigned. The NRC staff noted that it disagrees with Bechtel's finding that personnel qualification was not a probable cause, and stated that further review of the basis for this Bechtel finding will be needed.

Staff comments regarding the QA/QC aspects (presentation item 8) were based upon the applicant's 10 CFR 50.54(f) responses to question 1 by letter of April 24, 1979:

(1) The applicant's response in item B.1 of Appendix I (page I-3) states its conclusion that "Specifications C-210 and C-211 provide sufficient criteria by which to ensure that the fill is adequately placed to prevent excessive settlement." The staff noted its disagreement with this statement. The staff noted, for example, that its I&E investigations show that the specifications did not require qualification of equipment used to compact material, the lift thicknesses permitted were excessive for adequate compaction, the moisture control was unclear and the compactive effort to develop 95% of compaction was internally in conflict within Specification C-210.

(2) The applicant's response in item B.2 of Appendix I (page I-3) noted that letters, TWX's, telecons, and memoranda are often used to clarify the intent of the specifications, and that "it is possible" that in some situations the clarification provided through such methods may have modified the specification without formally changing the wording of the specifications. The staff commented that a more positive statement appears to be warranted based upon the findings of I&E. Numerous examples where telecons and memoranda were used to change the requirements of the specifications without revising the controlled document itself was cited in I&E Inspection Report No. 50-329/78-20 and 50-330/78-20. I&E found that not only did these memoranda change the requirements of the specifications, but in some instances, conflicted with previous engineering directives.

(3) The staff noted that its review of QA aspects was continuing and that further requests for information would be issued.

At the conclusion of the presentations, the NRC staff noted that the information presented was significant to the present review, and requested that the applicant document and submit its presentations, including copies of the viewgraph slides used.

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

Enclosure:
As stated

cc: See next page

ENCLOSURE 1

ATTENDEES

July 18, 1979

Consumers Power Company

G. S. Keeley
J. E. Horn
T. Thiruveneadam
T. C. Cooke

NRC:NRR

D. S. Hood
D. M. Gillen
R. E. Lipinski
J. Gilray
F. Schauer
L. Heller
L. S. Rubenstein

NRC:OELD

R. Hoefling

NRC:IE

D. W. Hayes
G. Gallagher
J. B. Henderson

ACRS

D. Zukor
P. Tam

Bechtel*

T. E. Johnson (BPC)
P. A. Martinez (BPC)
K. Wiedner (BPC)
D. Riat (AA)
W. R. Ferris (SF)
H. Wahl (AA)
A. B. Arnold (SF)
B. Dhar (AA)
F. J. Hsiu (AA)
S. S. Afifi (AA)
G. Richardson (BPC)
A. J. Boos (BPC)
J. R. Davie (G)

Bechtel Consultants

R. B. Peck
R. Loughney
C. H. Gould

* BPC = Bechtel Power Corporation
AA = Ann Arbor, Michigan
SF = San Francisco, Calif.
G = Gaithersburg, Md.

Consumers Power Company

ccs:

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Isham, Lincoln & Beale
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Secretary
Consumers Power Company
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Frank J. Kelley, Esq.
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State of Michigan Environmental
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720 Law Building
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Mr. Wendell Marshall
Route 10
Midland, Michigan 48640

Grant J. Merritt, Esq.
Thompson, Nielsen, Klaverkamp & James
4444 IDS Center
80 South Eighth Street
Minneapolis, Minnesota 55402

Mr. Don van Farowe, Chief
Division of Radiological Health
Department of Public Health
P. O. Box 33035
Lansing, Michigan 48909

Mr. S. H. Howell
Vice President
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Settlement of Diesel Gen Foundations and Structures

During the rpt period the lic has completed adding 20 feet of sand in and around the diesel gen bldg. This is the max amount of sand planned for placement for preloading of the building.

The lic also informed the Res Insp that test pits pertaining to the [illegible] settlement [illegible] monitoring program are [illegible] scheduled for digging [illegible] for Nov [illegible] [illegible]. The lic indicated that they would attempt to give an approximate 2 week notice to the NRC prior to start of test pit excavation.

5-C Sa... 1979

DRAFT

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-329/79-16; 50-330/79-16

Docket No. 50-329; 50-330 License No. CPPR-81; CPPR-82

Licensee: Consumers Power Company
1945 West Parnall Road
Jackson, MI 49201

Facility Name: Midland Nuclear Power Plant, Units 1 and 2

Inspection At: Midland Site, Midland, Michigan

Inspection Conducted: ~~May 1-31, 1979~~ June 1 - July 11, 1979

Inspector: R. J. Cook
T. E. Vandel ((June 5-7, 1979)) ______________

Approved By: R. C. Knop, Chief ______________
Projects Section 1

Inspection Summary

Inspection on May 1-31, 1979 (Report No. 50-329/79-16; 50-330/79-16)

Areas Inspected: Examination of site conditions, settlement of diesel generator foundations and structures, strength capabilities of reactor building spray piping supports, inadequate soldered terminations in control panel status modules, information meeting with Congressman D. Albosta and aides, acts of malicious vandalism (cut wires in the control room and nails driven into three conductor power cable), hydrostatic testing of Unit 2 Incore Instrument Tank ~~to~~ 2T-87, ASME Section III qualification of auxiliary feedwater pump seal and lube oil coolers, audit of QA management functions. This inspection effort involved a total of 83 inspector-hours by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

7909040225

Licensee Action on Previous Inspection Findings

Reportable Deficiencies - 50.55(e) Items

Settlement of Diesel Generator Foundations and Structures

(Open) Item No. (329/78-13-03; 330/78-13-03): During the report period the licensee has kept the Resident Inspector informed of activities being performed pertinent to the settlement of the diesel generator building. The licensee has started digging of some selected test pits for further evaluations for the site settlement monitoring program. The licensee informed the Resident Inspector of these plans for digging test pits and the information was relayed to NRR and the Regional Office. On May 14-15, 1979, a Regional Based Inspector was onsite and reviewed the status of the settlement monitoring program. The results of his inspection efforts are documented in a separate NRC Inspection Report No. 50-329/79-10; 50-330/79-10.

Reactor Building Spray Piping Supports

On May 15, 1979, the licensee informed the Resident Inspector that the 50.55(e) item pertaining to the load carrying capability of the reactor building spray piping support would require additional review as the installed hangers are not compatible with the design

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

MAR 21 1979

Docket Nos: 50-329
50-330

Mr. S. H. Howell
Vice President
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Dear Mr. Howell:

SUBJECT: 10 CFR 50.54 REQUEST REGARDING PLANT FILL

At the meetings on February 23, 1979, and March 5, 1979 at the NRC Region III Office in Glen Ellyn, Illinois, the circumstances associated with settlement of the diesel generator building at the Midland facility were discussed. This discussion was part of the investigation being conducted by Region III. Representatives of the staff from headquarters attended the meeting on March 5, 1979. The staff stated that its concern is not limited to the narrow scope of the settlement of the diesel generator building but extends to the various buildings, utilities and other structures located in and on the plant area fill. In addition, the staff expressed concern with your quality assurance program.

Under the authority of Section 182 of the Atomic Energy Act of 1954, as amended, and Section 50.54(f) of 10 CFR Part 50, additional information is requested regarding the adequacy of the fill and your quality assurance program for the Midland site in order for the Commission to determine whether enforcement action such as license modification, suspension or revocation should be taken. Accordingly, please submit complete and adequate responses to the enclosed requests within thirty days after receipt of this letter. Your responses should be submitted by cover letter signed under oath or affirmation. In those cases in which a complete response must await the results of future activities, an interim reply should be given within thirty days addressing the adequacy of that activity to provide the basis for a suitable reply, and the associated schedules for that activity and reply.

Should you desire clarifications or other discussions of the enclosed requests, please contact our Division of Project Management.

Sincerely,

Harold R. Denton, Director
Office of Nuclear Reactor Regulation

Enclosure:
Requests for Additional
Information

cc: See next page

Consumers Power Company

MAR 21 1979

ccs:
Michael I. Miller, Esq.
Isham, Lincoln & Beale
Suite 4200
One First National Plaza
Chicago, Illinois 60670

Judd L. Bacon, Esq.
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Mr. Paul A. Perry
Secretary
Consumers Power Company
212 W. Michigan Avenue
Jackson, Michigan 49201

Myron M. Cherry, Esq.
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Frank J. Kelley, Esq.
Attorney General
State of Michigan Environmental
Protection Division
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Mr. Wendell Marshall
Route 10
Midland, Michigan 48640

Grant J. Merritt, Esq.
Thompson, Nielsen, Klaverkamp & James
4444 IDS Center
80 South Eighth Street
Minneapolis, Minnesota 55402

ENCLOSURE

Requests for Additional Information

Regarding Plant Backfill Settlement

1. Your quality assurance (QA) program, which falls under the provisions of 10 CFR 50, Appendix B, was applicable to the technical information that went into the PSAR and FSAR and the design and construction of the diesel generator building. In our view, the unusual settlement problem at the site points to an apparent lack of implementation of certain QA program requirements. Therefore, provide the following:

   (a) Identify those quality assurance deficiencies that contributed to this problem, the possibilities of these deficiencies being of a generic nature and affecting other areas of the facility, and describe the corrective actions you have taken to preclude these deficiencies from happening in the future;

   (b) What assurance exists that the apparent areas of contradictions in the PSAR and FSAR as described by I&E during the meetings of February 23, and March 5, 1979, do not exist in other sections of the PSAR and FSAR dealing with matters other than fill?

   (c) Investigate other activities not associated with the fill, but important to safety for other systems, components, and structures of the Midland facility, to determine if quality assurance deficiencies exist in view of the apparent breakdown of certain quality assurance controls; identify those items investigated and the results of your investigation;

   (d) Considering the results of your investigation in item (c) above, describe your position as to the overall effectiveness of your QA program for the design and construction of the Midland plant.

2. Discuss the consideration given to, and estimate the cost of, grouting any natural lacustrine deposits (sands) upon which safety related structures are founded.

3. During the meeting on March 5, 1979, you stated that on August 21, 1978, construction survey data indicated a settlement approaching the maximum value given in FSAR Figure 2.5-48. However, your response to staff request 362.12 by FSAR Revision 18 states, "In July 1978, the settlement of the diesel generator building exceeded the anticipated values shown in FSAR Figure 2.5-48." Clarify this apparent inconsistency.

4. Specify and justify the acceptance criteria which you will use to judge the acceptability of the fill, structures and utilities upon conclusion of the preload program. Compare these criteria with that to which the material was to have been compacted by the original requirements set forth in the PSAR. The response should consider all areas where preloading is either planned or in progress (i.e., diesel generator building, borated water storage tanks, diesel fuel oil storage tanks, Unit 1 transformer, condensate storage tanks, and others still under evaluation). Describe how conformance to these criteria will result in assurance that unacceptable residual settlements can not reasonably be expected to occur over the life of the plant. For each such area, state the extent of residual settlement which will be permitted and the basis for each limit.

5. To what extent will additional borings and measurements be taken after completion of preloading programs to ascertain that the material has been compacted to the original requirements set forth in the PSAR?

6. You propose to fill the borated water storage tanks and measure the resulting structure settlements.

   (a) On what basis do you conclude a surcharge no greater than the tank loading will achieve compaction to the extent intended by the criteria stated in the PSAR? What assurance is provided by the technique that residual settlement for the life of the plant will not be excessive?

   (b) A similar procedure is proposed for other tanks, including the diesel fuel oil storage tanks, and should also be addressed.

   (c) The borated water storage tanks have not yet been constructed and are to be located upon questionable plant fill of varying quality. Provide justification why these safety related tanks should be constructed prior to assuring the foundation material is suitable for supporting these tanks for the life of the plant. For example, can the tanks be removed with reasonable effort without significant impact?

7. Describe in detail how you will determine the adequacy of the electrical duct banks in view of the previous loading caused by contact of the diesel generator building foundation with these banks. Describe corrective measures which may be taken in the event of unacceptable results.

8. What tolerance is placed upon the alignment of the diesel generators and upon what is this limit based? How will the present differential settlement of the diesel generator pedestals be corrected? Discuss the extent

and rate of residual settlement of the diesel generator pedestals predicted over the life of the plant. In view of the variability of the foundation material indicated by Bechtel's Interim Report 4 to MCAR 24 which was forwarded by your letter of February 23, 1979, how can long term differential settlement be predicted with sufficient confidence to assure reliable startup and operation of the diesel generators when needed? What surveillance program (and inspection frequency) for the pedestals do you intend to conduct to assure detection of misalignment before these limits can be reached? What corrective action, and the basis therefor, do you propose if these limits should be approached?

9. Based on the information provided in your Interim Report Number 4, it appears that the tests performed on the exploratory borings indicate soil properties that do not meet the original compaction criteria set forth in the PSAR and specification for soils work. Provide assurance that the soil under other Class I structures not accessible to exploratory boring meets the control compaction rquirements.

10. You have stated that the fill is settling under its own weight. What assurance is provided that the fill has not and will not settle locally under structures with rigid mat foundations, such as portions of the auxiliary building or service water pump structure?

11. In view of the variations indicated by present borings, what assurance exists that vertical borings taken adjacent to structures are sufficiently representative of fill conditions under the structure?

12. Document the condition of soils under all safety related structures and utilities founded on plant area fill or natural lacustrine deposits. Based on the results of investigations, compare the properties and performance of existing foundation materials under all expected loading conditions with those which would have been attained using the criteria stated in the PSAR. If the foundation materials are found to be deficient, discuss measures that will be taken to upgrade them to criteria stated in the PSAR.

13. How has the lack of compaction and the increase in soil compressibility affected soil-structure interaction during seismic loading and therefore the seismic response spectra used in design?

