Sept. Site Visit (2 Day) Not 16 & 17
Not 9 & 10

1 of
J. Kane
4/86

July 28, 1982 Design Audit

AUXIL BLDG - Item 9
SWPS - Item 3

Topic-Construction Dewatering for Underpinning

FSAR Fig. 2.5-22C (Section F-F)

Drilled Probe hole (auger w/ wall point)

Recommendation:
For first pier (not test pier), then 15' laterally-flexible by pier layout
When within 5' of planned pier bottom - advance probe hole (4"ϕ max) to locate GWT - extend probe hole 10' (5' below pier bottom) to determine what should be done w/dewatering

E12, W12

E10, W10
E7, W7
E4, W4
CT6
CT-1, CT-12

Do piers W12 & E12 - then piers @ approx. 50' spacing
CT-1 & CT-12
KC-4, KC-9, CT-14

NRC Position
Require probing @ every third pier
W12 & E12
W9 & E9
W6 & E6
W3 & E3
in additional to W12 & E12
Seven additional (uniformly spaced between W12 & CT-1
E12 & CT-12)
and one additional between CT-1 & CT-12
(their 4 + 7 additional) - @ earliest possible date

ASK CPC to identify

Resolved see above

8408140357 840718
PDR FOIA
RICE84-96 PDR

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C. Gould on Load Transfer
Ref. Drawings S-74, S-74a
C-1409-2, C-1409-4 Jacking Tower Views

Load Transfer (Drwg S-74)

7/29/82

DGB Structural Analysis for Settlement

Study	Time Frame		
1A	3/28/78	to 8/15/78	
1B	8/15/78	to 1/5/79	Compare w/ Table 1-4
2A	1/5/79	to 8/3/79	Due only to settlement not dead load
2B	8/3/79	to 12/31/2025	Case 2 Maximum Rebar Stress South Wall Element 63 20.817 KSI; 2nd Highest Shield Wall El. 664 Element 209 18.267 KSI Rebar Stress

Want to review soil pressures for 2A & 2B

Case studied D@ 52.7 (4/21/82) Sheets 7 & 11

- Replaced soil springs w/ pant support locations
-

In Final SSER — indicate specification or procedures as required to be provided to Region III before the work

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BEARING CAPACITIES

Net Ultimate Bearing Capacity

FIUP

GWT El. 595, Fdn. Elev. 615.5 (SK-G-379), 15' width

$q_{ult} = \frac{1}{2} B \gamma N_\gamma + \gamma D_f (N_q - 1)$ Peck et al Eq. 19.2

Rel. Density = 85%, Used $\phi = 35°$ $N_\gamma = 37$ $N_q = 33$

$q_{ult} = \frac{1}{2} \times 15 \times 0.13 \times 37 + 0.13 \times 33 (33-1)$ = 173 ksf

Adopted value = 25 ksf

DGB & Pedestals

GWT El. 595, Fdn. Elev. 628, Footing Width = 10 ft

For DGB - DL + LL range from 3.2 ksf to 3.9 ksf (Do not include soil wt above footing

$\bar{\sigma}_v = 5(130) + 4500 = 5150$ lb/ft^2

For PI = 11 & OCR = 1 to 2, then $K_o = 0.55$ (Fig. 20.8 Lambe & Whitman)

$\bar{\sigma}_m = \frac{1}{3}(\sigma_1 + \sigma_2 + \sigma_3)$ $\sigma_2 = \sigma_3 = K_o \sigma_1 = K_o \bar{\sigma}_v$

$= \frac{1}{3} \bar{\sigma}_v (1 + 2K_o)$

$= \frac{1}{3} \times 5150 (1 + 2 \times 0.55) = 3605$ psf

Wt. of soil above footing $= \frac{0.130 (3.\ )(8.5)}{10}$ = 0.39 ksf

footing width

$N_c = 5.14$ pg. 271 Peck

For DGB structure $q_{ult} = c \cdot N_c$

$= 2.7(5.14)$

$= 13.9$ ksf

For Pedestals $q_{ult} = 5c\left(1 + 0.2 \frac{B}{L}\right)\left(1 + 0.2 \frac{D_f}{B}\right)$

$= 5(1.4)\left(1 + .2 \frac{10}{41}\right)\left(1 + 0.2 \times \frac{6}{18}\right)$

$= 5(1.4) \times 1.098 \times 1.067 = 8.1$ ksf

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2 of
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Safety Factor
for DGB structure $D+L_{gross} = 4.5$

$D+L_{net} = 3.7$

$D+L+E_{gross} = 5.7$ (based on $5.3 + 0.4$ soil over footing)

$D+L+E_{net} = 4.9$

$$F.S. = \frac{14}{3.7} = 3.8$$

$$\frac{14}{4.9} = 2.9$$

AUXIL. BLDG
Area I & J, Fdn. El. 569

$B = 14.5'$ $L = 56$

$D_f = 6.5'$ $B/L = 0.26$

$c = 7$ ksf $D_f/B = 4.5$ use 2.5

$$q_{ult} = 5c\left(1+0.2\frac{B}{L}\right)\left(1+0.2\frac{D_f}{B}\right)$$

$= 5.7$ ksf

$q_{ult} = 55.2$ ksf

$$F.S. = \frac{\text{Net } D+L+E_{gross}}{D+L+E_{gross}} = \frac{50}{4.2} = 11.9$$

RR Bay
Shallow portion El. 630.5, $B \approx 28'$ GWT El. 595
Corrected Blow count $N = N' = \frac{50}{P+10}$ Bowles pg. 125

$$N = 10 + \frac{50}{28.9} =$$

σ

$P = 2720 \frac{lb}{ft^2} \times \frac{1}{144 \frac{in^2}{ft^2}} = 18.9$ psi

Used $N = 10$, $\therefore \phi = 30°$ Bowles pg 125, Table 3.2

$q_{ult} = \frac{1}{2} B \gamma N_\gamma + \gamma D_f (N_q - 1)$ $N_q = 19$

$= \frac{1}{2} \times 28 \times 130 \times 15 + 130 \times 3.5 (19-1)$

$= 35{,}490$ lb/ft^2

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FSAR 38-51 ~~38-52~~ for View of RR Bay

4' thick fdn. mat 634-6 to 630-6"
77-6" long x 28' min
C-268(Q)

* CPC
Request definitions of Alert & Action be defined in FINAL SSER

4/86 1 of
J. Kane
7/21/82

Meeting w/ CPC July 21, 1982 @ 0900 in Room 220 Landow Bldg

Asked by SEB:
- Concerning allowable movements of Anal. Bldg during underpinning: (D.L. + 25% L.L. used Factor of 1.0 adopted)
- What loads (& factors) used in analysis
- Pg. 5, Jun 14, 1982 submittal
- How do loads and settlements used in analysis during underpinning compare w/ long term condition (e.g. OBE) settlements for total settlement
  Projected future settlements ~~vs~~ w/ design load combinations
- Modifying slab @ El. 659 - what impact on settlements
  Not needed for underpinning - needed for earthquake loading

Why settlements (EPA vs C.J.) are in direction given in Jun 14, 1982 submittal

* Predetermined sacking load would not be placed if, when sacking, vertical recovery reaches 0.03" (Elevation maintenance) Called
Do not expect to recover the settlement which occurs during undermining & underpinning - (Per. C. Gould)

Define Emergency Stop limit
Action level
Alert level (Trigger level)

* Have CPC define & ~~be~~ being tied to settlement limits
Make part of procedures
How recognition that settlement

6. BACKFILL AND COMPACTION REQUIREMENTS Aux. Bldg. Item 2 FIVP Rec'd 7/27/82 from N. Swanberg

5/86

A. DEFINITIONS AND ABBREVIATONS

STRUCTURAL BACKFILL - "STRUCTURAL BACKFILL" AS USED HEREIN AND ON DRAWING 7220-C- REFERS TO FILL PLACED BELOW SEISMIC CATEGORY I FOUNDATIONS AND WITHIN 3 FEET OF THE EXTERIOR WALLS OF STRUCTURES.

GENERAL BACKFILL - "GENERAL BACKFILL" AS USED HEREIN AND ON DRAWING 7220-C- REFERS TO FILL PLACED TO FILL DRIFTS, ACCESS SHAFTS, ETC, WHICH ARE NOT INTENDED TO CARRY STRUCTURAL LOADS.

ASTM - ASTM REFERS TO AMERICAN SOCIETY FOR TESTING AND MATERIALS. REFERENCED STANDARDS ARE DESCRIBED IN SECTION 2.2 OF SPECIFICATION 7220-C-195(Q).

RGE - RGE REFERS TO THE RESIDENT GEOTECHNICAL ENGINEER OR HIS DESIGNATED REPRESENTATIVE.

B. BACKFILL REQUIREMENTS

UNLESS OTHERWISE APPROVED, MATERIALS FOR STRUCTURAL AND GENERAL BACKFILL SHALL BE SAND OBTAINED FROM A SOURCE MEETING THE FOLLOWING GRAIN-SIZE GRADATION RANGE AS DETERMINED BY ASTM D 422 WITHOUT THE HYDROMETER TEST:

SIEVE SIZE	PERCENT FINE	RETAINED* COURSE
1 INCH	0	0
#4	0	25
#10	0	50
#40	40	95
#200	95	100

*THIS GRADATION RANGE SHALL NOT BE SKIP GRADED.

DELIVERED OR STOCKPILED BACKFILL MATERIAL SHALL BE VISUALLY INSPECTED AND TESTED IN ACCORDANCE WITH ASTM D 422 AT LEAST ONCE DAILY OR AS DIRECTED BY THE RGE, AND SHALL BE APPROVED BY THE RGE PRIOR TO USE.

IN LIEU OF THE GENERAL BACKFILL MATERIAL DESCRIBED ABOVE, FILLCRETE (A SAND-CEMENT MIXTURE), AS SPECIFIED IN SPECIFICATION 7220-C-230, MAY BE USED WHEN REQUIRED BY THE DESIGN DRAWINGS.

C. PLACEMENT

BACKFILL SHALL BE PLACED IN THE ZONES SHOWN ON DRAWING 7220-C-

PRIOR TO PLACEMENT OF BACKFILL, THE CONDITION OF THE SUBGRADE SHALL BE APPROVED BY THE RGE. ALL BACKFILLING WORK SHALL BE OBSERVED BY THE RGE. BACKFILL MATERIAL SHALL BE MOISTURE CONDITIONED BY ~~SPRINKLING OR BY OTHER MEANS APPROVED BY THE~~ RGE. scaling immediately prior to compaction

BACKFILL SHALL NOT BE PLACED UPON A FROZEN SURFACE NOR SHALL ANY FROZEN MATERIAL BE INCORPORATED IN THE BACKFILL. HEATING SHALL BE REQUIRED WHEN THE AMBIENT TEMPERATURE IS 32F AND FALLING

BACKFILL SHALL NOT BE PLACED UPON A FROZEN SURFACE NOR SHALL ANY FROZEN MATERIAL BE INCORPORATED IN THE BACKFILL. HEATING SHALL BE REQUIRED WHEN THE AMBIENT TEMPERATURE IS 32F AND FALLING.

