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March 31, 1982

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

MIDLAND PROJECT
MIDLAND DOCKET NO 50-329, 50-330
RESPONSE TO THE NRC STAFF REQUEST FOR ADDITIONAL INFORMATION REQUIRED FOR COMPLETION OF STAFF REVIEW OF PHASES 2 AND 3 OF THE UNDERPINNING OF THE AUXILIARY BUILDING AND FEEDWATER ISOLATION VALVE PITS
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DATED MARCH 22, 1982
ENCLOSURE: RESPONSE TO THE NRC STAFF REQUEST FOR ADDITIONAL INFORMATION REQUIRED FOR COMPLETION OF STAFF REVIEW OF PHASES 2 AND 3 OF THE UNDERPINNING OF THE AUXILIARY BUILDING AND FEEDWATER ISOLATION VALVE PITS

Attached to the referenced NRC correspondence of March 22, 1982 was a compilation of the information required by the Staff for completion of their review of Phase 2 of the construction activities for the auxiliary building underpinning. Additional concerns were identified by the Staff for our response during the Staff audit held at Bechtel's Ann Arbor Offices on March 16-19, 1982.

We are responding to these Staff requests by forwarding the enclosed document which addresses each individual NRC Staff concern identified for Phases 2A, 2B, and 3 of the auxiliary building underpinning effort.

We believe the enclosed information combined with the discussion of these responses at our March 19, 1982 meeting adequately responds to the request and individual concerns identified for us by the Staff. The responses contained in the enclosure to this correspondence lend further support to our conclusion that the design issues related to the auxiliary building and feedwater isolation valve pit structures for Phase 2 have been adequately resolved. With the physical completion of open items noted in the enclosed document, the Staff should be in a position to concur with our request to proceed with Phase 2.

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5/1 Drawings
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We further believe that resolution of the very few remaining open items, related to Phase 3, can be quickly achieved during another meeting with the Staff.

James W. Cook

JWC/RLT/mkh

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ENCLOSURE

RESPONSE TO THE NRC STAFF REQUEST FOR ADDITONAL INFORMATION REQUIRED FOR COMPLETION OF STAFF REVIEW OF PHASES 2 AND 3 OF THE UNDERPINNING OF THE AUXILIARY BUILDING AND FEEDWATER ISOLATION VALVE PITS

MIDLAND PLANT UNITS 1 AND 2

DOCKET NO 50-329 AND 50-330

CONSUMERS POWER COMPANY

MIDLAND PLANT UNITS 1 AND 2

RESPONSE TO THE NRC STAFF REQUEST FOR ADDITONAL

INFORMATION REQUIRED FOR COMPLETION OF STAFF

REVIEW OF PHASES 2 AND 3 OF THE UNDERPINNING

OF THE AUXILIARY BUILDING AND

FEEDWATER ISOLATION VALVE PITS

CONTENTS

INTRODUCTION

PHASE 2A AUXILIARY BUILDING UNDERPINNING WORK

REVIEW CONCERN 1

REVIEW CONCERN 2

REVIEW CONCERN 3

REVIEW CONCERN 4

REVIEW CONCERN 5

REVIEW CONCERN 6

REVIEW CONCERN 7

REVIEW CONCERN 8

REVIEW CONCERN 9

REVIEW CONCERN 10

REVIEW CONCERN 11

PHASE 2B AUXILIARY BUILDING UNDERPINNING WORK

REVIEW CONCERN 1

REVIEW CONCERN 2

PHASE 3 AUXILIARY BUILDING UNDERPINNING WORK

REVIEW CONCERN 1

REVIEW CONCERN 2

REVIEW CONCERN 3

REVIEW CONCERN 4

Table of Contents (Continued)

ATTACHMENTS

1 Summary Outline-Emergency Actions for Underpinning of the Auxiliary Building

2 Auxiliary Building Parametric Analysis

TABLES

1 Well Failure Mechanisms and Responses

FIGURES

1 Areas Committed to Permanent Dewatering

2 Recharge Test Curves

3 Drawing C-1495(Q) Rev. A - Auxiliary Building Underpinning, Instrumentation for Bldg Settlement Monitoring, El. 659'-5/16"

4 Drawing C-1493(Q) Rev. A - Auxiliary Bldg & FIVP, Instrumentation System Monitoring Matrix

MIDLAND PLANT UNITS 1 AND 2
RESPONSE TO THE NRC STAFF REQUIRED
FOR COMPLETION OF PHASES 2 AND 3 OF THE
UNDERPINNING OF THE AUXILIARY BUILDING
AND FEEDWATER ISOLATION VALVE PITS