14. For all seismic Category I structures (including, but not limited to the diesel generator building) which are located on fill, provide the results of an evaluation showing which structure you predict may experience settlements in excess of that originally intended, and provide an evaluation of the ability of these structures to withstand the increased differential settlement. For the diesel generator building and/or any seismic Category I structure which exhibits cracking, evaluate the effects of the existing and/or anticipated cracks on the performance of the intended function of these buildings. The calculated stresses for seismic Category I structures at critical locations should be tabulated and compared to that of allowable stresses as stated in the appropriate ACI Codes.

15. For all seismic Category I structures which are partially located on fill and partially located on glacial till or original soils, provide a detailed evaluation of the ability of these structures to withstand the differential settlement. The possibility of not having a contact surface between the structures and the fill, due to settlement occuring prior to or during a seismic event, should be considered over the life of the plant.

16. Since the plant area fill is apparently settling under its own weight, what assurance exists that the fill has not and will not settle locally under piping in the fill, resulting in lack of continuous support and causing additional stress not accounted for in design?

17. Identify and document the current condition of all seismic Category I piping founded in the plant area fill. Include all piping founded in the plant area fill whose failure could adversely impact safety related structures, foundations and/or equipment. Also, discuss how Code - allowable conditions will be assured throughout plant life. If any essential piping has now or should later approach Code - allowable stress criteria, or cannot be determined, what measures will you take to alleviate these conditions?

18. For all seismic Category I piping and all piping whose failure could adversely impact safety-related structures and/or systems, whether buried or not, describe what evaluations you plan to conduct to assure that such piping can withstand the increased differential settlement between buildings, within the same building, or within the piping system itself without exceeding Code - allowable stress criteria. The potential influence due to differential seismic anchor movement should also be considered. Discuss what plans you have to assure compliance with Code - allowable stress criteria throughout the life of the plant.

19. The piping in fill under and in the vicinity of the diesel generator building could have deformations induced either prior to or during the preload program. What is the present status of any deformation in the piping and what ultimate deformations are predicted. If any deformations are or will be excessive, what actions are being or will be taken to correct the condition?

20. Provide assurance that the stress levels of all components (e.g., pumps, valves, vesssels, supports) associated with seismic Category I piping systems that have been or will be exposed to increased settlement will be within their code-allowable stress limits. Also, provide assurance that deformations of active pumps and valves installed in such systems will be kept within limits for which component operability has been established.

21. Your letter of December 21, 1978, on the settlement of the diesel generator foundations and building advised us that the use of a preload to densify the existing fill material in place had been selected as the major corrective action plan. Bechtel's Interim Report 3 to MCAR 24 forwarded by your letter of January 5, 1979, identifies six alternative plans for corrective action, from which your soil consultants have advised that only two suitable options exist at that time (i.e., the preload option or the option to remove and replace the building and fill material). We require the following additional information regarding the basis for selection of these two options:

    (a) Provide a cost comparison of the two options. Include, by major items, an estimate of the cost of replacing each safety related structure and utility (e.g., piping, cables, etc.) located on or in the questionable plant area fill.

        In the event the preload option should fail to provide acceptable results, what additional costs will have occurred which would not otherwise have resulted had the removal and replacement option been selected originally? Upon what items would these additional costs have been expended?

        What savings will have occurred if the preload option provides acceptable results, compared to selection of the removal and replacement option? In what areas will these savings have occurred?

    (b) Provide a detailed comparison of the impact on construction completion between the two options. What schedule penalty is associated with an unacceptable result for the option selected?

(c) Discuss for each option the probability of achieving the degree of compaction intended by the original requirements stated in the PSAR.

(d) What other significant factors influenced your selection?

22. The following information is required using the assumption that work is to stop on all activities related to construction of structures, systems and utilities affected by fill (whether such effect is either presently known or suspect), including any mechanical, electrical or civil activity involving a significant expenditure of funds:

(a) Identify any schedule impacts on construction completion dates as a function of months of delay over a period of 24 months.

(b) Identify any capital costs of the delay and quantify them.

(c) Identify any other cost or schedule impacts associated with a halt or suspension of construction for a period of 3 months, 6 months, 9 months, 12 months, 18 months, and 24 months.

(d) Identify the principal construction activities which are to take place over the next 24 months, with particular reference to those activities associated with structures, systems, components and utilities affected by fill settlement, whether such settlement is either known or suspect.

(e) For those activities identified in response to item (d) above, identify each which is significant in terms of weight addition to structures founded totally or partly on or in fill.

(f) Identify all alternative solutions associated with the plant area fill settlement which would be foreclosed by continuation of any of the above activities.

LICENSEE REPORTS PER 10 CFR 50.55(e)

SECTION I - INFORMATION

FACILITY _____ TIME _____ DATE _____

PERSON CALLING _____ PERSON RECEIVING _____

EVENT DATE AND DETAILS _____

FINAL/INTERIM REPORT DUE 20 Oct, 1978 RECEIVED _____

SECTION II - NOTIFICATION

☐ MORNING REPORT ☐ PAO ☐ HQ ☐ PN

☐ OTHER _____

☐ INSPECTOR/TEAM DISPATCHED TO SITE

SECTION III - ASSIGNMENT

☐ EVALUATE REPLY ☐ EVENT LATER DETERMINED NOT REPORTABLE

☐ CONDUCT VERIFICATION INSPECTION

OTHER INFORMATION/INSTRUCTIONS _____

ASSIGNED ☐ PROJECT ☐ ENGINEERING I ☐ ENGINEERING II

DATE _____ INSPECTOR _____

REQUIRED COMPLETION DATE _____

SECTION IV - CLOSEOUT

☐ ADEQUATE REPLY RECEIVED NO VERIFICATION INSPECTION

COMPLETED BY _____ DATE _____

NONCONFORMANCE REPORT

1. PROJECT NAME: Midland Units 1 & 2
JOB NO.: 7220
19. NO. 1482
20. PAGE 1 OF 2

2. UNIT(S): Common
3. DRAWING/PART NO.: N/A
REV: N/A
4. ITEM DESCRIPTION: Building Settlement
5. ITEM LOCATION: Diesel Gen. Bldg.

6. P.O. OR SPEC NO.: N/A
7. SERIAL NO.: N/A
8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A
9. SOURCE: Construction
10. CONTRACTOR/SUPPLIER: N/A

11. INSPECTION CRITERIA ( ) DV ( ) SPEC (X) OTHER — IR NO. N/A NO. Survey
12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO
13. SKETCH ATTACHED (X) YES ( ) NO
14. Discovered During ( ) Rec'g (X) Const ( ) Test
15. Equip Furnished By ( ) Client ( ) Eng (X)

16. NONCONFORMING CONDITION: The attached sketch identifies settlement of the Diesel Generator Foundations and Structure. In addition the mud mat between the E/Wall and Generator has spalled and has been displaced. "Q"-List #1.40. Hold for Engineering Disposition. 4 Hold Tags Applied.

17. REPORTED BY: [signature] DATE: 8-21-78
18. VALIDATED BY: [signature] for W.L.B. DATE: 8-21-78

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

PROJECT ENGINEERING TO EVALUATE AND SPECIFY ALL TESTING AND OTHER INVESTIGATION REQUIREMENTS TO RESOLVE THIS NONCONFORMANCE.
[signature]

23. PROJECT ENGINEERING DISPOSITION

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is

PROJECT FIELD ENGINEER — DATE
PROJECT ENGINEER — DATE
PROJ CONSTR QC ENGINEER — DATE
AUTHORIZED INSPECTOR — DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE
QC ENGINEER — DATE
AUTHORIZED INSPECTOR — DATE

Request Conditional Release to allow continuation of construction up to but excluding the placement of concrete. Corrections or removal can be accomplished without causing damage or contamination to the associated plant equipment or structure.

A J Baron 8-22-78 W. W. Gallen for J. W. B. 8-22-78

PFE Date PFQCE Date

W Dreisbach 8-22-78

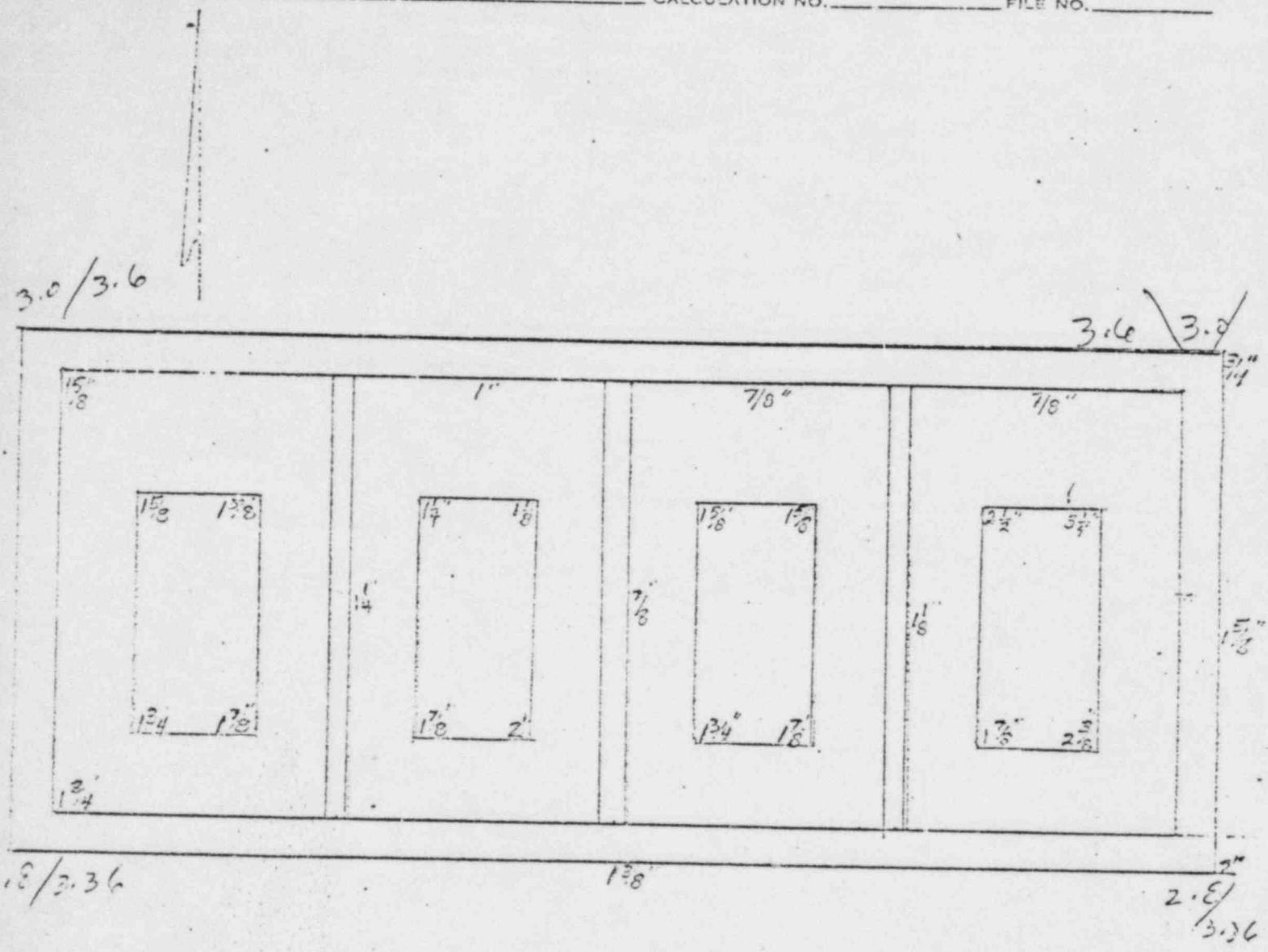
LQAE Date

CALCULATION SHEET

DESIGN BY _____ DATE 8-21-78 CHECKED BY _____ DATE _____ SHEET NO. _____

PROJECT _____ JOB NO. _____

SUBJECT _____ CALCULATION NO. _____ FILE NO. _____



note: figures shown are total settlements from theoretical plant elevation.

Page 3 of 3
NCR 1182

REGION III, DIRECTORATE OF REGULATORY OPERATIONS

DAILY REPORT - Const BRANCH

DATE - [illegible]

Facility/Licensee	Notification	Item or Event	Regional Action
Midland	Resident Inspector	Licensee notice of 50.55(e) [illegible] item. It has been determined that the [illegible] of soils under and around the diesel generator building is possibly less than when originally installed. This has resulted in a greater amount of settling of the Diesel Generator Building structure. Additional exploration and evaluation is being performed by the licensee and contractor.	

Submitted ____________________
Branch Chief

Corrective Actions - MCAR #24 (9/22/72)
BLC-6578

Possible methods for resolution depend on results of lab. tests

Options under investigation include

1) No corrective action
2) Modify strip foundations for walls to a continuous mat foundation for the entire bldg.
3) Preload & consolidate the soil under bldg.
4) Combine 2 & 3 above
5) Underpin the bldg to transmit loads directly to the undisturbed soil layer.
6) Remove & replace the bldg and fill material

5-C Soils Sett TAR, Dec 1979

Cook

OCT 24 1978

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

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

Gentlemen:

Thank you for your interim report dated September 29, 1978, pursuant to 10 CFR 50.55(e) regarding Settlement of Diesel Generator Foundations and Building. We will review your final report on this matter upon receipt.

Your cooperation with us is appreciated.