LIFT THICKNESSES OF UNCOMPACTED BACKFILL SHALL NOT EXCEED 4 INCHES.

BACKFILL AREAS SHALL BE RAISED SIMULTANEOUSLY, FORMING AN APPROXIMATELY HORIZONTAL PLANE.

FOLLOWING DISCONTINUITIES IN BACKFILL PLACEMENT AND COMPACTION OF 4 OR MORE HOURS, OR AFTER DELAYS DURING WHICH COMPACTED MATERIAL WAS DISTURBED AS DETERMINED BY THE RGE, THE LAYER UPON WHICH ADDITIONAL BACKFILL IS TO BE PLACED SHALL BE INSPECTED BY THE RGE AND ADDITIONAL TESTS SHALL BE PERFORMED AS DIRECTED BY THE RGE.

D. COMPACTION REQUIREMENTS

BACKFILL SHALL BE COMPACTED IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS.

1. STRUCTURAL BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 95% OF THE MAXIMUM DENSITY VALUES DETERMINED IN ACCORDANCE WITH ASTM D 1557, METHOD D.
2. GENERAL BACKFILL SHALL BE COMPACTED TO NOT LESS THAN 85% OF THE MAXIMUM DENSITY VALUES DETERMINED IN ACCORDANCE WITH ASTM D 1557, METHOD D.

E. COMPACTION EQUIPMENT AND EFFORT

COMPACTION EQUIPMENT SHALL BE SELECTED AND APPROVED ON THE BASIS OF DEMONSTRATED ABILITY TO ACCOMPLISH ADEQUATE COMPACTION OF FILL MEETING THE BACKFILL REQUIREMENTS. THE RGE SHALL PREQUALIFY THE EQUIPMENT USED FOR COMPACTION BASED ON TESTING RESULTS AT A TEST AREA WHERE 4-INCH LIFTS OF MATERIAL MEETING THE BACKFILL REQUIREMENTS WERE PLACED AND COMPACTED. COMPACTION DOCUMENTATION SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

1. EQUIPMENT DESCRIPTION AND MODEL
2. NUMBER OF PASSES PER LIFT
3. SPEED OF ADVANCEMENT
4. VIBRATION FREQUENCY
5. OVERLAP PER PASS
6. COMPACTION DENSITY RESULTS

UNLESS OTHERWISE APPROVED BY THE RGE, THE COMPACTION EQUIPMENT SHALL BE SELECTED FROM THE FOLLOWING:

EQUIPMENT NAME	MODEL
WACKER VIBRATORY PLATE WITH 8" OUTRIGGERS	DVJ 3001
RAMMER TYPE COMPACTOR (POGO STICK)	CP-4RV
J-FOOT WACKER	GVR 220Y

RAMMER TYPE COMPACTOR (POGO STICK) CP-4RV

J-FOOT WACKER GVR 220Y

F. SOIL TESTING

SOIL PLACED AND COMPACTED IN ACCORDANCE WITH THIS SPECIFICATION SHALL BE TESTED IN ACCORDANCE WITH ARTICLE 9.0 OF SPECIFICATION 7220-C-208, EXCEPT THAT FIELD DENSITY TESTING FREQUENCY SHALL VARY FROM 1/10 YD^3 TO 1/100 YD^3 PER TEST, AS DETERMINED BY THE RGE, OR ONE TEST PER LIFT AT EACH BACKFILL LOCATION, WHICHEVER IS MORE FREQUENT.

G. TEST LOCATION

THE RGE SHALL DETERMINE ALL DENSITY TEST LOCATIONS. THESE LOCATIONS SHALL BE DOCUMENTED WITHIN ±3 FEET IN PLAN AND ±3 INCHES IN ELEVATION.

H. TEST RESULTS

THE RGE SHALL REVIEW AND APPROVE EACH SOILS TEST REPORT. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO, REPORTS FOR GRADATION, MOISTURE, AND DENSITY TESTS.

I. FAILING TEST

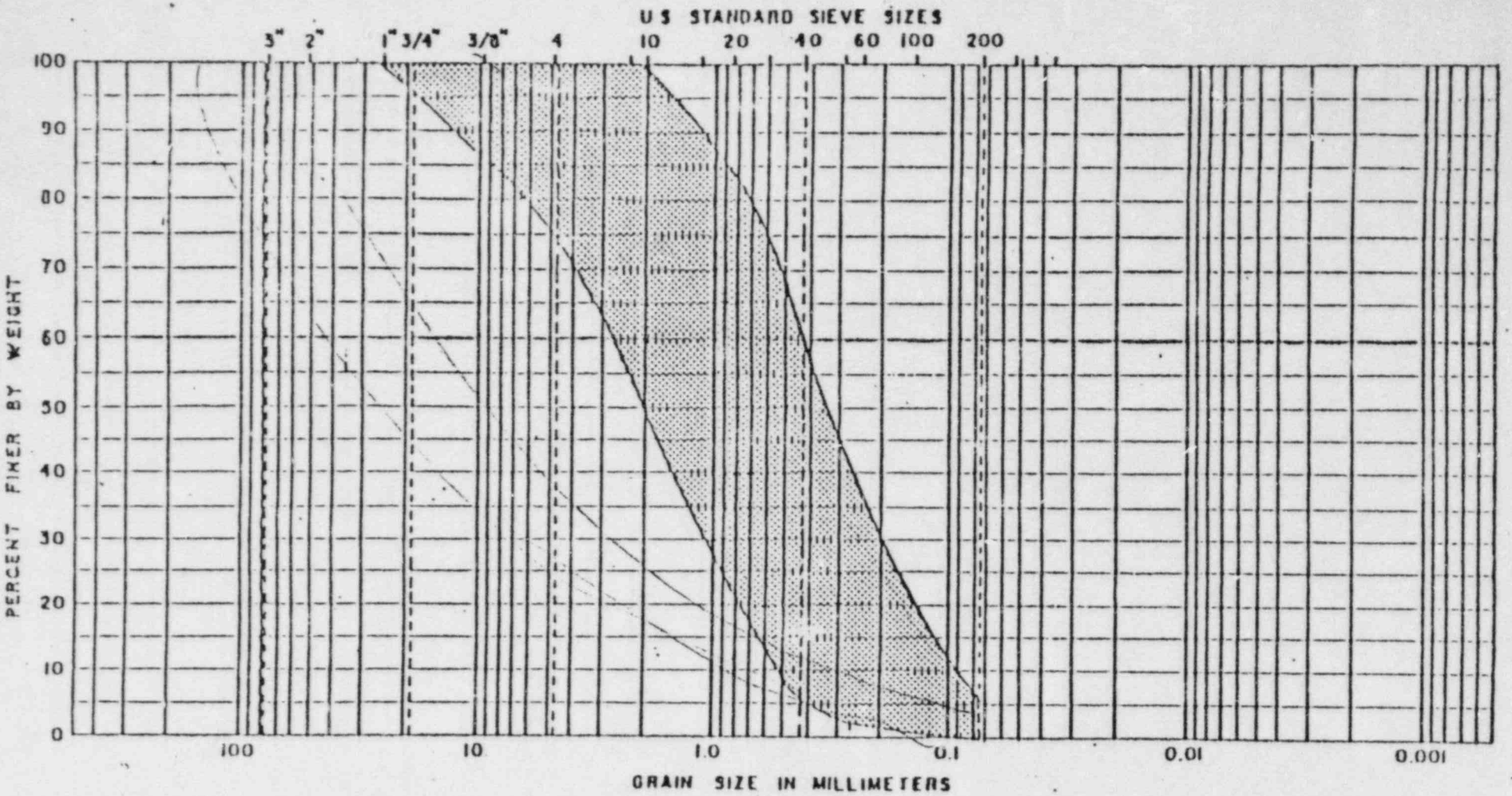
BACKFILL MATERIAL REPRESENTED BY FAILING TESTS, AS DETERMINED BY THE RGE, SHALL BE REWORKED UNTIL THE SPECIFIED COMPACTION IS OBTAINED. NO MATERIAL SHALL BE PLACED ON ANY KNOWN FAILING MATERIAL UNTIL SATISFACTORY TESTS ARE OBTAINED.

J. WINTER PROTECTION OF THE BACKFILL

THE FIELD SHALL TAKE WHATEVER PRECAUTIONS ARE NECESSARY TO PROTECT THE PARTIALLY COMPLETED BACKFILL DURING THE WINTER. THE FIELD SHALL PERFORM ANY NECESSARY RECONDITIONING OF THE AREA BEFORE BACKFILL OPERATIONS RESUME. THE RGE SHALL APPROVE ALL AREAS BEFORE BACKFILL OPERATION RESUME AFTER THE WINTER MONTHS.

K. QUALITY REQUIREMENTS

ALL ACTIVITIES AFFECTING THE QUALITY OF THE MATERIAL, PLACEMENT, AND TESTING SHALL BE CONTROLLED BY CONTRACTOR'S QUALITY CONTROL PROGRAM. LIKEWISE, THE QUALITY DOCUMENTATION WILL BE IN ACCORDANCE WITH THE REQUIREMENTS OF CONTRACTOR'S QUALITY CONTROL PROGRAM.