INTRODUCTION

Attached to the NRC correspondence of March 22, 1982 was a compilation of the information required by the Staff for completion of their review of Phase 2 of the construction activities for the auxiliary building underpinning. Additional concerns were identified by the Staff for our response during the Staff audit held at Bechtel's Ann Arbor offices on March 16-19, 1982. We are responding to these Staff requests by forwarding the following responses which address each individual NRC Staff concern identified for Phases 2A, 2B, and 3 of the auxiliary building underpinning effort.

PHASE 2A UNDERPINNING WORK

REVIEW CONCERN 1

Submittal of Updated Construction Sequence Drawing (Identified in February 3-5 Audit and February 26, 1982 Meeting).

RESPONSE

The construction sequence drawing reflecting improved techniques for Phase 2 work was provided to the Staff at the NRC audit on March 19, 1982 in Bechtel's Ann Arbor offices. An updated construction sequence for Phase 3 will be provided prior to April 29, 1982.

REVIEW CONCERN 2

Letter documenting actual work to be performed under Phase 2A (telephone record, March 8, 1982, Par 3). Letter should provide commitment not to proceed with 2B until the analyses using NRC recommended stiffness valves are completed and results reviewed by NRC Staff.

RESPONSE

Phase 2A will include Piers 11, 12, 13 and 14 (west and east), Piers KC2 and KC11, extending the access shafts to El 597' and constructing the access drifts under the turbine building to column lines 2.5 and 10.5.

Phase 2B will include Piers 8, 9 and 10 (west and east), Piers KC3 and KC10, constructing the access drifts under the turbine to points between column lines 3 and 3.5 and 10 and 9.5, and access drifts under the feedwater isolation valve pit.

Refer to our response to Review Concern 3 under the subsection for Phase 2A herein for statement regarding commitment.

REVIEW CONCERN 3

Update drawing of "Monitoring Matrix", No C-1493(Q) that will include tolerance criteria (Telephone record, March 8, 1982, Par 4.b).

RESPONSE

The monitoring matrix drawing C-1493(Q) (Figure 4) has been updated to include movement tolerances. Tolerances for Phase 2 will be based on a till subgrade modulus of 30 Kcf. Tolerances for Phase 3 will be based on a till subgrade modulus of 70 Kcf. These tolerances may be refined by the iterative analysis approach described during the presentation of February 26, 1982. A "for information only" copy of C-1493(Q) (Figure 4) is attached showing instruments, tolerance points, location and frequency of monitoring, including additional monitoring during critical construction sequences.

REVIEW CONCERN 4

CPC commitment to have 6 deep-seated benchmarks with instruments installed and operational before beginning Phase 2A work. (Telephone record, March 8, 1982, Par 4.b and Par 5). Also instruments DMD-1W, DMD-1E, DSB-1W, DSB-1E are to be installed and operational. (February 3-5 Design Audit).

RESPONSE

Current plans are to have nine deep-seated benchmarks operational prior to the start of Phase 2A. The correct designation for the bench marks is:

Feedwater Isolation Valve Pits	DSB1-W
	DSB1-E
Electrical Penetration Area Outer Ends	DSB2-W
	DSB2-E
Control Tower South Wall	DSB3-W
	DSB3-E
Auxiliary Building Column Line H	DSBAS-1
	DSBAS-2
Railroad Bay	DSBA-N

Relative movement monitoring devices DMD-1W and DMD-1E will also be operational prior to Phase 2A. As discussed on March 16, 1982 if Consumers Power is unable to install one or more of the deep-seated benchmarks due to construction difficulties, we will contact the Staff.

REVIEW CONCERN 5

Submittal of strain gage installation details @ EL 659' with limiting strain valves and basis (February 26, 1982 meeting and telephone record, March 8, 1982, Par 4.d).

RESPONSE

Details of strain measuring devices to be installed at El 659' will be provided. These devices will be used during Phases 2A and 2B for information only and to establish baselines. Acceptance criteria will be established for Phase 3 based on the data obtained during the early construction phase.

Drawing C-1495(Q) (Figure 3) shows the monitoring details for the strain guage at EL 659'-5/16".

REVIEW CONCERN 6

Commitment to perform test load above design load (eg, 1.30 times) on installed pier to develop load-deflection curve for verification of hard clay soil modulus. Identify pier. (February 3-5 Design Audit).