Sincerely,

R. F. Heishman, Chief
Reactor Construction and
Engineering Support Branch

cc: Central Files
Reproduction Unit NRC 20b
PDR
Local PDR
NSIC
TIC
Ronald Callen, Michigan Public
Service Commission
Dr. Wayne E. North
Myron M. Cherry, Chicago

7811010092

OFFICE ▶	RIII	RIII	RIII	RIII		
SURNAME ▶	Vandel/ls	Cook	Hayes	Heishman		
DATE ▶	Gallagher 10/23	10/21/78		10/23/78		

NRC Form 318A (RIII) (5-76) NRCM 0240 *U. S. GOVERNMENT PRINTING OFFICE: 1978-253

CONSUMERS POWER COMPANY

Stephen H. Howell
Vice President

General Offices: 1945 West Parnall Road, Jackson, Michigan 49201 • Area Code 517 788-0453

September 29, 1978
Howe-183-78

Mr J G Keppler, Regional Director
Office of Inspection and Enforcement
Region III
US Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR PLANT -
UNIT NO 1, DOCKET NO 50-329
UNIT NO 2, DOCKET NO 50-330
SETTLEMENT OF DIESEL GENERATOR FOUNDATIONS AND BUILDING

In accordance with the requirements of 10 CFR 50.55(e), this letter constitutes an interim report on the status of the settlement of the diesel generator foundations and building.

A description of the conditions relative to the settlements and the investigative actions planned are documented in the enclosures to this letter.

Another report, either interim or final, will be sent on or before November 17, 1978.

Enclosures: 1) Quality Assurance Program, Management Corrective Action Report, MCAR-1, Report 24, dated September 7, 1978.

2) Letter, P A Martinez to G S Keeley, BLC-6578, MCAR-24, Interim Report #1, dated 9/22/78, with attached report.

CC: Director, Office of Inspection & Enforcement
Att: Mr John G Davis, Acting Director, USNRC (15)

Director, Office of Management
Information and Program Control, USNRC (1)

OCT 2 1978

8006120823

Howe-163-T6

QUALITY ASSURANCE PROGRAM
MANAGEMENT CORRECTIVE ACTION REPORT
MCAR-1

REPORT NO. 24

JOB NO. 7220 Q NO. 1.40 DATE 9/7/78

I *DESCRIPTION (Including references):

The Bechtel "Foundation Data Survey Program" has indicated that the settlement of the Diesel Generator Building has been greater than expected. This has been documented in NCR-1482 dated (8/21/78). A preliminary evaluation of soil boring data from an investigation being conducted by Project Engineering indicated that the magnitude of the investigative tests and analysis of test results makes this item roportable under 10CFR50.55 e, 1, iii.

*RECOMMENDED ACTION (Optional)

1. Determine the amount of settlement of the Diesel Generator Building (DGB) and increase the frequency of foundation survey measurements to find if the settlement is or will be excessive.
2. Determine the cause of the settlement.
3. If the settlement is or will be excessive, determine what actions are required to correct the condition and preclude recurrence.

REFERRED TO [X] ENGINEERING [ ] CONSTRUCTION [ ] QA MANAGEMENT [ ] _____

W.J. Morin for
ISSUED BY L. A. Dreisbach 9/7/78
Project QA Engineer Date

II REPORTABLE DISCREPANCY

[ ] NO [X] YES NOTIFIED CLIENT 9/7/78 Date

Project Manager Date 9/7

III CAUSE

CORRECTIVE ACTION TAKEN

SEP 8 1978

QUALITY ASSURANCE

AUTHORIZED BY _____ Date

DISTRIBUTION:
- Project Manager
- Construction Manager
- Engineering Manager
- Project Engineer
- Proj. Supt. / Proj. Const. Mgr. or P & I Procurement Mgr.
- Chief Field QC Engineer or Procurement Insp. Mgr.
- QA Supervisor
- Client

J.B. Violette
S.I. Heisler
L.A. Dreisbach
J. Amaral (Gaithersburg)
J.E. Bashore (Norwalk)

FORMAL REPORT TO CLIENT _____ Date
(If Section II Applies)

CORRECTIVE ACTION IMPLEMENTED

VERIFIED BY _____
Project QA Engineer Date

*Describe in space provided and attach reference documents.

Bechtel Power Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

September 22, 1978

BLC-6578

Mr. G. S. Keeley
Project Manager
CONSUMERS POWER COMPANY
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
MCAR 24 INTERIM REPORT 1
Files 2417/2801

Dear Mr. Keeley:

Attached is Interim Report 1 addressing the Deisel Generator Building Settlement as described in MCAR 24 (issued September 7, 1978).

As agreed with W. R. Bird on September 21, 1978, the next report will be issued November 3, 1978.

Very truly yours,

for P. A. Martinez
Project Manager

PAM/WGM/pp

cc: Mr. R. C. Bauman
Mr. W. R. Bird
Mr. J. L. Corley
Mr. B. W. Marguglio

Attachment (5 pages).

Bechtel Associates Professional Corporation

Attachment to BLC-6578

SUBJECT: MCAR #24 (Issued 9/7/78)

Settlement of the diesel generator foundations and building

INTERIM REPORT # 1

DATE: September 22, 1978

PROJECT: Consumers Power Company
Midland Plant Units 1 & 2
Bechtel Job 7220

Introduction

This report summarizes the project's actions relating to the settlement of the diesel generator foundations and building as described in MCAR #24 and NCR 1482.

The fill material in this area was placed between 1975 and 1977. Construction was started on the diesel generator building in mid-1977. The diesel generator building settlements were noticed to exceed anticipated values in July 1978. The diesel generator building construction was placed on hold on August 23, 1978. A diesel generator building soil boring program was started on August 25, 1978. Based on preliminary soil boring data evaluation, MCAR #24 was issued.

The actions requested by MCAR #24 are being performed as follows:

1) The Foundation Data Survey Program, Specification 7220-C-76, has been expanded by increasing the number of data locations and the frequency of measurements.

2) The cause of the settlement and the corrective actions required to preclude the recurrence of this condition will be addressed after the testing and monitoring programs have been evaluated.

3) The options available to resolve the existing settlement conditions will be discussed in the Corrective Actions section.

Deficiency

The Bechtel Foundation Data Survey Program (Specification 7220-C-76) generated data that indicated the settlement of the diesel generator foundations and building was greater than anticipated. Nonconformance Report 1482 was generated on August 21, 1978, describing the settlements.

The general foundation and building settlements, as of September 19, 1978, are shown on Figure 1 (attached).

Due to the magnitude of the settlements observed, a soils boring program was started. Based on the borings completed to date, the fill under the building has variable strength properties ranging from good to poor.

Further clarification of the fill deficiency will be made when the soil test results have been completed and evaluated.

An independent soils consultant has been retained to help in the data evaluation and feasibility of the corrective actions.

Safety Implications

Large settlements can pose possible safety problems for buildings. A preliminary evaluation of soil boring data from the investigation being conducted indicates that the magnitude of the investigative tests and analysis of test results makes this item reportable under 10 CFR 50.55 e, 1, iii.

These structures are monitored for settlement as part of the foundation data survey program. Hence, any unusual settlement of the structure would be detected before the diesel generators would be rendered inoperable due to the resulting distortions.

Activities in Progress

Several activities are in progress to generate information needed to evaluate the feasibility of possible corrective actions. The activities are:

1) The Foundation Data Survey Program has been expanded to include additional settlement data locations as well as monitoring these data locations more frequently. Building time rate of settlement curves are being developed based on this datum for a better understanding of the problem.

2) A boring program has been initiated to provide better definition of the fill conditions under the building and to obtain soil samples for laboratory tests. Dutch cone penetration tests are also being performed under the building area to better define the variable strength properties of the fill material.

3) Laboratory tests being performed are:

   a. Shear strength tests to determine fill characteristic for bearing capacity evaluation

   b. Consolidation tests to predict building settlement for the present fill material

   c. Soil classifications

   d. Mineralogy tests to evaluate the swelling potential of the fill material

This portion of the Bechtel Report is deleted because it contains a premature discussion of possible corrective action options. Specific options will be included in subsequent reports following a complete evaluation of soil conditions.

Detailed descriptions of the selected options will be presented in subsequent reports.

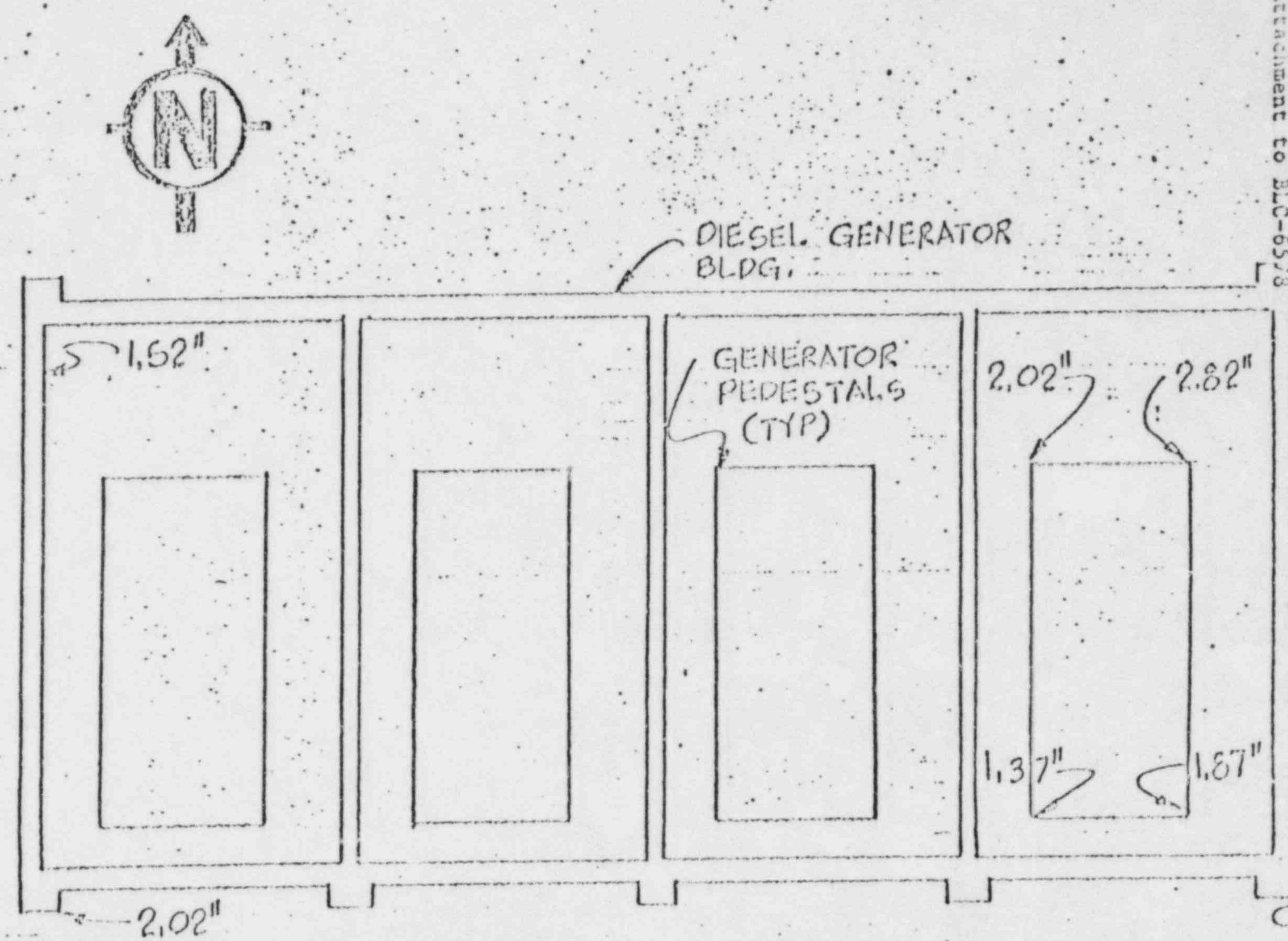
Submitted by: [signature]

Approved by: [signature]

Concurrence by: [signature]

JH/cap
9/19/6

Attachment to BLC-6578



DIESEL GENERATOR BLDG.

SETTLEMENT DATA AS OF 9-19-78

No.	DATE	REVISIONS	BY	CH'K
1	9-22-78	ISSUED FOR INFO. TO MCAR # 24, INTERIM REPORT # 1	PS	

ORIGIN

CONSUMERS POWER COMPANY
MIDLAND PLANTS UNITS 1 AND 2
MCAR # 24

JOB No. 7220

SPEC/DES GUIDE No

Procedure FCP No. 11 was developed to allow hydraulic tensioners to be used for setting the steam generator and reactor holddown bolts at the pretension level established by Drawing No. 3760, Revision 8. During the reporting period, tensioning of Unit 2. North Steam Generator holddown bolts were witnessed. The above referenced procedure was being applied at this time.

Reportable Deficiencies - 50.55(e) Items

Settlement of Diesel Generator Foundations and Structures

(Open) Item of Noncompliance (329/78-13-03; 330/78-13-03): During the reporting period the licensee has informed the Resident Inspection of additional soil borings and data wich have been taken pertinent to monitoring the settlement of the diesel generator building. The preliminary qualitative results of this data was subsequently relayed to Regional Office Personnel. A Regional Based Inspector performed an inspection onsite on March 28 and 29, 1979, to perform a quantitative review of the settlement monitoring program (NRC Inspection Report No. 50-329/79-06; 50-330/79-06).

Jan. 1979 file

(5)

Licensee Action on Previous Inspection Findings
Reportable Deficiencies - Seismic Design
Settlement of Diesel Generator Foundation and Structure
Open (Item No. 329/78-13-03; 330/78-13-03)

The licensee has kept the Resident Inspector informed of some of the activities being performed pertinent to the settlement of the diesel generator building during the reporting period. This information was subsequently relayed to personnel from the Regional office involved in investigating this event. These personnel were on site on January 22-25, 1979 to review information and/or activities pertaining to the building settlement. The licensee has started to add preloading sand into and around the diesel generator building during the reporting period.