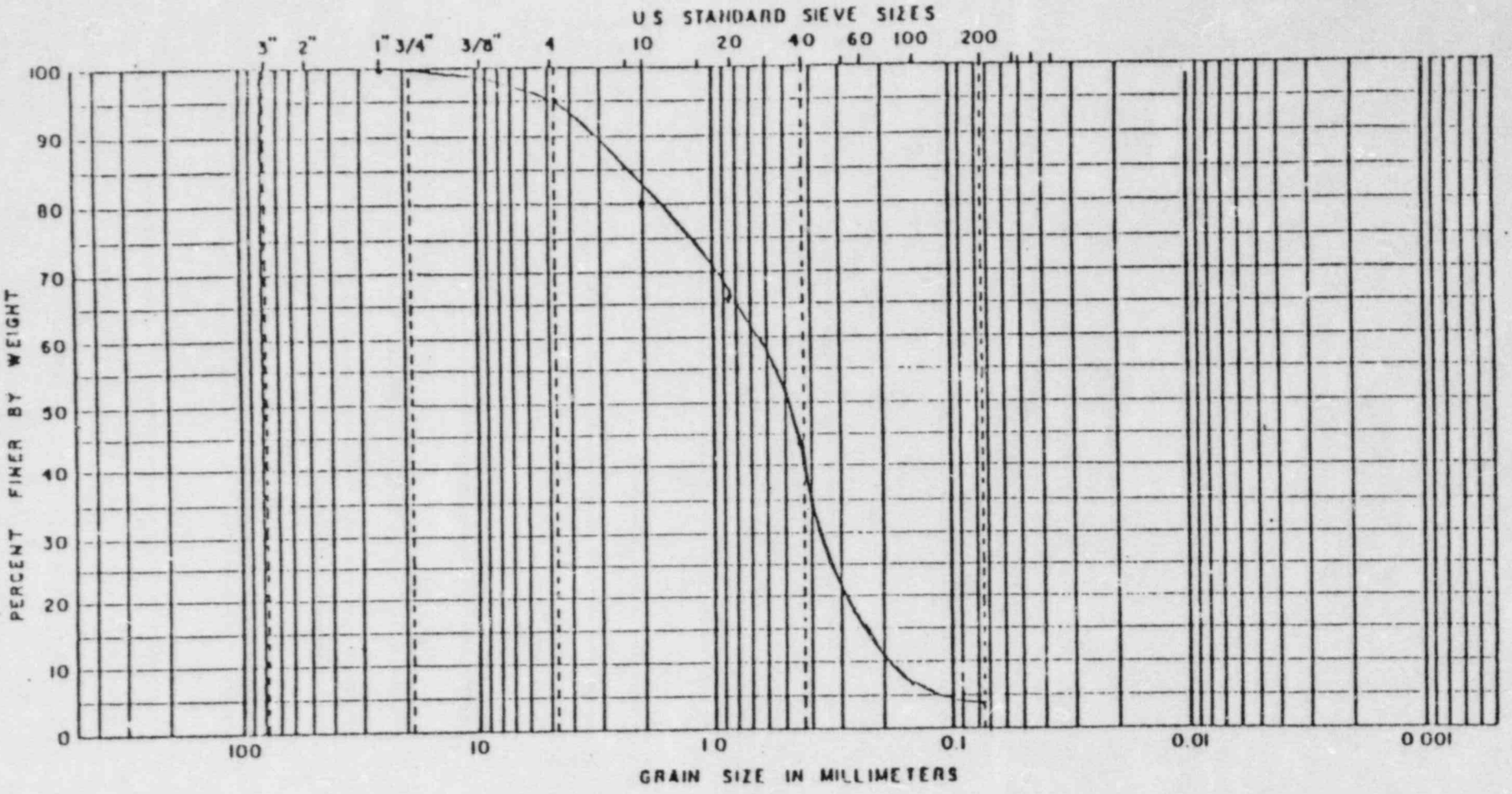
BOUL. DERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO	ELEV OR DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
						GRADATION RANGE OF STRUCTURAL BACKFILL SPEC. C-211

GRAIN SIZE DISTRIBUTION

MIDLAND POWER PLANT
UNITS 1&2

Rec'd 7/21/82

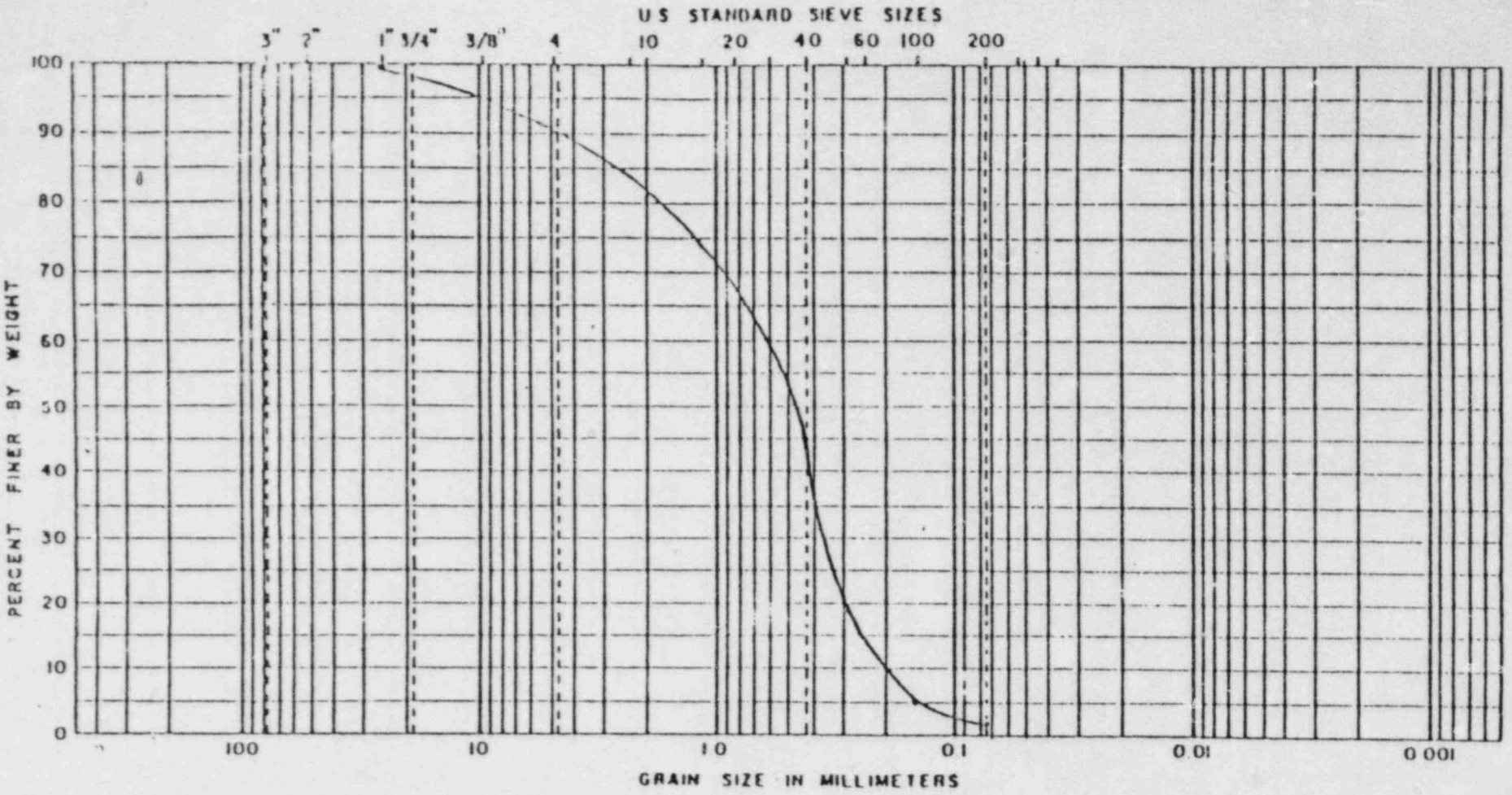


BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO	ELEV OR DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
Log No. 3468						Structural Backfill RD 335 Test Fill #2, Lift 6

GRAIN SIZE DISTRIBUTION

Midland Power Plant
Units 1 & 2



BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

BORING NO	ELEV OR DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
Lot No. 3500						Structural Backfill RD 417 Test Fill #2, Lift 8

GRAIN SIZE DISTRIBUTION

Midland Power Plant
Units 1 & 2

Furnished by GEI
CPC has committed to adopting the testing procedures in controlling the granular fill beneath the FIVP

July 29, 1982
GEI 81907

Fig. 9-11 would be assumed to have the same maximum dry unit weight. Substantial errors in the computed percent compaction would result.

For the above reason, the measurement of percent compaction in the field should be carried out using the following "one-point procedure":

1. Determine the compaction curves for about three samples of the borrow that are carefully selected to represent the probable range of materials to be used.
2. Plot all three compaction curves on one page to form a "family" of curves, such as Fig. 9-10. Note on this plot the maximum particle size used in the compaction test, e.g., -3/4 in. or -No. 4.
3. Measure the field unit weights at the desired location using a procedure such as the sand-cone (ASTM D 1556). ~~or a nuclear densometer.~~ Do not measure the unit weight at the fill surface. Dig down a minimum of 4 in. before making the measurement.
4. Take a sample of the soil from the walls of the field unit weight hole ~~or at the location where the nuclear densometer probe was inserted~~. Do not dig below the field unit weight hole ~~to the depth of the probe~~, because the next layer below may have a different maximum dry unit weight.
5. Remove and save the coarser particles, i.e., the sizes not used in the compaction tests in Step 1,

from the sample in Step 4. Measure the percent by weight of the total sample represented by the coarser particles, P_g. Brush the fines off the larger particles and retain them in the sample.

6. Perform a "one-point" compaction test on the sample from Step 5 (i.e., after removal of the coarser particles).

7. Plot the one-point test result on the family of curves from Step 2.

8. Interpolate between the family of compaction curves and estimate the maximum density, γ_{dx}, for that sample. (If the point falls outside the family of curves, a new compaction curve should be carried out on another sample taken in the field from the location of the field density test.)

9. Correct the field density measured in Step 3 for the percentage of the sample that contains particles coarser than those used in the compaction tests. The following formula applies:

$$\gamma_{dc} = \frac{1 - P_g}{\left(1 - \frac{P_g \gamma_d}{G \gamma_w}\right)} \gamma_d \quad (\gamma_{dc} < \gamma_d)$$

where γ_{dc} = corrected field dry unit weight

γ_d = measured field dry unit weight

γ_w = unit weight of water

P_g = percent by weight of gravel particles removed in Step 5. (Dry weight of gravel/total dry weight)

G = specific gravity of gravel particles

10. Compute the percent compaction as the ratio

$$P = \frac{\gamma_{dc}}{\gamma_{dx}} \quad \frac{(\text{Step } 9)}{(\text{Step } 8)}$$

γ_{dx} = max. density from lab test

Use of this procedure will ensure that the measured dry unit weight is compared with the proper maximum dry unit weight. ~~Other procedures are available to accomplish the same purpose, e.g., Hilf (1959).~~

Experience has shown that use of either the above procedure ~~or that given by Hilf~~ is vital for practically all soil types because the maximum density varies substantially even for materials whose grain-size curves are nearly identical. Unless it can be shown for a particular case in practice that the procedure can be simplified, the above procedure should be used.