RESPONSE

We will commit to perform either a load test of the completed pier to 1.3 times allowable load or a plate test of the bearing statum. If a pier is used, the pier most likely to be used will be pier W11. The test will be performed prior to Phase 3.

REVIEW CONCERN 7

Submittal of measures to be required during periods of work shutdown to support faces of drifts and bottoms of pits (February 3-5 Design Audit).

RESPONSE

The required measures for excavation protection for drift faces and pit bottoms were transmitted in correspondence on March 10, 1982 (J W Cook to H R Denton, Serial 1[illegible]). These measures include control of perched groundwater, flowing ground, seepage and belling in the clay till.

REVIEW CONCERN 8

Submittal of plans for dewatering localized water pockets (eg, placing wells in sand fill around reactor perimeter) in advance of pit construction (February 3-5 Design Audit).

RESPONSE

The following issues discussed in the February 3-5 design audit are addressed below.

Construction Dewatering

A five step plan has been developed for localized dewatering of water pockets. The first step is presently activated. If Step 1 should not be sufficient,

Step 2 will be activated with Steps 3 through 5 available, should the earlier procedures be inadequate to control the local groundwater.

Step 1 Install wells in sand fill around reactor perimeter, (construction wells are installed and ready for operation within excavation);

Step 2 Use localized dewatering (sumps);

Step 3 Reactivate TEW wells, (The TEW wells and logs are shown in 50.54f Question 42 and Volume 8 respectively, and generally are located in the turbine building adjacent to the auxiliary building);

Step 4 Stablize soil locally with grout;

Step 5 Add ejector wells from within drifts.

Recharge Tests

The enclosed Figure 2 envelops the most and least conservative observation wells during the recharge test near the diesel generator building and auxiliary building railroad bay. The graphs show that the earliest any well will reach elevation 610' is after 71 days of loosing all wells with no corrective measures taken. The enclosed Table 1 "Well Failure Mechanisms and Responses" has been updated and shows both the repair time and a commitment to shut the unit down whenever the water level exceeds elevation 608.5. This level allows sufficient time to shut the unit down based on the assumptions listed on the recharge test graph. The elevation 608.5' will be reevaluated in the final recharge test report. This controlling water level, EL 608.5' will be applied to any observation well within the areas marked in the attached Figure 1 drawing.

Pipe Break Analysis

In response to NRC Question 49, we analyzed a non mechanistic failure of the 96-inch diameter Unit 2 circulating water pipe which was considered the "worst case" pipe failure in the area of the diesel generator building (DGB). The NRC Staff requested we consider failure of the 20-inch diameter condensate water pipe, which is located directly beneath the DGB. Using a simplified and very conservative analysis, we assumed the entire contents of the condensate water tank (300,000 gallons) was spilled directly to the area beneath the DGB. Further, it was assumed that all of the water would be contained directly beneath the building. Using a weighted average specific yield of .28 for the materials beneath the DGB, the following analysis was used:

1. Quantity of water spilled from condensate water tank = 300,000 gallons
2. Area of DGB: 155ft x 70 ft = 10,850 sq ft
3. Thickness of zone to be saturated under DGB: el 610 (maximum water level) - El 595' (operating level) = 15 ft
4. Volume beneath DGB: 10,850 sq ft x 15 ft = 162,750 cu ft
5. Number of gallons that can be accomodated beneath the DGB: 162,750 cu ft x .28 (average weighted specific yield) x 7.48 gallons/cu ft = 340,864 gallons
6. Therefore 340,864 gallons of water can be placed below the DGB before El 610' is exceeded.

Since the volume of water in the condensate storage tanks is less than the volume required to fill this area to El 610', a failure of the condensate water pipe is not considered a significant problem, even when assuming the unlikely case where all water spills into the soil directly beneath the DGB and when assuming there are no permanent area dewatering wells operating in the area.

REVIEW CONCERN 9

Review piping between FIVP and containment building.

RESPONSE

The feedwater line settlement was reviewed and approved during the audit of February 1-5, 1982. The 2-inch steam generator blowdown piping is presently not connected. Shoud it become desirable to connect this piping, allowable differential settlement criteria will be established.

REVIEW CONCERN 10

Applicant shall notify NRC that all underpinning construction will be Q-listed consistent with the NRC Staff's findings during the meeting of March 10, 1982.