Class 1E Battery Racks, Seismic Design

During the report period the Resident Inspector was informed that Bechtel Corporation had not accepted design change drawings for Class 1E battery racks to upgrade the design to withstand a seismic event and limit the

[illegible] the licensee completed an inspection of all safety related (Q-listed) equipment on site using States terminal blocks. This involved inspecting 53 equipment items. No loose links were found and all links examined used standard hexagon nuts in conjunction with compatible modified terminals.

(Open)(330/78-21-01) During the reporting period the status of B&W noncompliance reports (NCR's) No. 136 and 141 were reviewed. These NCR's pertain to an elevation mismatch between the B&W installed portion of the core flood system and the Bechtel Corporation installed portions. Final disposition has not been completed.

Dec, 1978 file

<u>Reportable Deficiencies - 50.55e Items</u>

<u>Settlement of Diesel Generator Foundations and Structures</u>

Open (Item No. 329/78-13-03; 330/78-13-03):

The licensee has kept the Resident Inspector informed of activities being performed during the reporting period which are pertinent to the settlement of the diesel generator building. During the reporting period, the licensee placed approximately

(closed) (329/78-13-01; 330/78-13-01): During the reporting period the orientation of the impellers with respect to the discharge canes for decay heat removal pumps with serial numbers 69080, 69081 and 69082 was examined by the inspector and licensee. The orientation of all impellers appear to agree with shaft rotation and discharge orientation as indicated on B+W Canada Instr. Drawing No. 71-500-013C.

Reportable Deficiencies - 50.55e Items

Settlement of Diesel Generator Foundations and Structures

Open (Item No. 329/78-13-03; 330/78-13-03): The licensee has kept the Resident Inspector informed of evaluations being performed which are pertinent to the settling of the diesel generator building and foundations. This information has subsequently been relayed to the Regional Office and NRR. The licensee is installing instrumentation on footing under and in proximity to the diesel generator building. Dust boards under the diesel generator building have been cut free and [illegible] in relative value between the dust boards and the diesel generator building.

Dec., 1978 file

S-C Soils Sept 7th Dec 1979

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

November 1, 1978

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

MEMORANDUM FOR: H. D. Thornburg, Director, RCI, IE

FROM: James G. Keppler, Director, RIII

SUBJECT: MIDLAND 1 AND 2 - EXCESSIVE SETTLEMENT OF DIESEL GENERATOR BUILDING FOUNDATIONS (A/I F30437H1)

Pursuant to 10 CFR 50.55(e), Consumers Power Company (CPC) notified RIII on September 7, 1978 that the settlement of the Diesel Generator Building foundations was greater than anticipated and, therefore, a soils boring program was started to determine the cause and extent of the problem. A copy of CPC's report is attached.

An inspection was conducted at the Midland site on October 24-27, 1978 to review this matter, and the results will be documented in Inspection Report No. 50-329/78-12; 50-330/78-12. The following summarizes the pertinent inspection findings:

1. The excessive total and differential settlements of the Diesel Generator building foundation and generator pedestals appear to be the result of several contributing factors. These are: variable properties of random fill material used to support the structure, influence of condensate piping and electrical conduit banks under a portion of the building, percent compaction requirements, raising the natural ground water level approximately 20 feet by filling the cooling water pond, and the design and construction sequence of the generator pedestals and spread footing foundations for the building.

2. The FSAR specifies "controlled, compacted cohesive soils" be used as the supporting soils for the Diesel Generator Building, portions of the Auxiliary Building, Borated Water Storage Tank foundation, Diesel Fuel Oil Tank foundation, Radwaste Building and other structures. However, the supporting soil actually used for these structures was random fill material (Zone 2), which is defined as any material free of humus, organic or other deleterious material. The material included sand, silts, clay and lean concrete.

3. The applicable specifications, procedures and drawings contained conflicting requirements, were at variance with FSAR requirements and/or did not implement recommendations of the A-E's consultant (Dames & Moore) in such areas as: percent compaction requirements, lift thickness, required number of passes with specifie equipment and type of fill material.

4. Settlement of the structures listed in paragraph 2 above has been observed, and it continues to be monitored along with that of the Diesel Generator Building. The A-E categorizes the settlement of these structures as not as severe as tha. of the Diesel Generator Building at this time.

5. The A-E has contracted Goldberg, Zoino, Dunnicliff & Associates (Consultant in Geotechnical Engineering) to perform laboratory tests on soil samples obtained during the soils boring program including a series of soils classification tests and determination of engineering soils properties.

6. The final results of the A-E's investigative soils test program and the A-E's recommended alternatives and actions concerning the resolution of this problem are scheduled to be presented to CPC during the week of November 6, 1978. CPC is desirous of making a presentation concerning their plans on this matter to the NRC approximately one week after the meeting with their A-E.

In our view, this deficiency has the potential for affecting the design adequacy of several safety related structures at the Midland site. As such, we believe that the responsibility for evaluation and resolution of this problem should be transferred to NRR since their evaluation of the application is in progress. Additionally, we believe that this deficiency is relevant and material for Board notification pursuant to MC 1530 and, therefore, recommend that this matter be forwarded to NRR for Board notification.

If you have questions or comments, please contact us.

James G. Keppler
Director

Enclosure:
Letter from CPC
dtd 9/29/78

cc w/encl:
J. G. Davis
G. W. Reinmuth

Stephen H. Howell
Vice President

General Offices: 1945 West Parnall Road, Jackson, Michigan 49201 • Area Code 517 788-0453

September 29, 1978
Howe-183-78

Mr J G Keppler, Regional Director
Office of Inspection and Enforcement
Region III
US Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR PLANT -
UNIT NO 1, DOCKET NO 50-329
UNIT NO 2, DOCKET NO 50-330
SETTLEMENT OF DIESEL GENERATOR FOUNDATIONS AND BUILDING

In accordance with the requirements of 10 CFR 50.55(e), this letter constitutes an interim report on the status of the settlement of the diesel generator foundations and building.

A description of the conditions relative to the settlements and the investigative actions planned are documented in the enclosures to this letter.

Another report, either interim or final, will be sent on or before November 17, 1978.

Enclosures: 1) Quality Assurance Program, Management Corrective Action Report, MCAR-1, Report 24, dated September 7, 1978.

2) Letter, P A Martinez to G S Keeley, BLC-6578, MCAR-24, Interim Report #1, dated 9/22/78, with attached report.

CC: Director, Office of Inspection & Enforcement
Att: Mr John G Davis, Acting Director, USNRC (15)

Director, Office of Management
Information and Program Control, USNRC (1)

OCT 2 1978

7810060285

MANAGEMENT CORRECTIVE ACTION REPORT
MCAR-1

REPORT NO. 24

JOB NO. 7220 Q NO. 1.40 DATE 9/7/78

I *DESCRIPTION (Including references):

The Bechtel "Foundation Data Survey Program" has indicated that the settlement of the Diesel Generator Building has been greater than expected. This has been documented in NCR-1482 dated (8/21/78). A preliminary evaluation of soil boring data from an investigation being conducted by Project Engineering indicated that the magnitude of the investigative tests and analysis of test results makes this item reportable under 10CFR50.55 e, 1, iii.

*RECOMMENDED ACTION (Optional)

1. Determine the amount of settlement of the Diesel Generator Building (DGB) and increase the frequency of foundation survey measurements to find if the settlement is or will be excessive.
2. Determine the cause of the settlement.
3. If the settlement is or will be excessive, determine what actions are required to correct the condition and preclude recurrence.

REFERRED TO [X] ENGINEERING [ ] CONSTRUCTION [ ] QA MANAGEMENT [ ] _____

ISSUED BY W.J. Martin for L.A. Dreisbach 9/7/78
Project QA Engineer Date

II REPORTABLE DISCREPANCY

[ ] NO [X] YES

NOTIFIED CLIENT 9/7/78 Date
Project Manager Date 9/7/78

III CAUSE

CORRECTIVE ACTION TAKEN

SEP 8 1978
QUALITY ASSURANCE

AUTHORIZED BY _____ Date

DISTRIBUTION:
- Project Manager
- Construction Manager
- Engineering Manager
- Project Engineer
- Proj. Supt. / Proj. Const. Mgr. or P & I Procurement Mgr.
- Chief Field QC Engineer or Procurement Insp. Mgr.
- QA Supervisor
- Client

J.B. Violette
S.I. Heisler
L.A. Dreisbach
J. Amaral (Gaithersburg)
J.E. Bashore (Norwalk)

FORMAL REPORT TO CLIENT _____ Date
(If Section II Applies)

CORRECTIVE ACTION IMPLEMENTED

VERIFIED BY _____ Date
Project QA Engineer

*Describe in space provided and attach reference document.

BPC 20583
G1001451-01

Bechtel Power Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

MAIL ADDRESS: P.O. Box 1000, Ann Arbor, Michigan 48106

September 22, 1978

BLC-6578

Mr. G. S. Keeley
Project Manager
CONSUMERS POWER COMPANY
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
MCAR 24 INTERIM REPORT 1
Files 2417/2801

Dear Mr. Keeley:

Attached is Interim Report 1 addressing the Deisel Generator Building Settlement as described in MCAR 24 (issued September 7, 1978).

As agreed with W. R. Bird on September 21, 1978, the next report will be issued November 3, 1978.

Very truly yours,

for P. A. Martinez
Project Manager

PAM/WGM/pp

cc: Mr. R. C. Bauman
Mr. W. R. Bird
Mr. J. L. Corley
Mr. B. W. Marguglio

Attachment (5 pages).

Bechtel Associates Professional Corporation

Attachment to BLC-6578

SUBJECT: MCAR #24 (Issued 9/7/78)

Settlement of the diesel generator foundations and building

INTERIM REPORT # 1

DATE: September 22, 1978

PROJECT: Consumers Power Company
Midland Plant Units 1 & 2
Bechtel Job 7220

Introduction

This report summarizes the project's actions relating to the settlement of the diesel generator foundations and building as described in MCAR #24 and NCR 1482.

The fill material in this area was placed between 1975 and 1977. Construction was started on the diesel generator building in mid-1977. The diesel generator building settlements were noticed to exceed anticipated values in July 1978. The diesel generator building construction was placed on hold on August 23, 1978. A diesel generator building soil boring program was started on August 25, 1978. Based on preliminary soil boring data evaluation, MCAR #24 was issued.

The actions requested by MCAR #24 are being performed as follows:

1) The Foundation Data Survey Program, Specification 7220-C-76, has been expanded by increasing the number of data locations and the frequency of measurements.

2) The cause of the settlement and the corrective actions required to preclude the recurrence of this condition will be addressed after the testing and monitoring programs have been evaluated.

3) The options available to resolve the existing settlement conditions will be discussed in the Corrective Actions section.

Deficiency

The Bechtel Foundation Data Survey Program (Specification 7220-C-76) generated data that indicated the settlement of the diesel generator foundations and building was greater than anticipated. Nonconformance Report 1482 was generated on August 21, 1978, describing the settlements.

The general foundation and building settlements, as of September 19, 1978, are shown on Figure 1 (attached).

Due to the magnitude of the settlements observed, a soils boring program was started. Based on the borings completed to date, the fill under the building has variable strength properties ranging from good to poor.

Further clarification of the fill deficiency will be made when the soil test results have been completed and evaluated.

An independent soils consultant has been retained to help in the data evaluation and feasibility of the corrective actions.

Safety Implications

Large settlements can pose possible safety problems for buildings. A preliminary evaluation of soil boring data from the investigation being conducted indicates that the magnitude of the investigative tests and analysis of test results makes this item reportable under 10 CFR 50.55 e, 1, iii.

These structures are monitored for settlement as part of the foundation data survey program. Hence, any unusual settlement of the structure would be detected before the diesel generators would be rendered inoperable due to the resulting distortions.

Activities in Progress

Several activities are in progress to generate information needed to evaluate the feasibility of possible corrective actions. The activities are:

1) The Foundation Data Survey Program has been expanded to include additional settlement data locations as well as monitoring these data locations more frequently. Building time rate of settlement curves are being developed based on this datum for a better understanding of the problem.

2) A boring program has been initiated to provide better definition of the fill conditions under the building and to obtain soil samples for laboratory tests. Dutch cone penetration tests are also being performed under the building area to better define the variable strength properties of the fill material.

3) Laboratory tests being performed are:

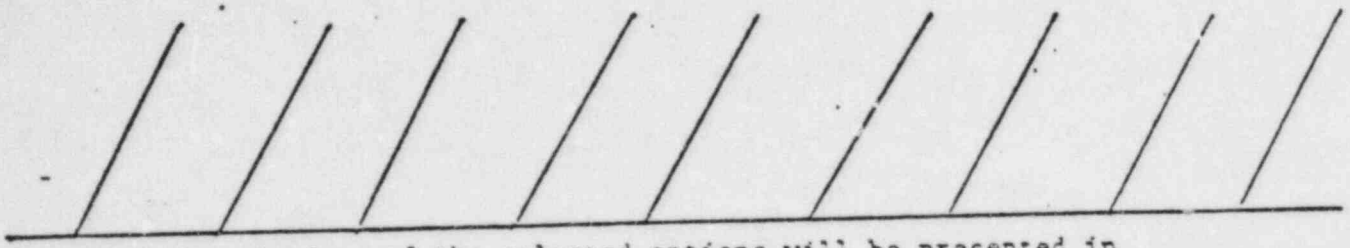
a. Shear strength tests to determine fill characteristic for bearing capacity evaluation

b. Consolidation tests to predict building settlement for the present fill material

c. Soil classifications

d. Mineralogy tests to evaluate the swelling potential of the fill material

This portion of the Bechtel Report is deleted because it contains a premature discussion of possible corrective action options. Specific options will be included in subsequent reports following a complete evaluation of soil conditions.