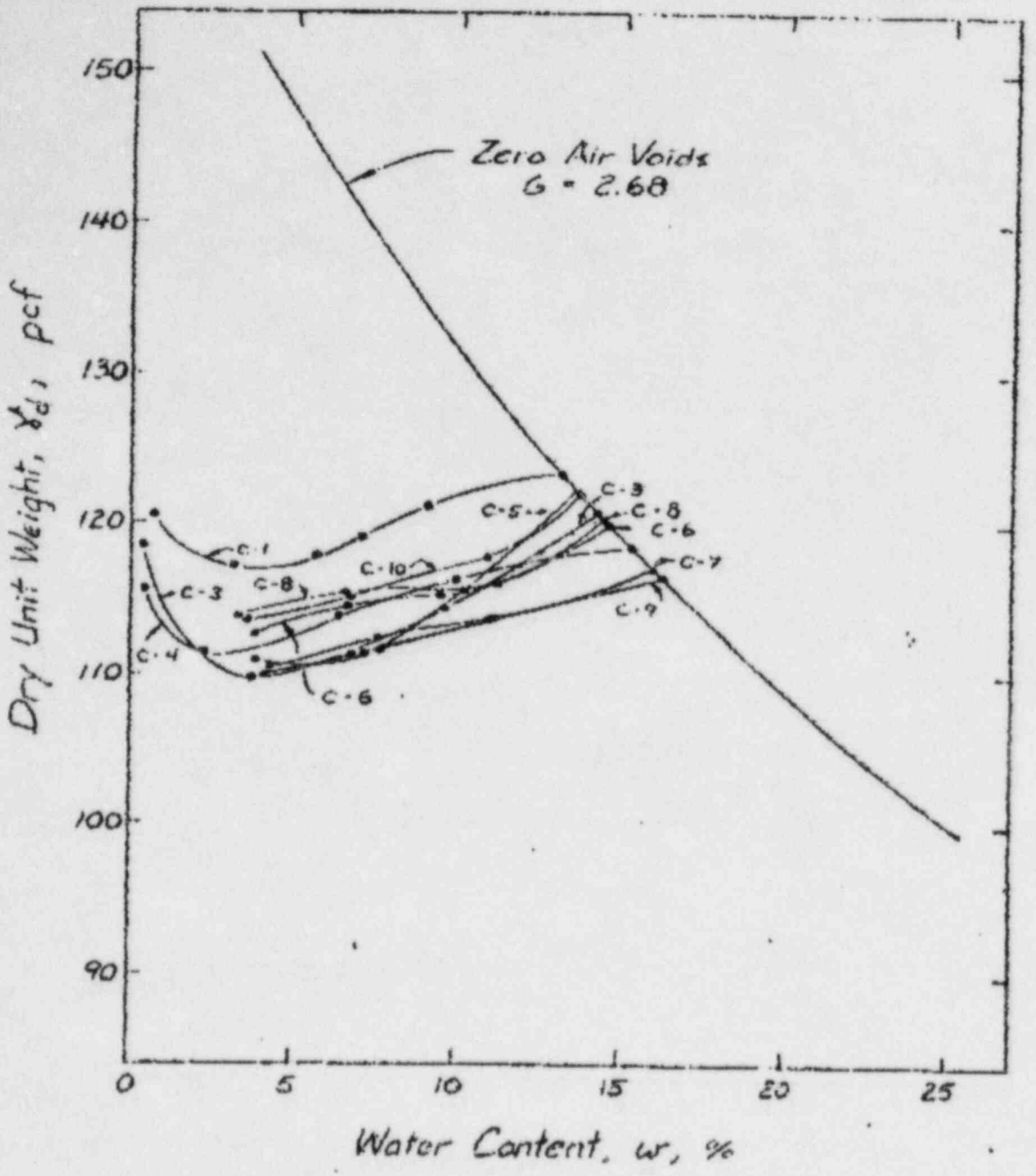


Fig 9-10 Summary of Modified AASHO Compaction Test Curves

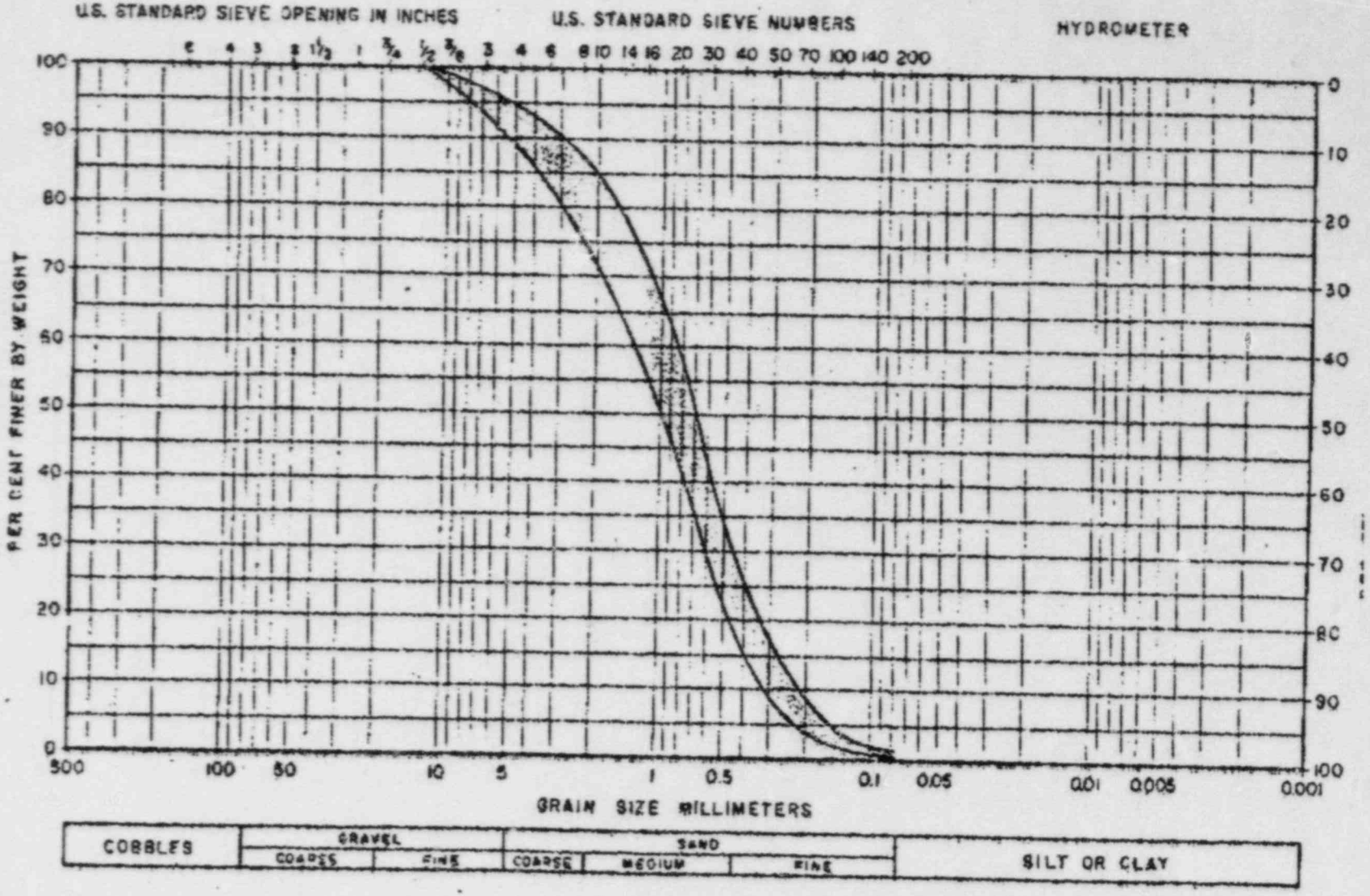


Fig 9-11 Band of Grain Size Curves for Soils in Fig. 9-10

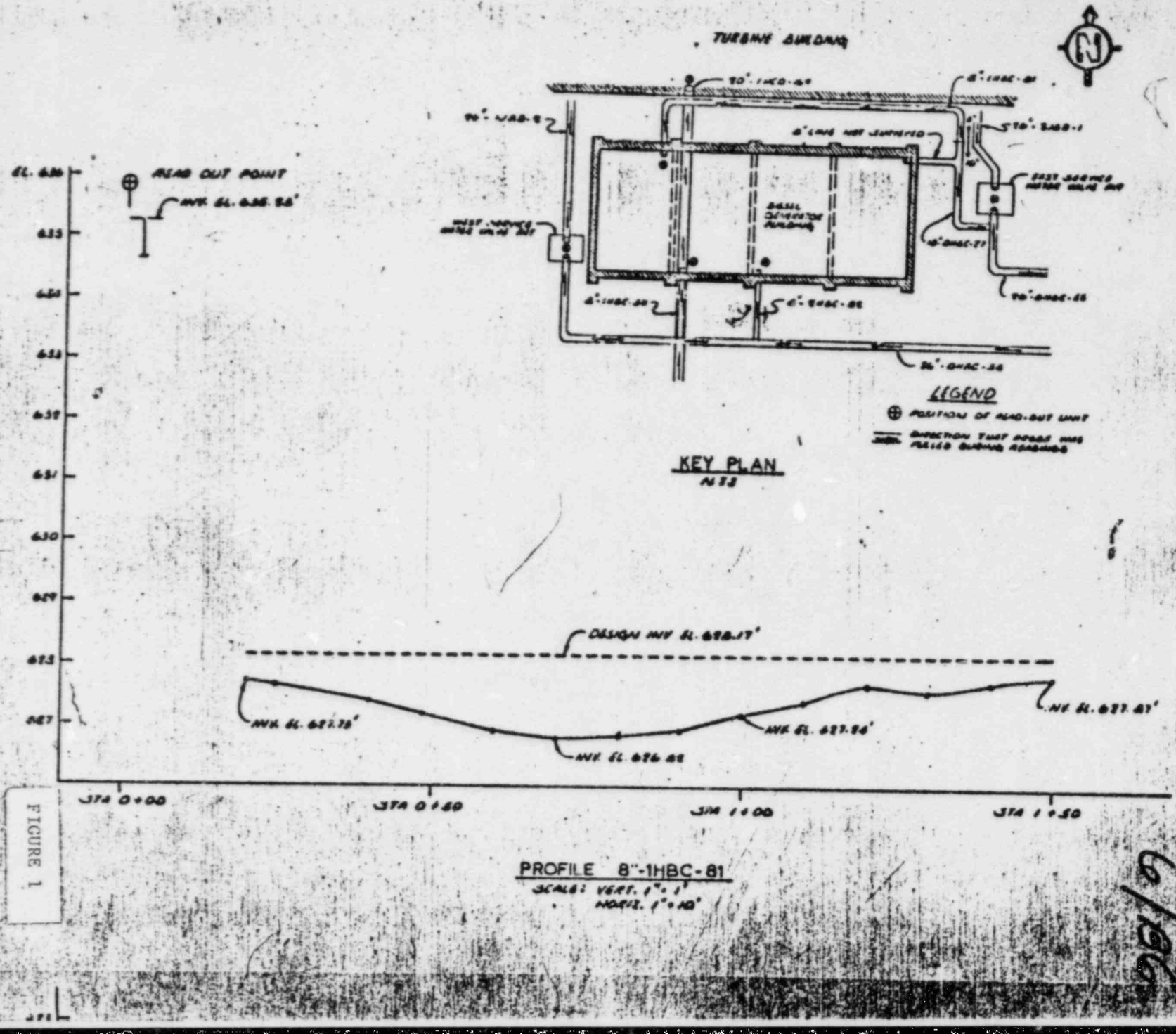


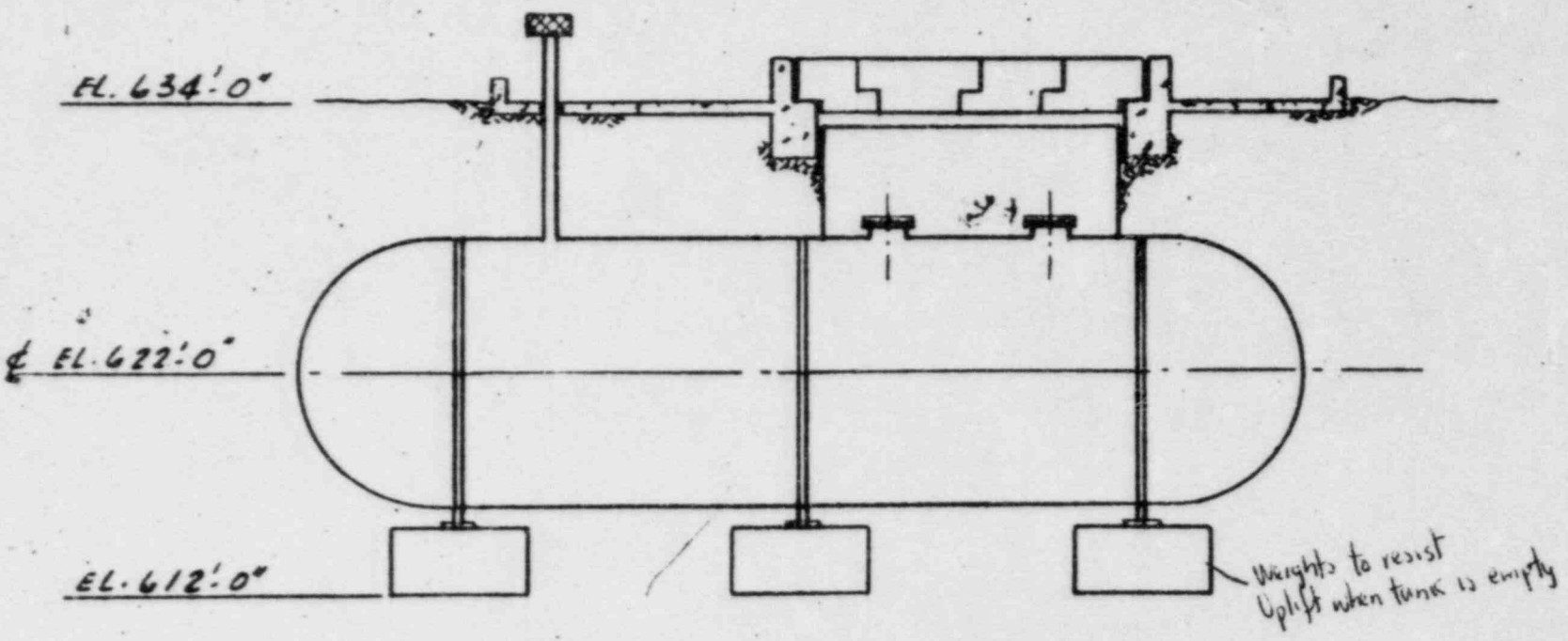