RESPONSE

We will provide by separate letter a statement as to the quality assurance philosophy and approach to be adopted for the underpinning of the auxiliary building prior to start of Phase 2

REVIEW CONCERN 11

A contingency plan for grouting of voids under the turbine building.

RESPONSE

Refer to Attachment 1 for an outline summarizing the main elements of the contingency plan which will be developed for grouting of voids which could be encountered under the turbine building foundation mat. This plan will be completed prior to the start of Phase 2A.

PHASE 2B AUXILIARY BUILDING UNDERPINNING WORK

REVIEW CONCERN 1

Commitment by CP Co to have installed and operational all of the remaining instruments identified on drawing C-1493(Q).

RESPONSE

Installation of all movement and strain measuring devices will be complete prior to start of Phase 2B the details of which are generally shown on C-1493(Q) (Figure 4).

REVIEW CONCERN 2

Reading frequency of monitoring devices during critical stages.

RESPONSE

Reading frequency of monitoring devices will be increased to twice per shift during the critical stages of Phase 2B. These critical stages will as a minimum be:

a.) Access drifts 5E & 5W

b.) Piers W9, E9, W8, & E8

c.) Balance of drift 22E & 22W to the Phase II/Phase III interface

d.) Drifts 7E & 7W (if installed)

PHASE 3 AUXILIARY BUILDING UNDERPINNING WORK

REVIEW CONCERN 1

Provide instrumentation details and horizontal movement tolerance criteria with basis, for 3 instruments to be installed at top of EPA's and Control Tower (Telephone record, March 8, 1982 Par. 4.c and Par. 5).

RESPONSE

Three relative movement devices will be provided to measure the horizontal movement between the turbine building and the auxiliary building. These devices are as follows:

Unit 1 EPA to Turbine Bldg el 705	DMD-11
Control Tower to Turbine Bldg el 705	DMD-12
Unit 2 EPA to Turbine Bldg el 705	DMD-13

These devices will be installed and read for background during phase 2A and 2B. Acceptance criteria will be established for Phase 3. Each monitoring point will be treated as a separate data base. The monitoring details are shown on drawing C-1493(Q) (Figure 4).

REVIEW CONCERN 2

Auxiliary Building Parametric Analysis for a subgrade modulus of 70 Kcf for the natural till under the auxiliary building.

RESPONSE

Phase 3 will not proceed until completion of the parametric auxiliary building analysis using a subgrade modulus of 70 Kcf for the till under the auxiliary building. The analysis will be based on the use of the parameters agreed to in the parametric analysis of the auxiliary building as identified in Attachment 2.

REVIEW CONCERN 3

Strain gauges or equivalent shall be provided at critical locations, including:

a. Elevation 659' slab
b. Control Tower shear wall
c. Slabs and walls near post-tensioning cables at the Control Tower and Electrical Penetration Areas
d. Steel beams shall have strain gauges, and not deflection meters.

Information shall be provided for these gauges regarding:

1. Location
2. Monitoring frequency
3. Limits (initial and distress points)
4. Evaluations of results (method and acceptance criteria)
5. Commitment that instruments shall be in place and operational before beginning Phase 2A.

RESPONSE

Refer to our response to Review Concern 5 under the subsection for Phase 2A herein.

REVIEW CONCERN 4

An analysis assuming loss of support of a portion of the electrical penetration area.

RESPONSE

An additional analysis will be conducted assuming reduced support of part of the electrical penetration area along the boundary with the turbine building due to effects of the access drift under the turbine building. This analysis will be completed prior to the start of Phase 3.

ATTACHMENT 1

SUMMARY OUTLINE
EMERGENCY ACTIONS FOR
UNDERPINNING OF THE AUXILIARY BUILDING

1. Introduction
2. Procedure for Monitoring
   a. Normal Response - No Action
   b. High Response - Evaluate
   c. Exceeds Allowable - Stop Work
3. Stop Work in Place
4. Jack on Existing Piers
5. Additional Temporary Piers
6. Additional Needle Beam Assembly
7. Back Fill Excavation
8. Grout Soil for Stability
9. Shoring
10. Grout Potential Void Under Slabs
11. Groundwater Control

ATTACHMENT 2

AUXILIARY BUILDING PARAMETRIC ANALYSIS

1.	E_c Value -	Same as ACI 318 (No Reduction).
2.	Steel in the Slab -	Restricted to the beams with shear studs.
3.	Reduced Stiffness -	Reduction in stiffness based on rebar and steel based on stud flexibility (use conservative estimate) in cracked area. Initial crack: based on $2\sqrt{f_c'}$ to $3\sqrt{f_c'}$ in shear, and $4\sqrt{f_c'}$ in tension
4.	Total Load -	Live load need not be considered (whatever exists must be included).
5.	Redistribution -	Accounted for by the cracking of elements. Only if necessary, local yielding may be considered, provided there is a valid mechanism to transfer load.
6.	Acceptance Criteria -	Based on stress in rebar and effective steel section.
7.	Refinement of Analysis -	More than two construction stages may be considered in the analysis.