Detailed descriptions of the selected options will be presented in subsequent reports.

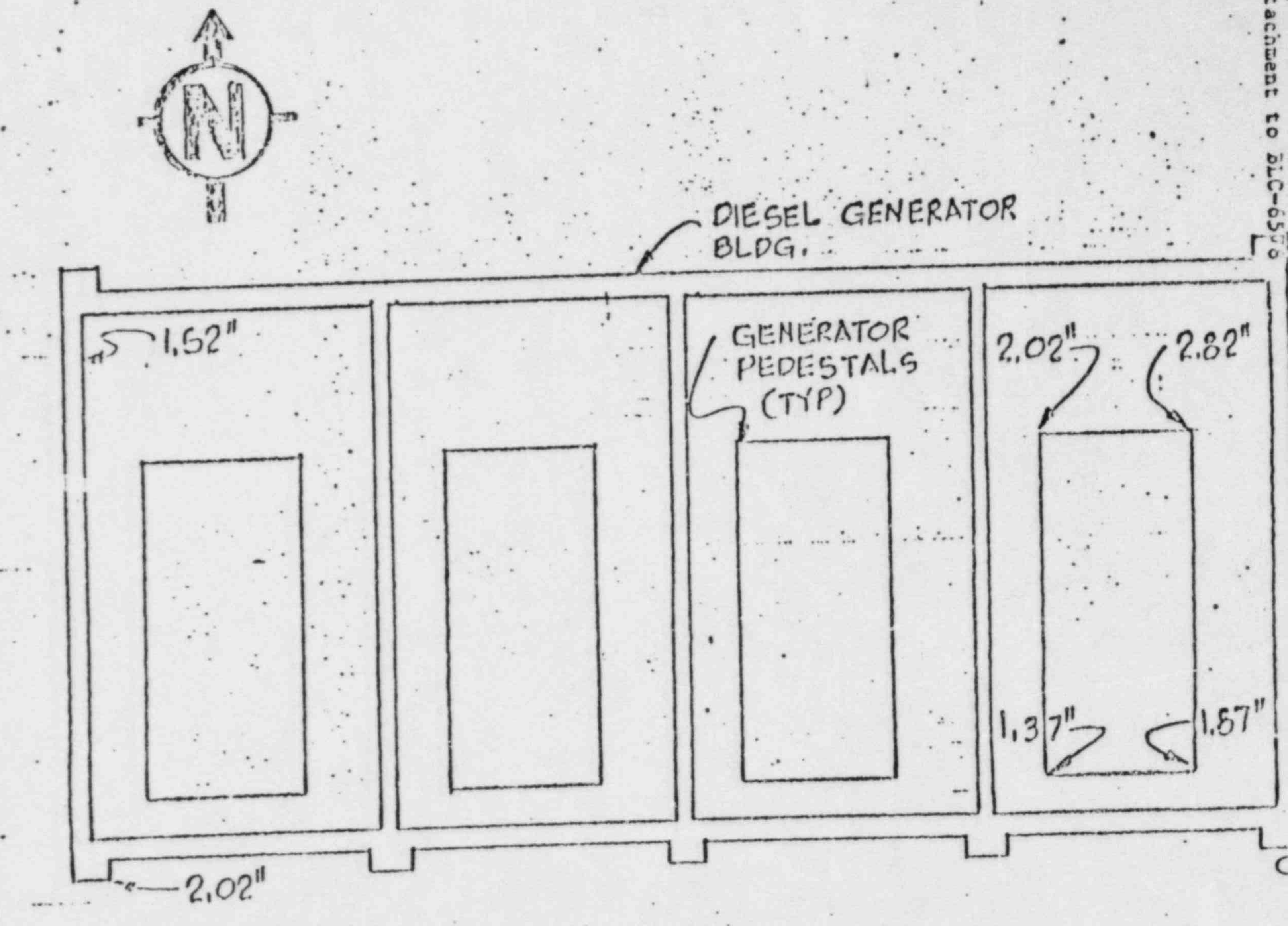
Submitted by: B Clark McConnel

Approved by:

Concurrence by:

JH/cap
9/19/6

September 22, 1978
Attachment to BLC-6558



DIESEL GENERATOR BLDG.

SETTLEMENT DATA AS OF 9-19-78

No.	DATE	REVISIONS	BY	CHK
1	9-22-78	ISSUED FOR INFO. TO MCAR # 24, INTERIM REPORT # 1	PB	

ORIGIN

CONSUMERS POWER COMPANY
MIDLAND PLANTS UNITS 1 AND 2
MCAR # 24

JOB No. 7220
SPEC/DES GUIDE No.
FIGURE 1
SHEET

5-9 Sent Dec 1979

Cook

OCT 24 1978

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

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

Gentlemen:

Thank you for your interim report dated September 29, 1978, pursuant to 10 CFR 50.55(e) regarding Settlement of Diesel Generator Foundations and Building. We will review your final report on this matter upon receipt.

Your cooperation with us is appreciated.

Sincerely,

R. F. Heishman, Chief
Reactor Construction and
Engineering Support Branch

cc: Central Files
Reproduction Unit NRC 20b
PDR
Local PDR
NSIC
TIC
Ronald Callen, Michigan Public
Service Commission
Dr. Wayne E. North
Myron M. Cherry, Chicago

7811010092

OFFICE ➤	RIII	RIII	RIII	RIII		
SURNAME ➤	Vandel/ls	Cook	Hayes	Heishman		
DATE ➤	Gallagher 10/23	10/21/78		10/23/78		

NRC Form 318A (RIII) (5-76) NRCM 0240 *U. S. GOVERNMENT PRINTING OFFICE: 1978—253-8

Consumers Power Company

Stephen H. Howell
Vice President

General Offices: 1945 West Parnall Road, Jackson, Michigan 49201 • Area Code 517 788-0453

September 29, 1978
Howe-183-78

Mr J G Keppler, Regional Director
Office of Inspection and Enforcement
Region III
US Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR PLANT -
UNIT NO 1, DOCKET NO 50-329
UNIT NO 2, DOCKET NO 50-330
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CC: Director, Office of Inspection & Enforcement
Att: Mr John G Davis, Acting Director, USNRC (15)

Director, Office of Management
Information and Program Control, USNRC (1)

OCT 2 1978

7810060285

NUREG-103-10

QUALITY ASSURANCE PROGRAM
MANAGEMENT CORRECTIVE ACTION REPORT
MCAR-1

REPORT NO. 24

JOB NO. 7220 Q NO. 1.40 DATE 9/7/78

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REFERRED TO [X] ENGINEERING [ ] CONSTRUCTION [ ] QA MANAGEMENT [ ] _____

W.J. Moring for
ISSUED BY L. A. Dreisbach 9/7/78
Project QA Engineer Date

II REPORTABLE DISCREPANCY

[ ] NO [X] YES

NOTIFIED CLIENT 9/7/78 Date
Project Manager 9/7 Date

III CAUSE

CORRECTIVE ACTION TAKEN

SEP 8 1978
QUALITY ASSURANCE

AUTHORIZED BY _____ Date

DISTRIBUTION:
- Project Manager
- Construction Manager
- Engineering Manager
- Project Engineer
- Proj. Supt. / Proj. Const. Mgr. or P & I Procurement Mgr.
- Chief Field QC Engineer or Procurement Insp. Mgr.
- QA Supervisor
- Client

J.B. Violette
S.I. Heisler
L.A. Dreisbach
J. Amaral (Gaithersburg)
J.E. Bashore (Norwalk)

FORMAL REPORT TO CLIENT _____ Date
(If Section II Applies)

CORRECTIVE ACTION IMPLEMENTED

VERIFIED BY _____
Project QA Engineer Date

*Describe in space provided and attach reference document.

Bechtel Power Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address: P.O. Box 1000, Ann Arbor, Michigan 48106

September 22, 1978

BLC-6578

Mr. G. S. Keeley
Project Manager
CONSUMERS POWER COMPANY
1945 West Parnall Road
Jackson, Michigan 49201

Midland Units 1 and 2
Consumers Power Company
Bechtel Job 7220
MCAR 24 INTERIM REPORT 1
Files 2417/2801

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for P. A. Martinez
Project Manager

PAM/WGM/pp

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Mr. W. R. Bird
Mr. J. L. Corley
Mr. B. W. Marguglio

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Bechtel Associates Professional Corporation

Attachment to BLC-6578

SUBJECT: MCAR #24 (Issued 9/7/78)

Settlement of the diesel generator foundations and building

INTERIM REPORT # 1

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Midland Plant Units 1 & 2
Bechtel Job 7220

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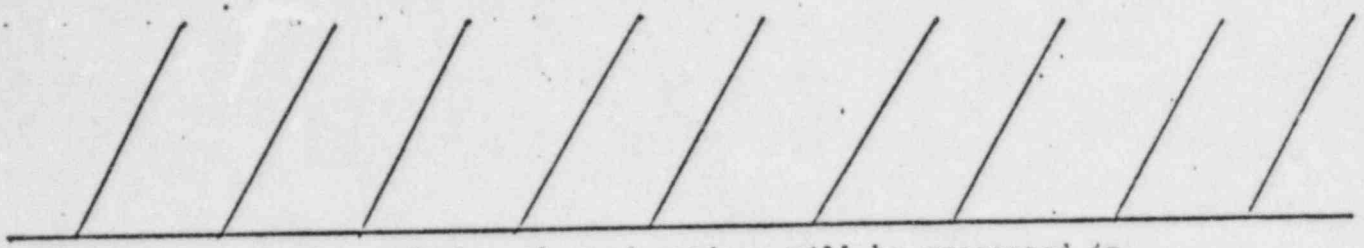


Detailed descriptions of the selected options will be presented in subsequent reports.

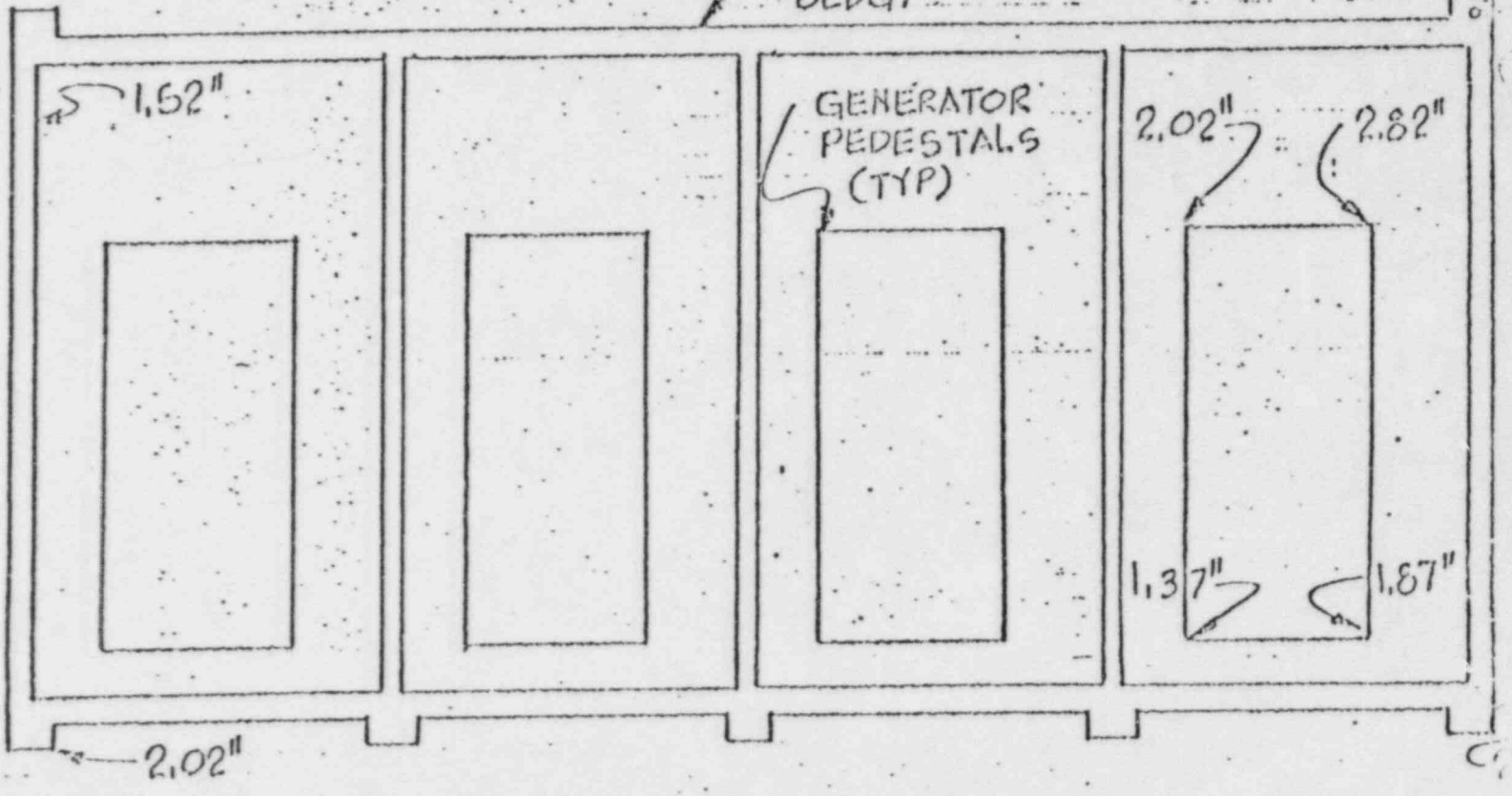
Submitted by: B Clark McConnel

Approved by:

Concurrence by:

JH/cap
9/19/6

Attachment to BLC-6570



DIESEL GENERATOR BLDG.