FIGURE 1

Tom Cooke

(2)

Presentation by Tom Cooke 2/29/80

6/80



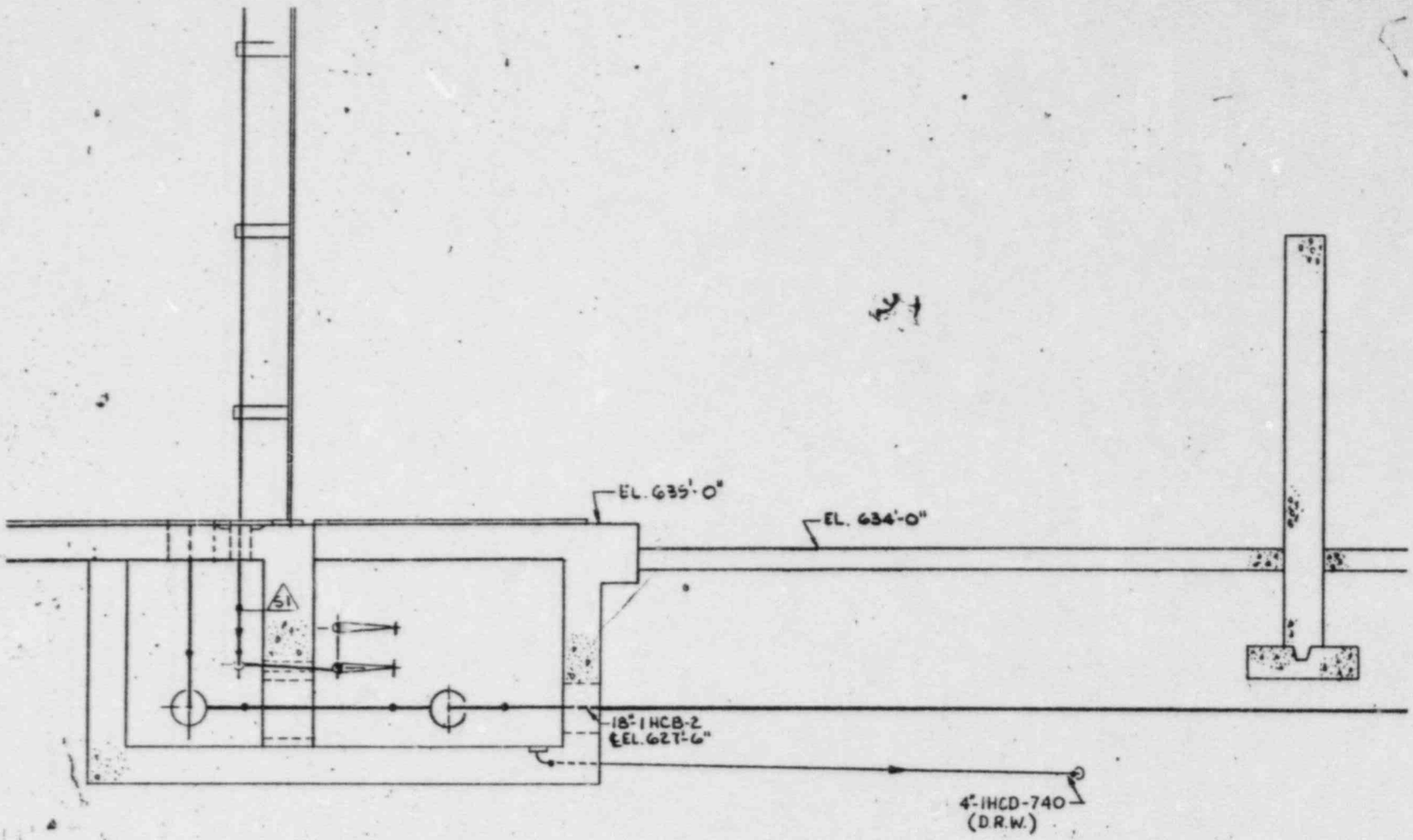
ELEVATION

EMERGENCY DIESEL FUEL OIL STORAGE TANKS (Q)

FIGURE 2

Tom Cooke

G-0617-04



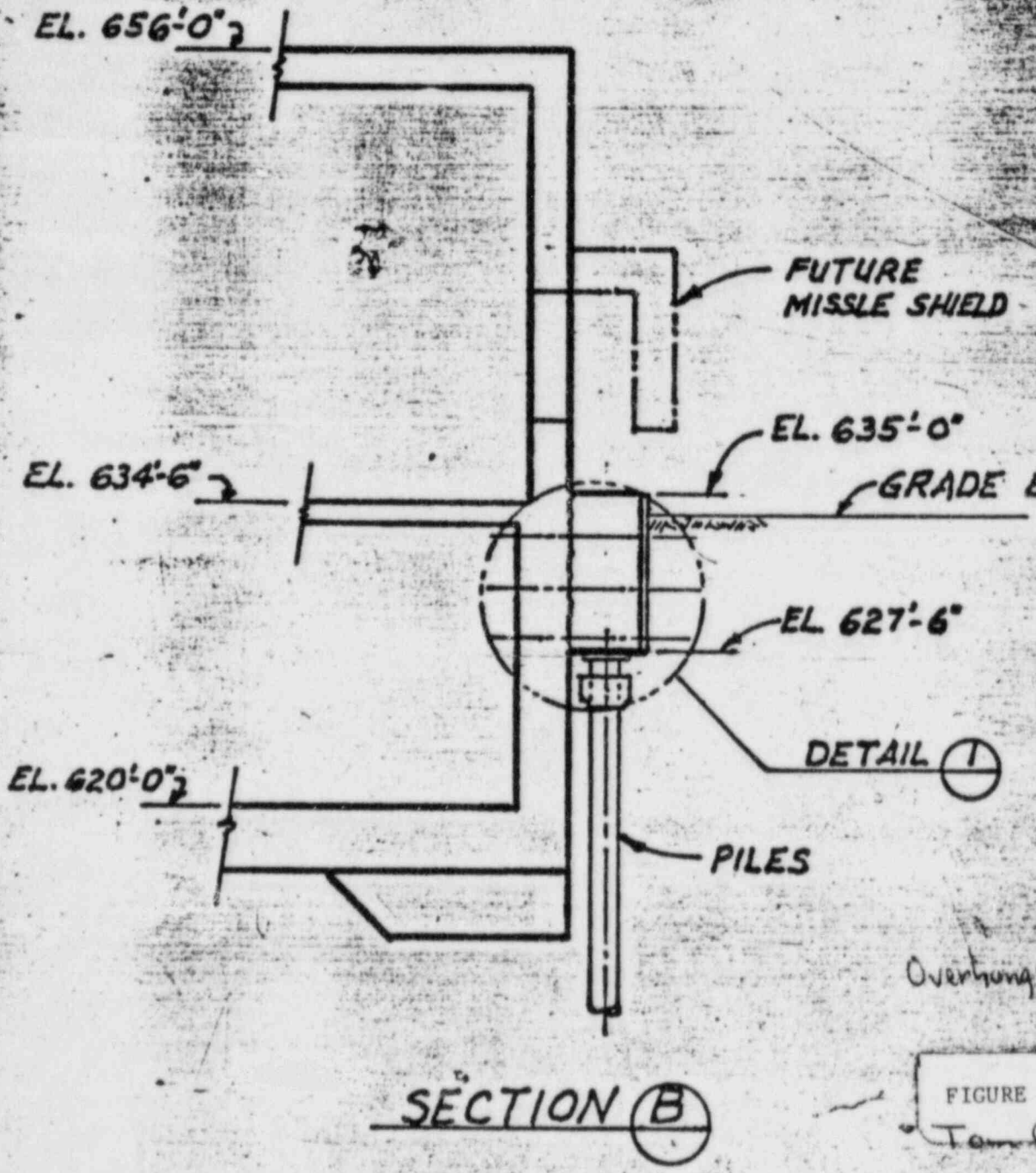
SECTION "A-A"