TABLE 1

WELL FAILURE MECHANISMS AND RESPONSES

Event	50.54F Reference	Repair Time
1. Electrical Failure		
A. Single well (wired in parallel)	24.a/24.c/47.1.b	Less than 1 day
B. Multiple wells due to power outage	24.a/24.c/47.1.b	One day to initiate power operation of back-up diesel power to interceptor wells. Operate until normal power can be restored. Back-up interceptor wells automatically begin pumping if water levels exceed elevation 595.
2. Failure of timers/pumps/ check valves	24.c/47.1.b/47.6	Less than 1 day, replacement parts on site.
3. Header pipe break	24.c	One day to attach flexible hose to each well affected and pump water to storm drains. In case of interceptor well header failure, initiate back-up wells (on separate header system).
4. Well screen incrustation	24.h/47.6/47.8	Two days to acidize well.
5. Complete loss of well	24.c/47.1.b	Four days to replace one well using cable tool rig. One day if other drilling method used. If well or wells need to be replaced, there is enough redundancy and pumping capacity to prevent water levels from rising in plant fill, while the replacement wells are being installed.

WELL FAILURE MECHANISMS AND RESPONSES

	Event	50.54F Reference	Repair Time
6.	Any or all of the above	47.1.b	After the plant operator has verified that a water level higher than el 595 is a true reading and the repair measures mentioned above are unable to correct the rise in water level at the diesel generator building or auxiliary building railroad bay, the plant will be shut down when any observation well at either of these two structures exceeds elevation 608.5 .