SETTLEMENT DATA AS OF 9-19-78

NO.	DATE	REVISIONS	BY	CHK
4	9-22-78	ISSUED FOR INFO. TO MCAR #24, INTERIM REPORT #1	PB	

ORIGIN

CONSUMERS POWER COMPANY
MIDLAND PLANTS UNITS 1 AND 2
NUCLEAR

JOB NO. 7220
SPECIFICS GUIDE NO.

51-1055 1

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 50-329/78-21; 50-330/78-21

Docket No. 50-329; 50-330 License No. CPPR-81; CPPR-82

Licensee: Consumers Power Company
1945 West Parnall Road
Jackson, MI 49201

Facility Name: Midland Nuclear Power Plant, Units 1 and 2

Inspection At: Midland Site, Midland, MI

Inspection Conducted: October 2-31, 1978

Inspector: R. J. Cook _____

Approved By: D. W. Hayes, Chief
Projects Section _____

Inspection Summary

Inspection on October 2-31, 1978 (Report No. 50-329/78-21; 50-330/78-21)

Areas Inspected: Examination of the general site condition, settlement of the diesel generator foundations and structures, ~~need for additional~~ seismic ~~braces for~~ qualification of Class 1E battery racks, scheduling analysis, information meetings with licensee personnel, location of core flood lines for Unit 2, installation of reactor coolant system piping restraints, potential for loose links on States Terminal Blocks, welding of reactor coolant system piping for Unit 2, sand blasting operations in Unit 1 containment, condition of temporary laydown areas, in place storage condition of electrical equipment, disposition of the ~~noncompliance~~ noncompliance

1. Site Tours

At periodic intervals generalized tours of the facility were performed by the Resident Inspector. During the reporting period, these tours covered essentially every area of the site. These tours were intended to assess the cleanliness of the site; storage condition of equipment and piping used in site construction; the potential for fire or other hazards which might have a deleterious affect on personnel and equipment and to witness construction activities in progress.

2. 50.55(e) Item

Settlement of Diesel Generator Foundations and Structure

Open (Item No. 330/78-13-03; 330/78-13-03) - The licensee has kept the Resident Inspector informed of evaluations being performed pertaining to the settling of the diesel generator building and foundations. Information requested by the Regional Based Inspector for the review of this item has been supplied through the Resident Inspector. The Resident Inspector participated in a portion of the inspection activities of the Regional Inspector conducted on site during the period of October 24-27, 1978.

NONCONFORMANCE REPORT

1. PROJECT NAME: Midland Units 1 & 2	JOB NO.: 7220				19. NO. 1482	20. PAGE 1 OF 2
2. UNIT(S): Common	3. DRAWING/PART NO.: N/A	REV: N/A	4. ITEM DESCRIPTION: Building Settlement		5. ITEM LOCATION: Diesel Gen. Bldg.	
6. P.O. OR SPEC NO.: N/A	7. SERIAL NO.: N/A	8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A	9. SOURCE: Construction	10. CONTRACTOR/SUPPLIER: N/A		
11. INSPECTION CRITERIA ( ) DWG ( ) SPEC (X) OTHER IR NO. N/A NO. Survey		12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO	13. SKETCH ATTACHED (X) YES ( ) NO	14. Discovered During ( ) Rec'g (X) Const ( ) Test	15. Equip Furnished By ( ) Client ( ) Eng (X) FLD	

16. NONCONFORMING CONDITION: The attached sketch identifies settlement of the Diesel Generator Foundations and Structure. In addition the mud mat between the E/Wall and Generator has spalled and has been displaced. "Q"-List #1.40. Hold for Engineering Disposition. 4 Hold Tags Applied.

17. REPORTED BY: [illegible] DATE: 8-21-78

18. VALIDATED BY: [illegible] for W.L.B DATE: 8-21-78

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

PROJECT ENGINEERING TO EVALUATE AND SPECIFY ALL TESTING AND OTHER INVESTIGATION REQUIREMENTS TO RESOLVE THIS NONCONFORMANCE. [illegible]

23. PROJECT ENGINEERING DISPOSITION

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is

PROJECT FIELD ENGINEER DATE

PROJECT ENGINEER DATE

PROJ CONSTR QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

25. DISPOSITION RESULTS

26. QC ACCEPTANCE

QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

Request Conditional Release to allow continuation of construction up to but excluding the placement of concrete. Corrections or removal can be accomplished without causing damage or contamination to the associated plant equipment or structure.

A J Boos 8-22-78
PFE Date

for A. D. Foster for WLB 8-22-78
PFQCE Date

W. Dreisbach 8-22-78
LQAE Date

CALCULATION SHEET

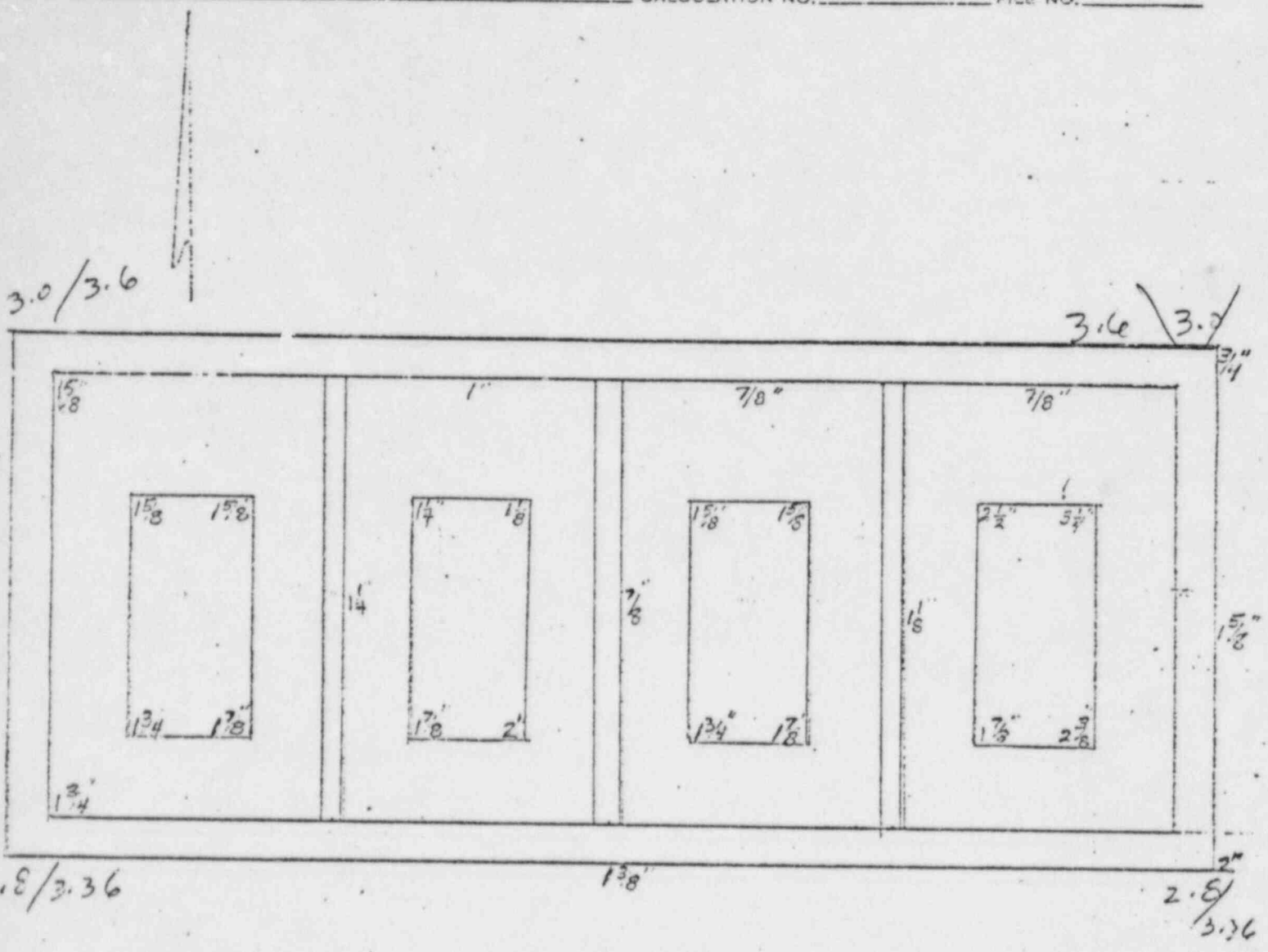
0510 (11-74)

DATE

DESIGN BY [illegible] DATE 8-21-78 CHECKED BY SHEET NO.

PROJECT JOB NO.

SUBJECT CALCULATION NO. FILE NO.



note: figures shown are total settlements from theoretical plant elevation.

Page 5.0
NCR 1182

LICENSEE REPORTS PER 10 CFR 50.55(e)

SECTION I - INFORMATION

FACILITY Midland TIME 1600 DATE 7 Sept. 1973

PERSON CALLING W. Bird/T. Cooke PERSON RECEIVING R. J. Cook

EVENT DATE AND DETAILS Diesel generator building and structures have settled more than anticipated — soil compaction is less than originally estimated.

FINAL/INTERIM REPORT DUE 7 Oct., 1973 RECEIVED _____

SECTION II - NOTIFICATION

☒ MORNING REPORT ☐ PAO ☐ HQ ☐ PN

☐ OTHER _____

☐ INSPECTOR/TEAM DISPATCHED TO SITE

SECTION III - ASSIGNMENT

☐ EVALUATE REPLY ☐ EVENT LATER DETERMINED NOT REPORTABLE

☐ CONDUCT VERIFICATION INSPECTION

OTHER INFORMATION/INSTRUCTIONS _____

ASSIGNED ☐ PROJECT ☐ ENGINEERING I ☐ ENGINEERING II

DATE _____ INSPECTOR _____

REQUIRED COMPLETION DATE _____

SECTION IV - CLOSEOUT

☐ ADEQUATE REPLY RECEIVED NO VERIFICATION INSPECTION

COMPLETED BY _____ DATE _____

REGION III, DIRECTORATE OF REGULATORY OPERATIONS

DAILY REPORT - Civil BRANCH

DATE - 9/3/78

Facility/Licensee	Notification	Item or Event	Regional Action
Midland	Resident Inspector	licensee notice of 50.55e reportable item. It has been determined that the compaction of soils under and around the diesel generator buildings presently less than when originally installed. This has resulted in a greater amount of settlement of the Diesel Generator foundation and structures. Additional exploration and evaluation is being performed by the licensee and contractors	

Submitted _____

Branch Chief

Sept 11 - Sept 29 '72

5. 50.55(e) Item
Settlement of Diesel Generator Foundation and Structure

The licensee has kept the Resident Inspector informed of exploratory activities associated with evaluations pertaining to the settling of the diesel generator building foundations and structures. Approximately 100 core borings have been or will be extracted from various locations around the site and diesel building for further evaluation by an independent laboratory. Relative soil density measurements have been taken at three locations to further enhance the evaluations pertinent to the diesel building settlement. An escalated survey program has been put into effect to monitor the rate of settlement.

6. Unit 2 Reactor Coolant System Piping

The inspector witnessed the lowering

Corrective Actions - Diesel Bldg.
MCAR #24 (9/22/76)
BLC-6578

Possible methods for resolution depend on results of lab. tests

Options under investigation include

1) No corrective action
2) Modify strip foundations for walls to a continuous mat foundation for the entire bldg.
3) Preload & consolidate the soil under bldg.
4) Combine 2 & 3 above
5) Underpin the bldg to transmit loads directly to the undisturbed soil layer.
6) Remove & replace the bldg and fill material

To JLCorley

From BHPeck/RMW

Date September 26, 1978

Subject MIDLAND PROJECT GWO 7020 - NRC QUESTION #362.2
REMOVAL OF LOOSE NATURAL SANDS
File: 0505.2 Serial: 3448

CONSUMERS POWER COMPANY

INTERNAL CORRESPONDENCE

CC DBMiller
GSKeeley

The purpose of this memorandum is to inform you of the results of Bechtel and CPCO-PMO efforts to answer the NRC licensing question relating to whether a natural sand layer near elevation 600' was removed during construction or if the sand tested out to be greater than 75% relative density. A copy of this question is attached.

A search of the records to date has not yielded any verification the sands were ever removed. Also, a search of the test records indicates that no tests were performed to confirm the in place density of the natural sands. The current boring program for the Diesel Generator Building problem will also be used as a data base for confirming the in place condition of the natural sand.

We will keep you informed as the situation develops.

Attachment

Question 362.2 (2.5.4.5.1)

Question 1 and the resulting discussion on Page 8.00-1 included in Amendment Number 9 to your PSAR stated that all natural sands with relative densities less than 75% would be removed beneath all Class I structures and beneath non-Class 1 structures so sited that their failure could endanger the adjacent Class 1 structures. Discuss the methods employed in mapping and removing the sands having less than 75% relative density. Provide plan and sectional figures showing the areas where these materials were removed. Figure A9-2 of the PSAR which displays subsurface profiles of Class 1 piping should be updated to show removal of sands of less than 75% relative density and be presented in the FSAR. Figure 2.5-21 of the FSAR shows loose sands beneath the Class 1 tanks although they were to have been removed. Explain this inconsistency, and provide proper documentation of as-built conditions.

Responses

Subsection 2.5.4.5.1 has been revised in response to this question. The request to provide plan and sectional figures of areas where the loose sands were removed will be responded in more detail by amendment in October 1978.