BORATED WATER STORAGE TANK
FOUNDATION & VALVE PIT

FIGURE 3

DL+LL+EQ = 2790^{K}

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

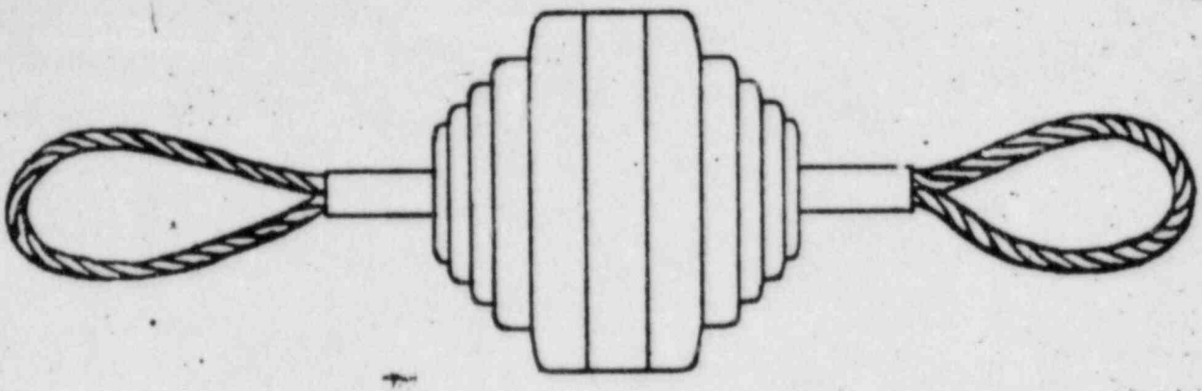


Overhung @ SW Pumphouse

SECTION B

FIGURE 4

Tom Cook



INSIDE DIAMETER OF CONDUIT = 4 1/4"
OUTSIDE DIAMETER OF MANDREL = 3 3/4"

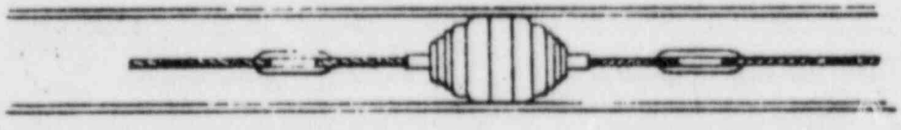
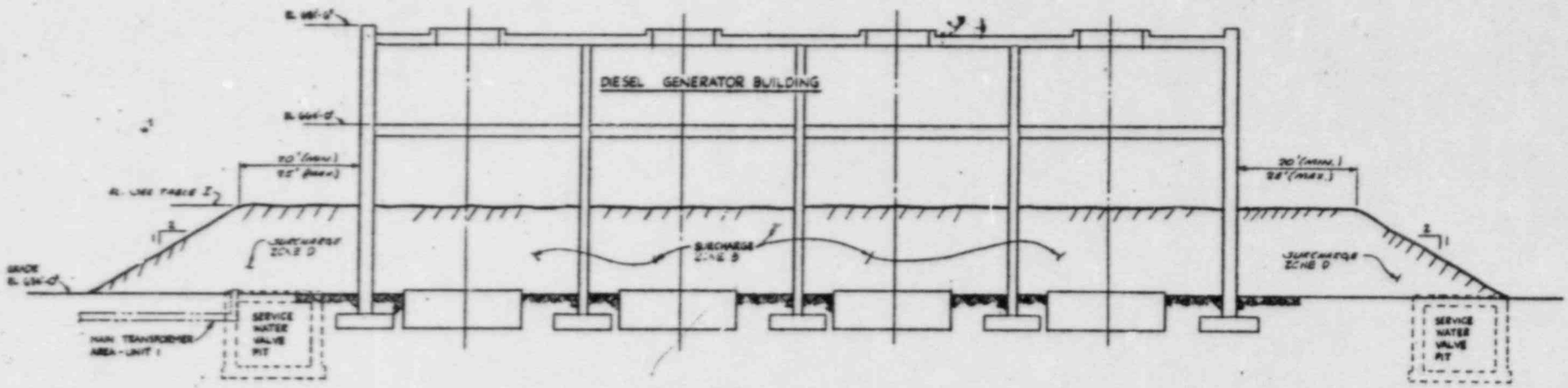


DIAGRAM OF MANDREL (RABBIT) USED TO CHECK CONDUITS

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

Tom Cooke



SECTION (B) SEE FIGURE 11

FIGURE 6

Tom Cooke

EXPLANATION

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

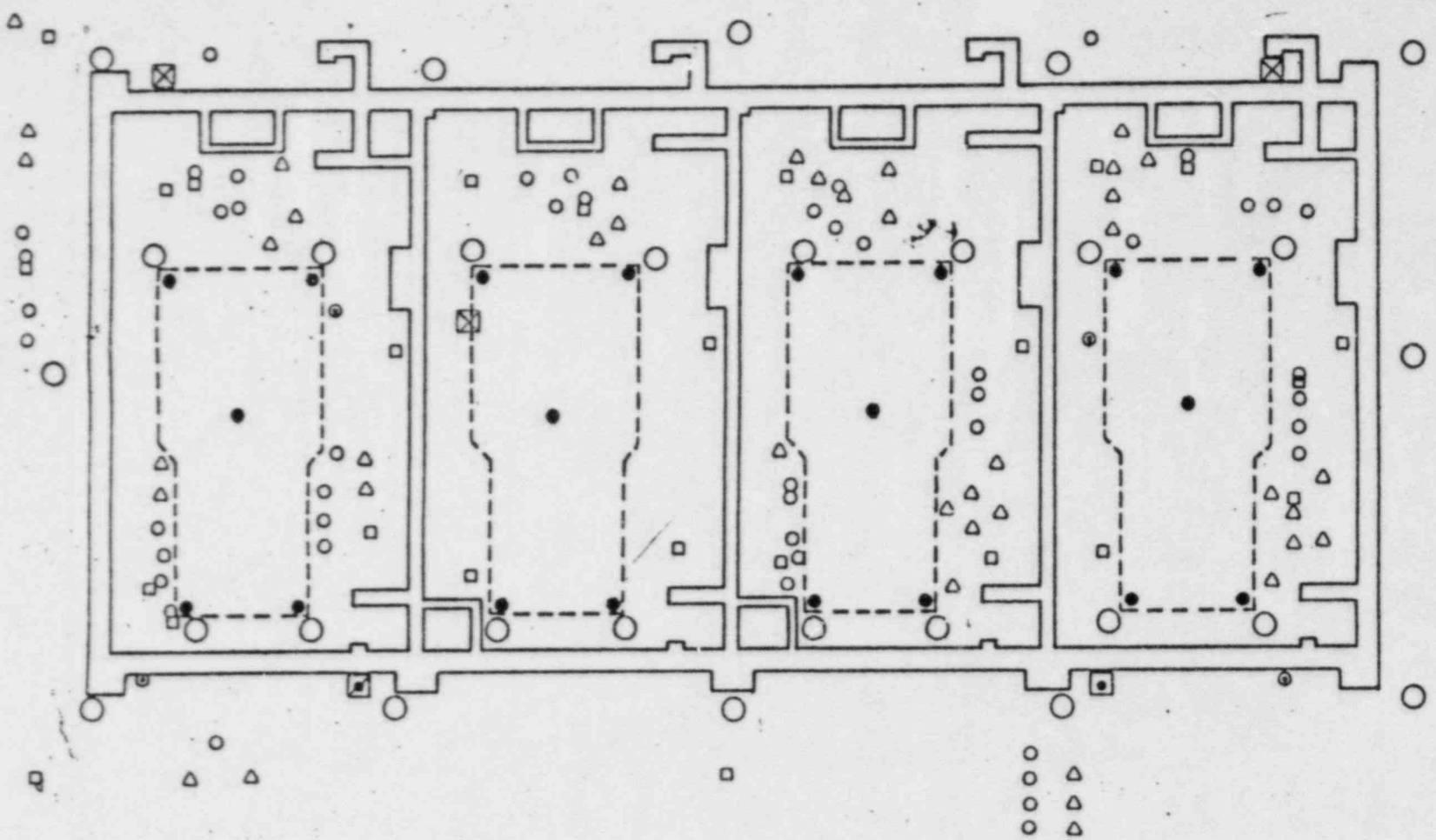
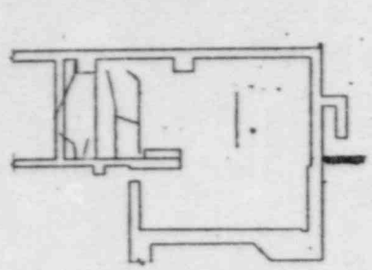
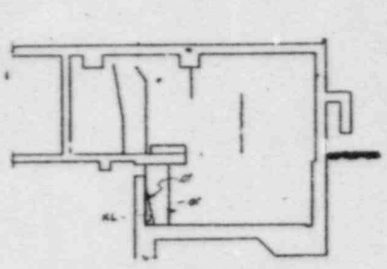


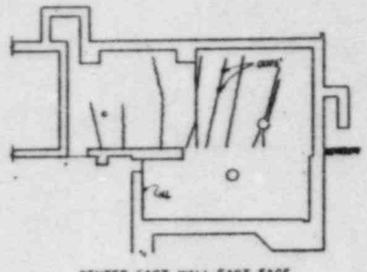
FIGURE 7



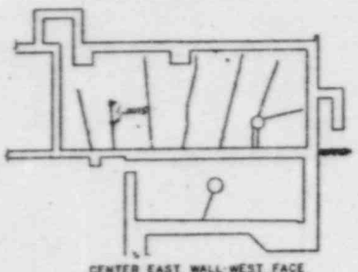
EAST WALL EAST FACE
LOOKING WEST



EAST WALL-WEST FACE
LOOKING WEST



CENTER EAST WALL-EAST FACE
LOOKING WEST



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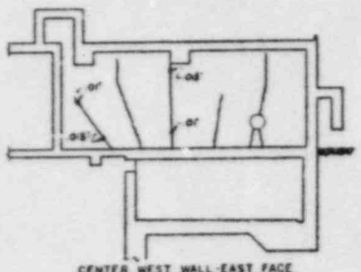
LOOKING WEST



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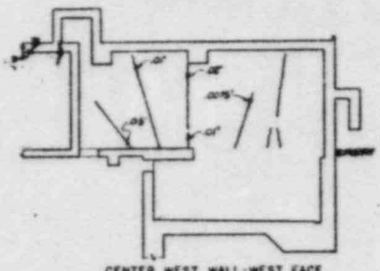
LOOKING WEST