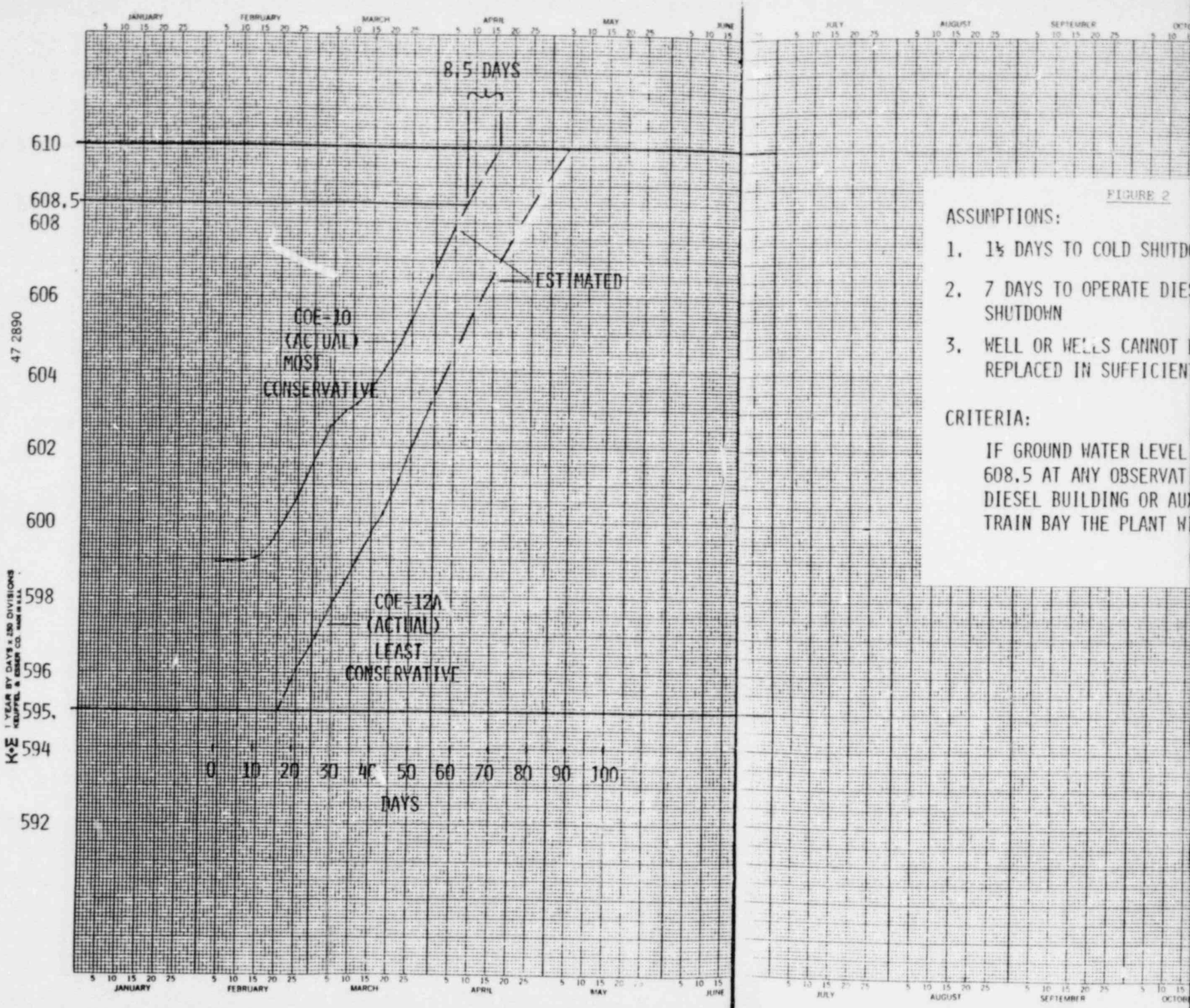


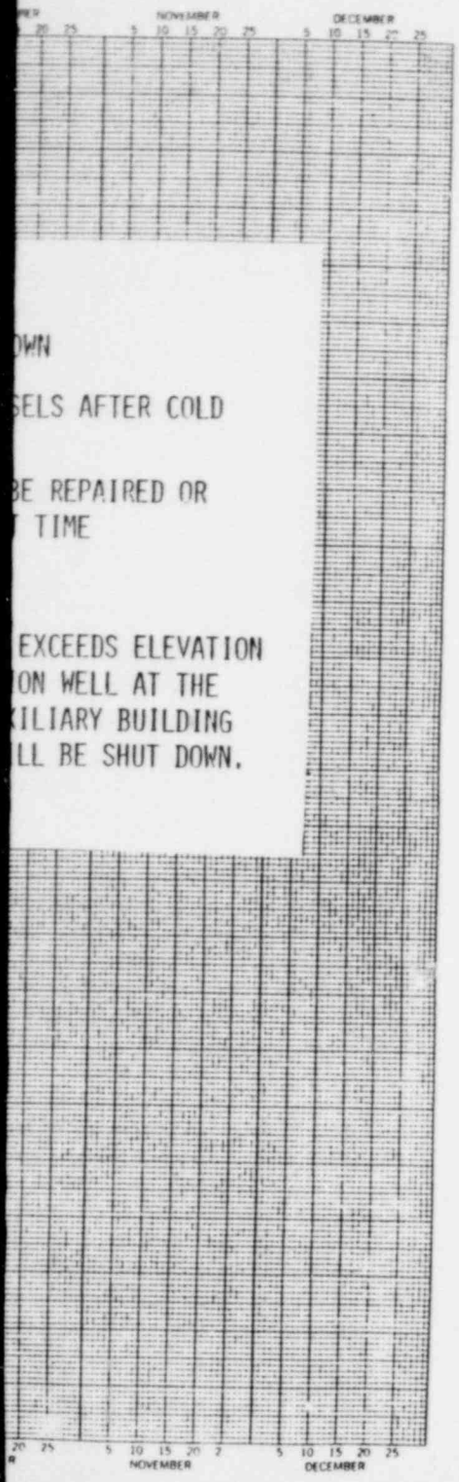
FIGURE 2

ASSUMPTIONS:

1. 1½ DAYS TO COLD SHUTD
2. 7 DAYS TO OPERATE DIE SHUTDOWN
3. WELL OR WELLS CANNOT REPLACED IN SUFFICIEN

CRITERIA:

IF GROUND WATER LEVEL 608.5 AT ANY OBSERVAT DIESEL BUILDING OR AU TRAIN BAY THE PLANT W



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SELS AFTER COLD

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ON WELL AT THE
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LL BE SHUT DOWN.

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