DRAFT

K. J. Cook

SUPPLEMENTAL REQUEST FOR ADDITIONAL SOILS SETTLEMENT INFORMATION: PART I

23. We have reviewed your response to question 1 of our March 21, 1979 letter, "10 CFR 50.54 Request Regarding Plant Fill", including related amendments or supplements in your letters dated May 31, July 9 and August 10, 1979. We find that the information provided is not sufficient for completion of our review. Accordingly, provide the following additional information:

(1) Your response to question 1a does not provide sufficient information relative to the root causes of the 13 deficiencies. In order to determine the acceptability of the corrective actions for the 13 deficiencies considering the possibility that these deficiencies are of a generic nature that could affect other areas of the facility, a more complete understanding of the root cause of each deficiency is necessary. Accordingly, provide a clearer description of the root causes of each of the 13 deficiencies, including a detailed discussion of the conditions that existed to allow these deficiencies and the changes that have been made to preclude the recurrence of such deficiencies.

(2) Regarding your response to question 1b:

a. The first seven paragraphs do not provide sufficient information to assure that contradictions do not continue to exist in the PSAR, FSAR, design documents, implementing procedures, and as-built conditions since the controls described in these seven paragraphs were in effect prior to the I&E findings reported in J. Keppler's letter of March 15, 1979. Modify your response to clearly describe the control revisions you have instituted to preclude design contradictions.

b. Items 1, 2, and 3 of the eighth paragraph describe the review and update of the PSAR commitment list, the review of the inactive sections of the FSAR, and the review of procedure EDP 4.22, "Preparation and Control of Safety Analysis Reports," without describing the extent of the review process or the qualifications of personnel involved in the review. Accordingly, describe what each of these reviews entails, including the extent to which these reviews are verified, approved, and documented. Identify the organizational unit that is, or will be, involved in these reviews and the qualifications of the involved personnel.

c. Item 2 of the eighth paragraph states that a review of the remaining sections of the FSAR is not necessary,"... because of the ongoing review process described above." Describe your rationale for not reviewing these remaining sections of the FSAR when it appears that the original review of the FSAR was performed prior to issuance of the March 15, 1979 letter providing the I&E findings and prior to any corrective actions resulting therefrom.

d. Describe the extent of the audit to which you have committed in item 4 of the eighth paragraph.

DRAFT

(3) Question 1c requested that other activities be investigated to determine whether programmatic quality assurance deficiencies exist in view of the apparent breakdown of certain quality assurance controls, and that the activities investigated and the results be identified. Your response addressed certain specifications and instructions that received a review of 1977; providing for more in-depth verification; increasing management audits from one to two per year; increasing the staff of Bechtel's QA engineers at the site from five to eight; instituting an overinspection program on certain Q-listed construction activities; assigning resident engineers at the site to aid in the interpretation of drawings and increasing their number from one to twenty-two; and initiating a trend analysis program.

a. According to your response, most of these actions were initiated in 1977. Describe your rationale for assuming that these actions provide confidence that quality assurance deficiencies do not exist in other areas. In order to determine if other areas have deficiencies, work already accomplished in these areas should be investigated. This includes the review of completed documentation, including inspection results, to verify consistency with design and SAR requirements. Also, representative sample inspections of completed work would seem appropriate to determine the acceptability of this work. Accordingly, describe a program in detail to accomplish the above or provide rationale as to why it is not necessary.

b. Your use of generalized statements such as "the reivew of", "increased audits," "overinspection," "identifying trends," and "increase of staff" does not provide sufficient specificity regarding the detail and extent these actions will take place and the effect they will have in assuring other areas are not deficient. Accordingly, in each of these areas provide a clearer description of these actions relative to the full impact they will have in assuring an effective QA program and in sufficient detail to assure that other areas are not deficient. In those cases where credit is taken for actions already accomplished (such as reviews, inspections, and audits), provide a summary of the results of these actions such that the success or failure of the actions can be determined.

(4) Considering the results of your investigation requested in our question 1c, question 1d asked that you describe your position as to the overall effectiveness of the QA program for the Midland Plant. Your overall assessment of the effectiveness of your program should be based on your revised response to our question 1c. (see above question 23(3)). The results of this assessment, including a description of the scope and extent of the assessment effort and the identification and qualifications of the individuals involved in this assessment, should be reported to us.

HISTORY

TIME	ACTIVITY	RESPONSIBLE ORGANIZATION
1969-1977	P S A R APPROX. 150 CHANGE NOTICES	DISCIPLINES
1976-AUGUST, 1977	F S A R DEVELOPED AND SUBMITTED AUGUST, 1977	F S A R ORGANIZATION
AUGUST, 1977 TO PRESENT	F S A R 1600 CHANGE NOTICES ADDITIONS PER NRC QUESTIONS (900) 48% DESIGN CHANGES 6% DESIGN CLARIFICATIONS 3.4% CLERICAL CORRECTIONS 16% 6% TECH CORRECTIONS 6%	DISCIPLINES
6/79-1/80	RE-REVIEW	DISCIPLINES

FSAR

	SOILS	OTHER AREAS
ORIGINATION	• PREPARED BY GEO/TECH • REVIEWED PRIOR TO SUBMITTAL BY DISCIPLINE	• PREPARED BY FSAR ORGANIZATION • REVIEWED PRIOR TO SUBMITTAL BY DISCIPLINES • (NOT ALL SPECS AVAILABLE)
REVIEW	• INACTIVE • NO NRC QUESTIONS • NO CHANGE NOTICES	• ACTIVE • 1600 CHANGE NOTICES • REVIEWED BY DISCIPLINES
		• METHOD: • EDP 4.23 • ELEMENT REVIEW – Break down in this section • DEGREE OF REVIEW BASED ON DEGREE OF ACTIVITY
RE-REVIEW	• SPECIAL PROCEDURE • SYSTEM/SUBSYSTEM RE-REVIEW • RE-REVIEW BY DISCIPLINE & GEO/TECH • TOTAL RE-REVIEW	• SPECIAL PROCEDURE • SYSTEM/SUBSYSTEM RE-REVIEW • RE-REVIEW BY DISCIPLINES • ≅ 55% OF CHAPTERS 1-12 • ADDITIONAL RE-REVIEW AS NECESSARY

RE-REVIEW CRITERIA

- TO BE RE-REVIEWED ARE:
  - SECTIONS WHICH WERE INACTIVE SINCE THEIR ORIGINAL INCORPORATION INTO FSAR
  - SECTIONS FOR WHICH THERE HAVE BEEN MAJOR DESIGN CHANGES
  - SECTIONS FOR WHICH INCONSISTENCIES MAY EXIST BASED ON THE FOLLOWING CONSIDERATIONS:
    - SECTIONS WITH MULTIPLE CROSS REFERENCES
    - SECTIONS WITH MULTIPLE INTERFACES
    - SECTIONS WITH MULTIPLE ORGANIZATION INPUTS
    - SECTIONS WITH PREVIOUSLY IDENTIFIED INCONSISTENCIES-
- CHAPTER 15 TO BE ADDRESSED SEPARATE FROM THIS PROGRAM
- NON-SAFETY RELATED SECTIONS EXCLUDED FROM RE-REVIEW
- CHAPTERS 13, 14 AND 17 NOT DESIGN RELATED AND EXCLUDED FROM THIS RE-REVIEW BUT ARE BEING REVIEWED SEPARATELY BY CPCO
- CHAPTER 16 BEING SIGNIFICANTLY REVISED AND WILL BE REVIEWED LATER

RE-REVIEW METHOD

1. IDENTIFY ORIGINAL PSAR COMMITTMENT.

2. COMPARE PSAR COMMITTMENTS WITH FSAR COMMITTMENTS FOR CONSISTENCY.

3. COMPARE FSAR COMMITTMENTS WITH SPECS, DRAWINGS AND OTHER DESIGN DOCUMENTS FOR CONSISTENCY.

4. IDENTIFY DISCIPLINE INTERFACES AND REPEAT STEPS ABOVE AS APPROPRIATE.

5. IDENTIFY AND DETERMINE NEED TO DISPOSITION CONSULTANT RECOMMENDATIONS.

6. RESOLVE OMISSIONS AND INCONSISTENCIES AND PROVIDE DISPOSITION.

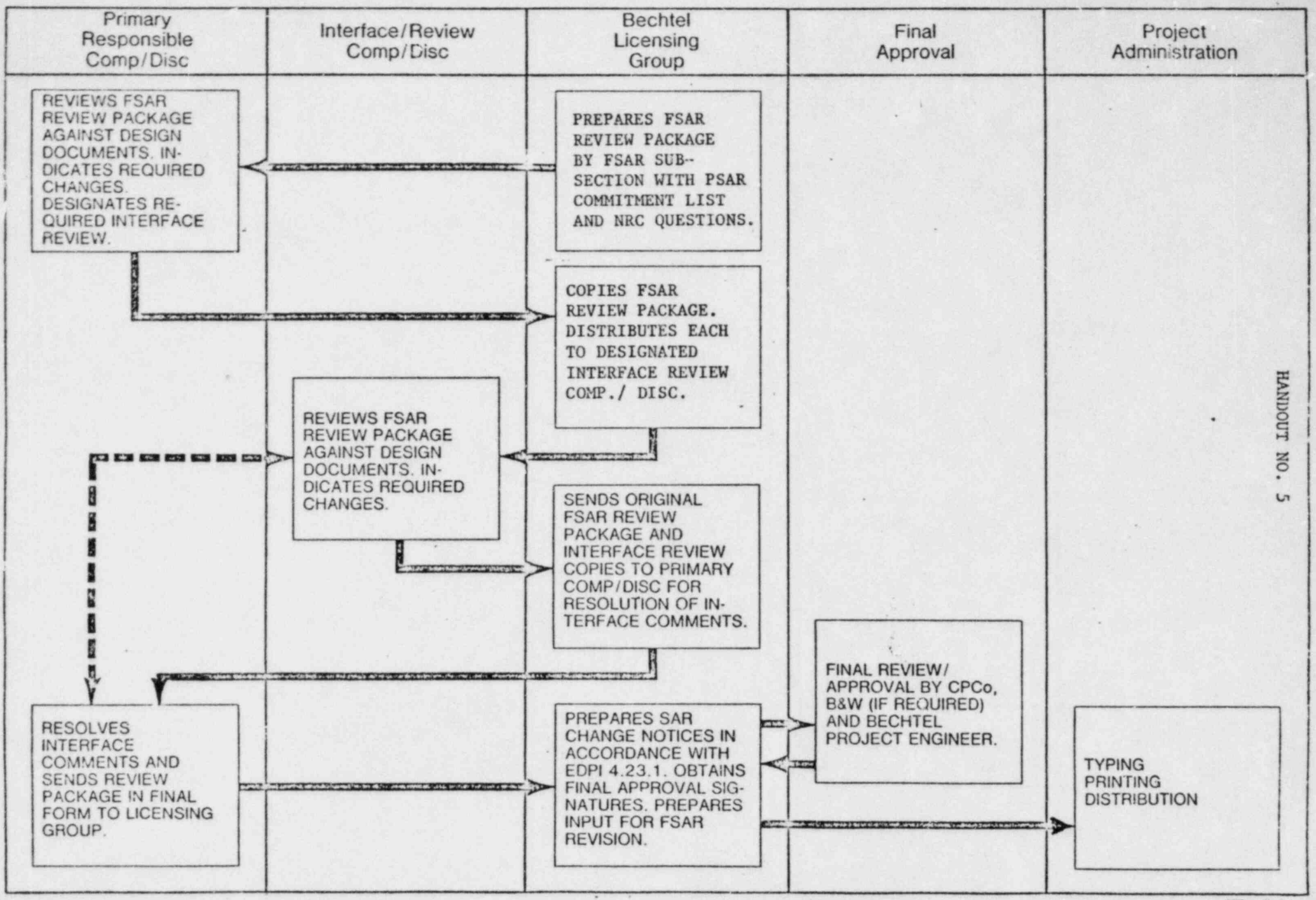
7. a. VERIFICATION BY DISCIPLINE GROUP SUPERVISOR

   b. OVERALL MANAGEMENT AND ACCOUNTABILITY BY LICENSING.

   c. AUDITS BY QUALITY ASSURANCE.

FSAR RE-REVIEW FLOW CHART

Midland Plant Units 1 & 2
Consumers Power Company
Bechtel Job 7220



HANDOUT NO. 5

FSAR REVIEW DOCUMENTATION FORM
MIDLAND PROJECT
JOB 7220

1. REVIEW LOG NO. _____

2. COMPANY: ☐ CPCo ☐ BECHTEL ☐ B&W

3. PRIMARY REVIEW DISCIPLINE:

4. FSAR SUBSECTION:

5. NRC QUESTIONS:

6. PSAR COMMITMENT LIST ITEMS:

8. PHASE I: DESIGN DOCUMENT REVIEW

7. RETURN TO BECHTEL LICENSING BY:

DESIGN DOCUMENT	CONFLICT	RESOLUTION
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	
	YES / NO	

9. INITIAL REVIEW APPROVAL (INDICATE REQUIRED INTERFACE REVIEW IN BLOCK 11.)

(PRIMARY REVIEWER) (DATE) (SUPERVISOR) (DATE)

11. PHASE II: INTERFACE REVIEW

10. RETURN TO BECHTEL LICENSING BY:

☐ BECHTEL

BECHTEL DISCIPLINE INTERFACE REVIEW:

☐ ARCH _____ ☐ PLANT DSN _____
☐ CIVIL _____ ☐ PQAE _____
☐ CONTROL SYS _____ ☐ STRESS _____
☐ ELEC _____ ☐ OTHER _____
☐ MECH/NUCLEAR _____

INTERFACING STAFF REVIEW:

☐ ARCH _____ ☐ M & QS _____
☐ CIVIL _____ ☐ MECH _____
☐ CONTROL SYSTEM _____ ☐ NUCLEAR _____
☐ ELEC _____ ☐ PLANT DSN _____
☐ GEOTECH _____ ☐ STRESS _____

☐ CPCo

☐ B & W

13. PHASE III: RESOLUTION OF COMMENTS

12. RETURN TO BECHTEL LICENSING BY:

FSAR CHANGE REQUIRED YES / NO

All Interface Comments Resolved. Licensing Group Is Authorized To Initiate A FSAR Change Without Additional Interface Review.