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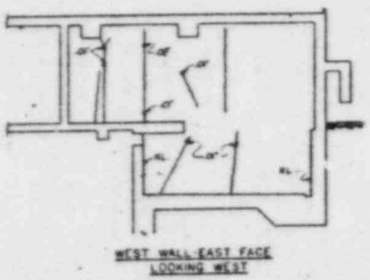
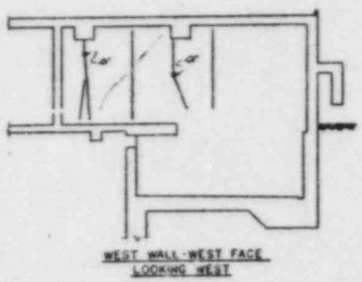
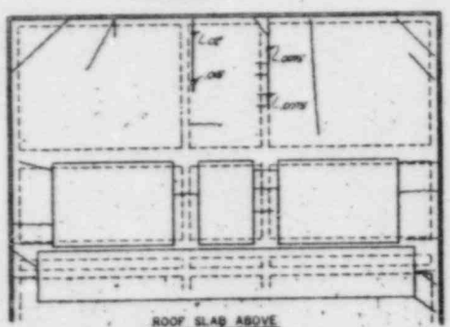
LOOKING WEST



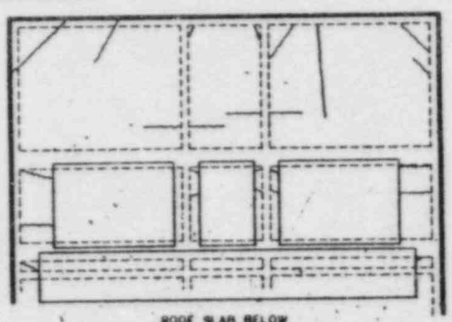
WEST WALL-EAST FACE
LOOKING WEST



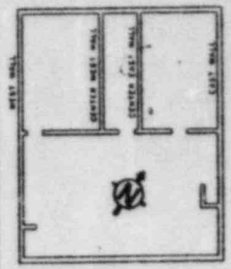
WEST WALL-WEST FACE
LOOKING WEST



ROOF SLAB ABOVE



ROOF SLAB BELOW



KEY PLAN

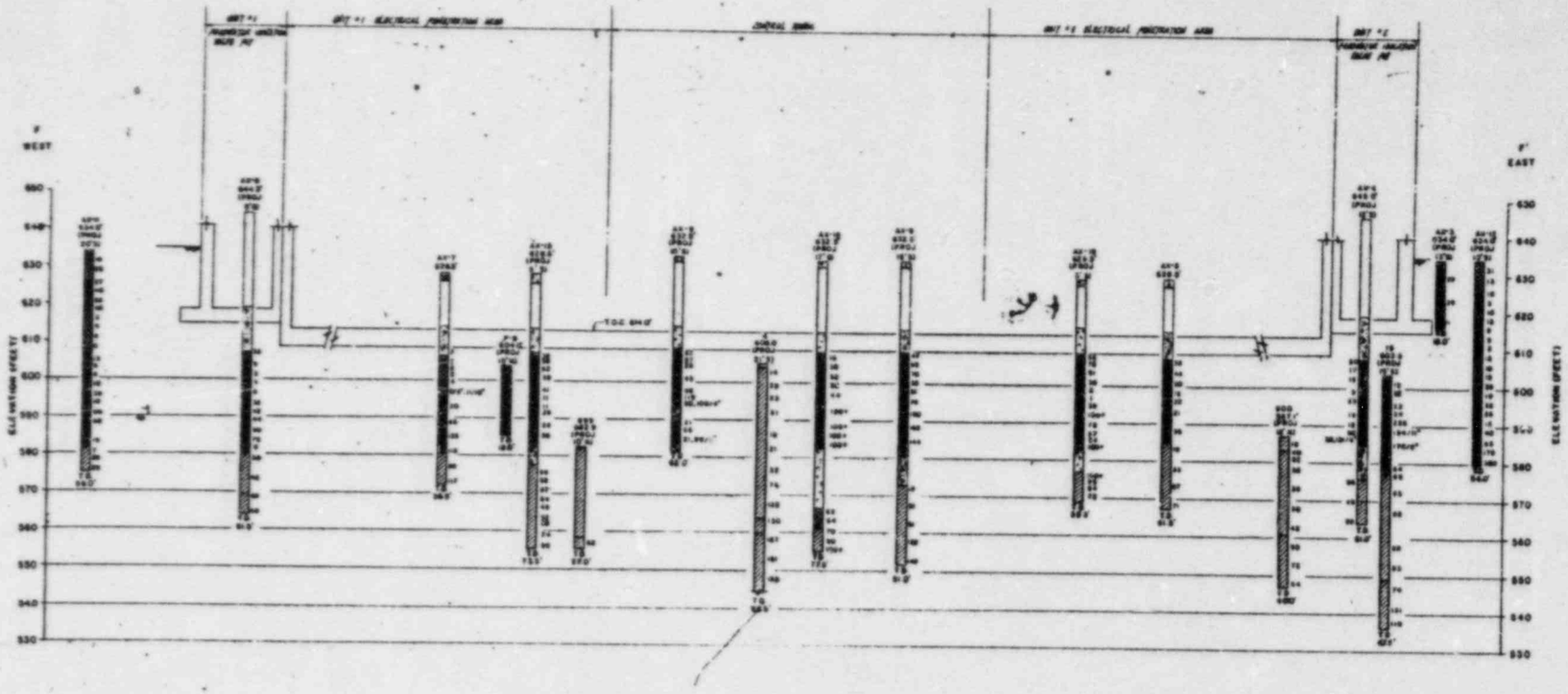
NOTES

1. ALL CRACKS ARE HAIRLINE OR LESS THAN .005" THICK UNLESS NOTED

MIDLAND PLANT UNITS 1 & 2
CONSUMERS POWER COMPANY
SERVICE WATER PUMP STRUCTURE
CRACK MAPPING

FIGURE 8

Tom Cooke



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:

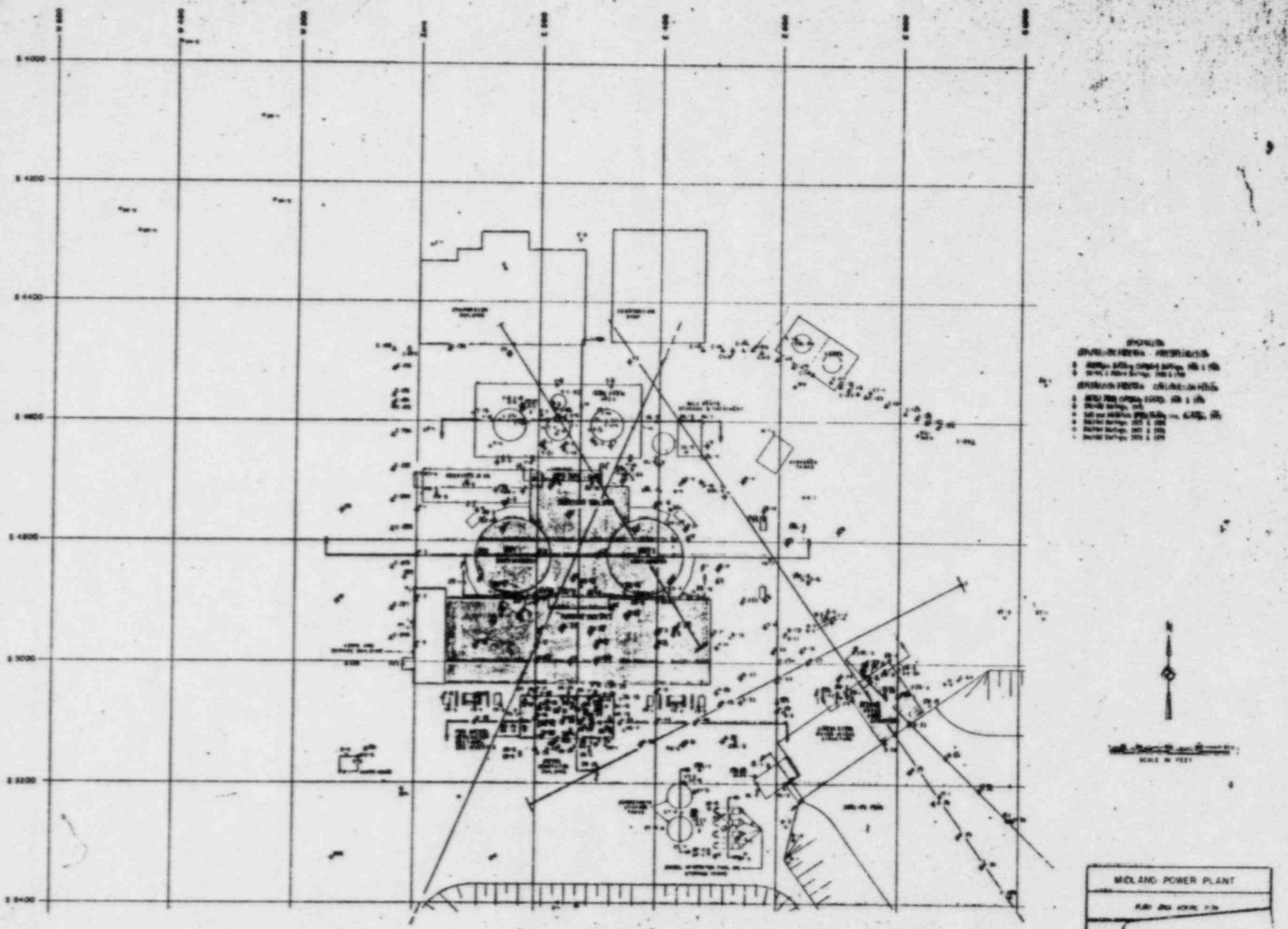
1. Borings P-9,4,15,899,& 900 were made for preconstruction exploration program before 1969. The remaining borings were made specifically for benefit investigation in 1978 & 1979.