(PRIMARY REVIEWER) (DATE) (SUPERVISOR) (DATE)

G-0648

F S A R / S O I L S

ROOT CAUSE	CORRECTIVE ACTION
•SPLIT RESPONSIBILITY FOR PREPARATION.	•SINGLE RESPONSIBILITY FOR PREPARATION AND REVIEW
•SMALL AMOUNT OF REVIEW BECAUSE OF INACTIVITY.	
•SOME MINOR SPECIFICATION CHANGES WITHOUT F S A R REVIEW.	•ALL SPECIFICATION CHANGE NOTICES SUBJECT TO REVIEW FOR COMPATABILITY WITH F S A R
•MULTIPLE DISPLAY OF TECHNICAL INFORMATION IN F S A R.	•RE-REVIEW

FSAR REVIEW AUDIT

- SCHEDULED FOR OCTOBER 26, 1979, AND FEBRUARY 1, 1980

- BECHTEL AND CONSUMERS POWER COMPANY TO PARTICIPATE

KEY AUDIT POINTS

- PROCEDURAL COMPLIANCE - That 100% of re-review conducted as Planned

- EFFECTIVENESS OF DETECTING F S A R OMISSIONS AND INCONSISTENCIES - Spot check

- EFFECTIVENESS OF IMPLIMENTING CORRECTIVE ACTION - Review the implementing results if appropriate and if not why not

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

Fermi
Cook

October 29, 1979

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

FROM: James G. Keppler, Director, Region III

SUBJECT: MIDLAND - RECOMMENDED CIVIL PENALTY

Attached for Headquarters use is a proposed letter to Consumers Power Company with attached Notice Of Violation and proposed civil penalty. The civil penalty is recommended only for the material false statement. Other items of noncompliance are also identified for which no civil penalty is proposed. This proposed civil penalty is patterned after and is consistent with the civil penalty action taken regarding the D. C. Cook facility in May 1978.

Please let us know if you have further questions.

James G. Keppler
Director

cc w/Attachments:
H. D. Thornburg, IE

 17pp.

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

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

Gentlemen:

This refers to the results of an investigation conducted during December 1978 and January 1979 into the settlement of the diesel generator building and the adequacy of the plant area fill at Midland Nuclear Plant Unit Nos. 1 and 2. The findings of this investigation were discussed with you in meetings in our Region III office on February 23 and March 5, 1979. A copy of the investigation report was transmitted to you by Region III by letter dated March 22, 1979.

The investigation determined a statement made by the licensee regarding fill material was false. Furthermore, it has been determined that the information presented regarding the type of fill was material in that the fill is of the wrong type and was not sufficiently compacted. This matter is further described in Appendix A, and we propose to assess a civil penalty of $5,000 for this item, as set forth in Appendix B.

In addition, there are two areas of concern. First, information and statements relative to load density calculatons, inde. of compressibility calculations, the type of mat foundations and estimates of settlement were reviewed and incorrect information was found. While the incorrect

information was a matter of concern to the NRC because the information furnished was false, it was not material because it did not affect a safety conclusion by the NRR staff.

Second, during this investigation four items of noncompliance were identified which are contained in Appendix C which is a separate Notice of Violation. This notice is sent to you pursuant to the provisions of Section 2.201 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations. Section 2.201 requires you to submit to this office within twenty days of your receipt of this notice a written statement or explanation in reply, including for each item of noncompliance: (1) corrective action taken and the results achieved; (2) corrective action to be taken to avoid further noncompliance; and (3) the date when full compliance will be achieved.

It is recognized that there has been extensive communications between you and the NRC regarding the diesel generator building settlement since the conclusion of our investigation which may contain information pertinent to the items of noncompliance. Therefore, where appropriate, you may wish to include specific references to those communications as a means of facilitating your response to this notice.

The NRC regulatory program is, of necessity, based on the premise that information provided by the licensees is factual, complete, and technically supported by data, records, calculations and judgments of technically qualified individuals. The review, evaluation and inspection processes involved in the regulatory program are therefore designed to function on that premise; that is, a program based on sampling and auditing techniques.

Inaccurate information could result in decisions which adversely affect the health and safety of the public. It is, therefore, imperative for licensees to exercise the utmost care in verifying information furnished to the NRC. This burden of accuracy must be stressed throughout licensee organizations.

We view material false statements as serious matters. In all cases where substantive material false statements are identified, we shall take strong enforcement action.

Your response to this notice and the results of future inspections will determine if further escalated enforcement action is required to assure future compliance.

Sincerely,

Appendix A

NOTICE OF VIOLATION

Consumers Power Company

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

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

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

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

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

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

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

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

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

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

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

This information is false, in that construction drawing C-45, Class I Fill Material Areas, specifies the foundation material for Class I structure to be Zone 2 material which is identified in FSAR Table 2.5-10, Gradation Ranges for Fill Material, as Random Fill and is described as "Any material free of humus, organic or other deleterious material." It was ascertained that materials other than "clay" or "controlled compacted cohesive fill" were used for support of structures.

Contrary to Section 186 of the Atomic Energy Act of 1954 as amended, this false statement was made under oath in careless disregard of the true circumstance.

(Civil Penalty - $5,000)

Appendix B

NOTICE OF PROPOSED IMPOSITION OF CIVIL PENALTIES

Consumers Power Company

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

This office proposes to impose civil penalties pursuant to Section 234 of the Atomic Energy Act of 1954, as amended, (42 USC 2282), and to 10 CFR 2.205 in the amount of Five Thousand Dollers ($5,000) for the specific item of noncompliance set forth in Appendix A to the cover letter. In proposing to impose a civil penalty pursuant to this section of the Act and in fixing the proposed amount of the penalty, the factors identified in the Statements of Consideration published in the Federal Register with the rule making action which adopted 10 CFR 2.205 (36 FR 16894) August 26, 1971, and the "Criteria for Determining Enforcement Action," which was sent to NRC licensees on December 31, 1974, have been taken into account.

The Consumers Power Company may, within twenty (20) days of receipt of this notice pay the civil penalty in the amount of Five Thousand Dollars ($5,000) or may protest the imposition of the civil penalty in whole or in part by a written answer. Should Consumers Power Company fail to answer within the time specified, this office will issue an order imposing the civil penalty in the amount proposed above. Should Consumers Power Company elect to file an answer protesting the civil penalty, such answer may: (a) deny the item of noncompliance listed in the Notice of Violation in whole or in part, (b) demonstrate extenuating circumstances,

(c) show error in the Notice of Violation, or (d) show other reasons why the penalty should not be imposed. In addition to protesting the civil penalty in whole or in part, such answer may request remission or mitigation of the penalty. Any written answer in accordance with 10 CFR 2.205 should be set forth separately from the statement or explanation in reply pursuant to 10 CFR 2.201, but you may incorporate by specific reference (e.g., giving page and paragraph numbers) to avoid repetition.

Consumers Power Company's attention is directed to the other provisions of 10 CFR 2.205 regarding, in particular, failure to answer and ensuing orders; answer, consideration by this office, and ensuing orders; requests for hearings, hearings and ensuing orders; compromise; and collection.

Upon failure to pay any civil penalty due which has been subsequently determined in accordance with the applicable provisions of 10 CFR 2.205, the matter may be referred to the Attorney General, and the penalty, unless compromised, remitted, or mitigated, may be collected by civil action pursuant to Section 234c of the Atomic Energy Act of 1954, as amended, (42 USC 2282).

Appendix C

NOTICE OF VIOLATION

Consumers Power Company

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

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

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

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

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

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

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

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

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

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

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

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

e. PSAR, Amendment 3, indicated that if filling and backfilling operations are discontinued during periods of cold weather, all

frozen soil would be removed or recompacted prior to the resumption of operations. Bechtel specification C-210 does not specifically include instructions for removal of frozen/ thawed compacted material upon resumption of work after winter periods.

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

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

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

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

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

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

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

(2) Soils activities were not accomplished under the continuous supervision of a qualified soils engineer who would perform in-place density tests in the compacted fill to verify that all materials are placed and compacted in accordance

with specification criteria. This is required by Bechtel Specification C-501 as well as PSAR, Amendment 3 (Dames and Moore Report, page 16).

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

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

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

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

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

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

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

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

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

Soils

Documents Referenced

1. Bechtel Foundation Data Survey Program (type C-76)

2. Nonconformance Report No. 1482 - August 21, 78

3. Soils testing specification C-79(Q), Rev 0, Sept 8, 1978

4. Preliminary report data compiled by Goldberg, Zoino, Dunnicliff & Associates

5. Construction detail drawings C-109 R2 and C-117 R6 (or identify applicable figure No. in FSAR)

6. Bechtel specification C-210 R6 - April 25, 1978

7. Bechtel QC instruction for Backfill Compaction C-1.02, Rev I

8. Design drawing C-1001 (Q) R5

9. Bechtel specification C-211, Rev 4, Sept 21 77, Structural Backfill

10. Dames & Moore report on original site soils and Backfill Study, March 15, 1968 - (Is this in FSAR?)

Site Settlement

Cook

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

December 6, 1978

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

MEMORANDUM FOR: R. L. Spessard

FROM: E. J. Gallagher

SUBJECT: MEETING HELD AT THE MIDLAND UNITS 1 AND 2 SETTLEMENT OF DIESEL GENERATING BUILDING

A meeting was held at the Midland site on December 4, 1978 between representatives of the NRC, Consumers Power Company and Bechtel regarding the settlement of the Diesel Generator Building and other Category I Structures. A list of attendees and the meeting agenda are attached. The meeting lasted from 9:30 a.m. through 2:30 p.m.

A brief summary of the presentation contents is as follows:

1. Bechtel provided a review of the settlement history to date and the identification of Category I Structures founded on the site fill material.

2. Bechtel explained the soil exploration program and results of soil borings and laboratory tests on the fill material as well as some possible causes of the excessive settlement.

3. The Bechtel Consultants discussed their recommendation for a resolution to the problem which includes a preloading of the foundation material by surcharging some 20 feet of sand in and around the Diesel Generator Building. This includes an extensive monitoring program of the structure and foundation materials during the preload.

4. Bechtel presented the activities that have been completed, in progress and planned.

5. Bechtel presented the impact of these activities on the project schedule.

6. A response to the open items documented in NRC Report 50-329/78-12; 50-330/78-12 was provided regarding the conflicts between FSAR commitments and site construction procedures. CPCo indicated that a formal response to these open items would be sent to our office.

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In general, the meeting was worthwhile in that it stimulated technical discussion and details of the proposed resolution to the problem. It was made clear by NRR project management that the proposed activities are at the risk of the licensee and that the results, after being formally documented, would be evaluated by NRR to the original acceptance criteria included in the PSAR/FSAR.

A detailed trip report of the technical issues is being prepared by NRR project management with input from the NRC attendees, and it will be made available when completed.

E. J. Gallagher

E. J. Gallagher, Reactor Inspector
Engineering Support Section 1

Enclosures:
As stated

cc w/encls:
J. G. Keppler
R. F. Heishman
R. J. Cook
D. W. Hayes
G. A. Phillip
T. E. Vandel

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

Meeting with NRC at Midland

DATE: December 4, 1978

AGENDA

I. Introduction by CPCo (Don Miller)

II. History by Bechtel (N. Swanberg)

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

III. Soil Exploration by Bechtel (S. Afifi)

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

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

a. Preload
b. Instrumentation

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

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

VI. Schedule by Bechtel (P. Martinez)

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

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

a. Responses to Gallaghar's concerns:

✓ 1) Conflict between FSAR Table 2.5-14 and Table 2.5-10 regarding fill material description

✓ 2) Conflict between FSAR Table 2.5-21 and Specification C-210 regarding required number of passes for compaction

✓ 3) FSAR Section 3.8.5.5 - expected settlement

✓ 4) Conflict between FSAR Figure 2.5-47 and project drawing regarding foundation elevation

✓ 5) Conflict in Specification C-210 regarding compactive effort in test method

✓ 6) Conflict between consultant's recommendation and Specification C-210 regarding lift thickness

7) ± 2% tolerance in moisture content permitted in Specification C-210

8) Cracks in the building structure

b. FSAR Question 362.2 (Section 2.5.4.5.1)

VIII. Closing Comments by CPCo

Attendees
12/4/78

Name	Organization	12/4/78	12/5/78
Darl Hood	NRC/DPM	✓	✓
Gene Gallagher	NRC Region III (IE)	✓	
Daniel Gillen	NRC/NRR Geosciences	✓	✓
Lyman Heller	" " "	✓	✓
Ronald Cook	NRC Resident Inspector	✓	✓

Dec 4 Mtg – Soils

NAME	ORGANIZATION
F. A. Martinez	Bechtel
KARL WIEDNER	BECHTEL
S. S. AFIFI	Bechtel
R. B. PECK	Bechtel Consultant
→ W. R. FERRIS	BECHTEL
MO ROTHWELL	BECHTEL
DB Miller	CPCO – Project
[illegible]	CPCO – PROJECT
[illegible]	Bechtel
[illegible] BARCLAY	BECHTEL
E. L. Richardson	Bechtel
A. J. BOOS	"
D. E. HORN	CPCo – QA
W R Bird	" "
R. M. Wheeler	CPCO – PMO
G. A. Hunt	CPCO: Engrg Services
D. E. Sibbald	CPCO Project
JOHN DUNNICLIFF	Bechtel Consultant
Austin MARSHALL	BECHTEL – GEOTECH
Y. K. Lin	" "
B. C. Mc Connel	"
B. D[illegible]	"
N. Swanberg	Bechtel