MIDLAND POWER PLANT

CROSS-SECTION F-F'
AUXILIARY BUILDING SOUTH

FIGURE 9

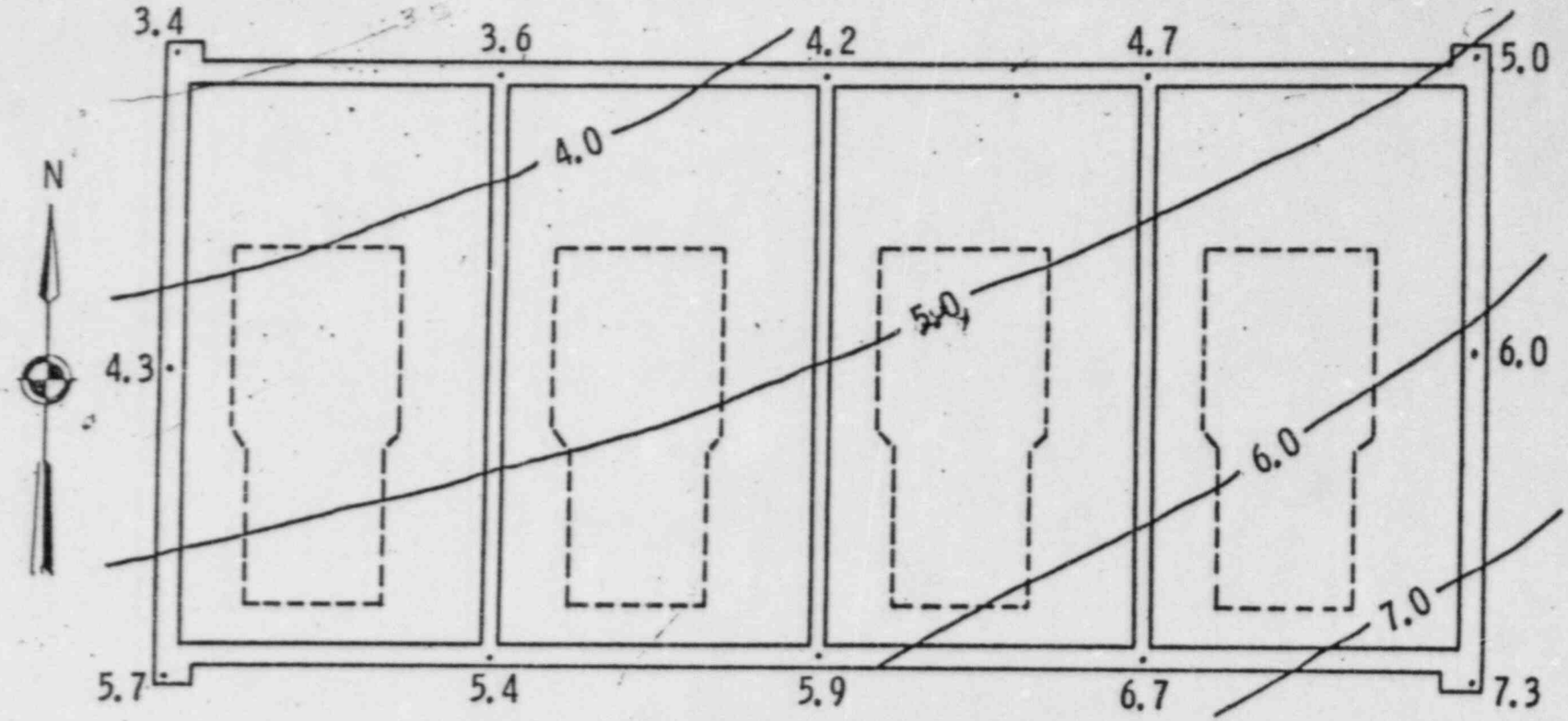
Tom Cooke



MIDLAND POWER PLANT

FIGURE 10

Tom Cooke



DIESEL GENERATOR BUILDING

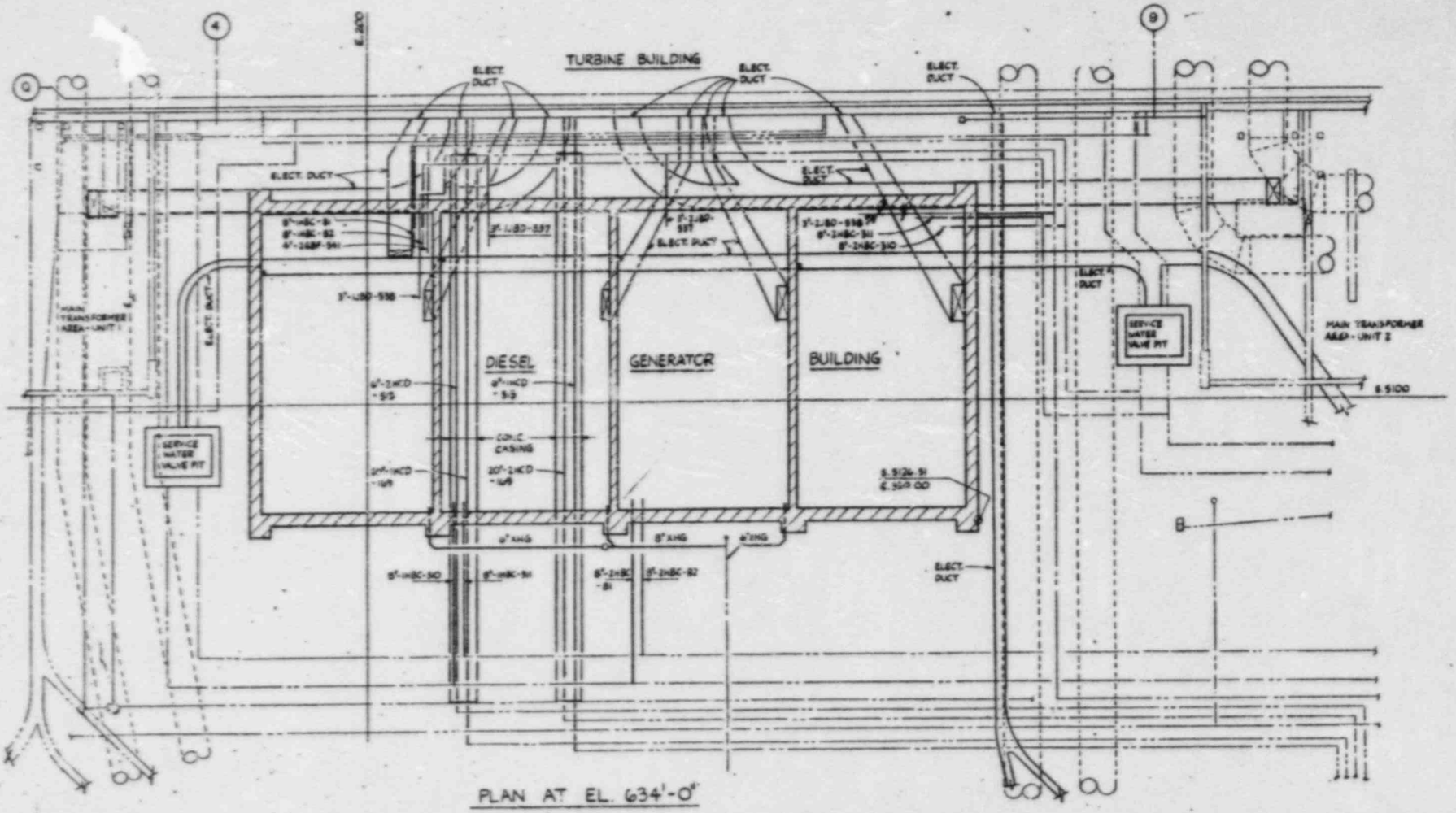
TOTAL SETTLEMENT OF WALLS FROM 7-14-78 TO 6-29-79 IN INCHES

(20 FEET OF SURCHARGE)

Compare this to Figs. 27-10 & 27-11 in Vol. 2

FIGURE 11

Tom Cook



PLAN AT EL. 634'-0"

FIGURE 12

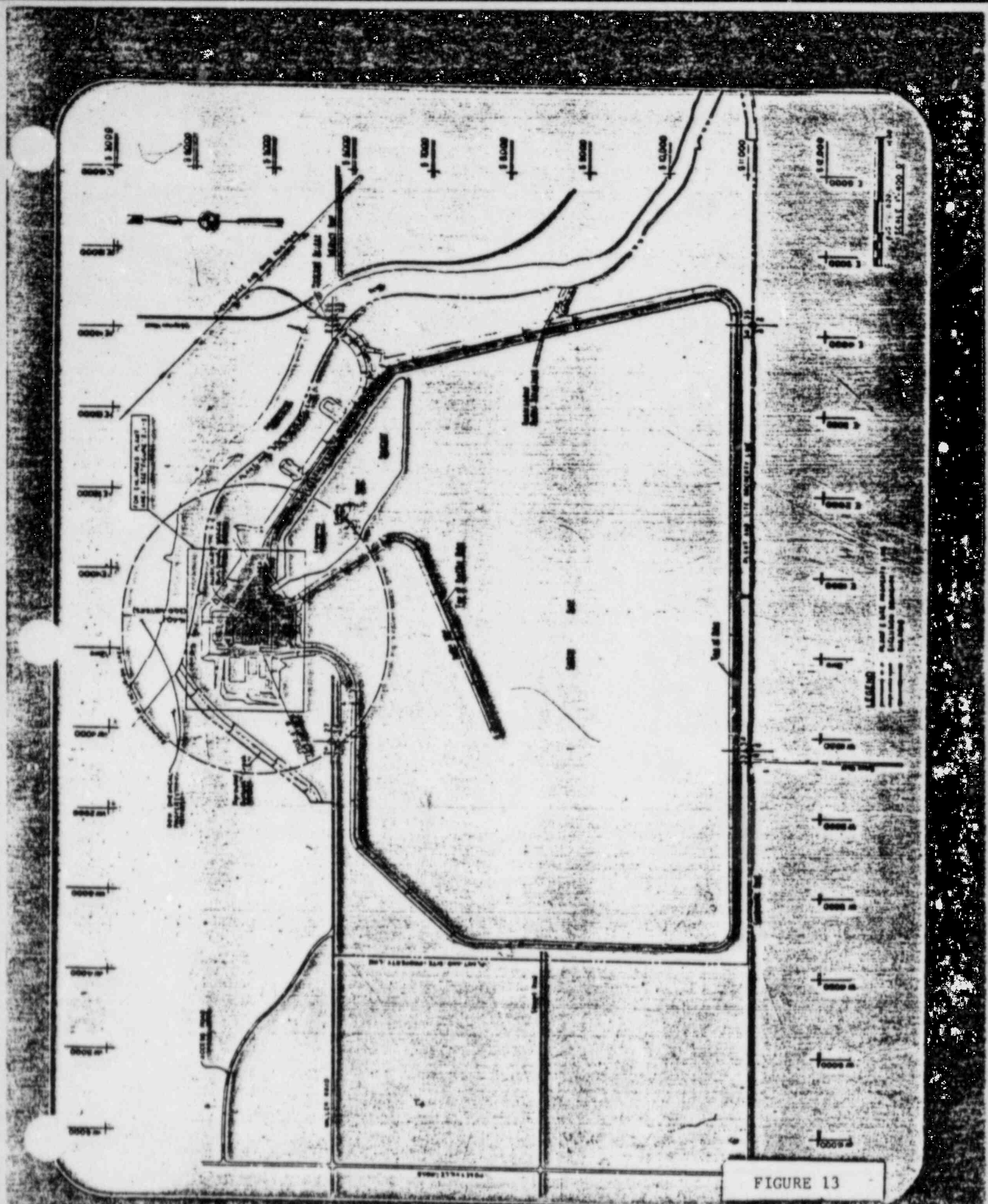
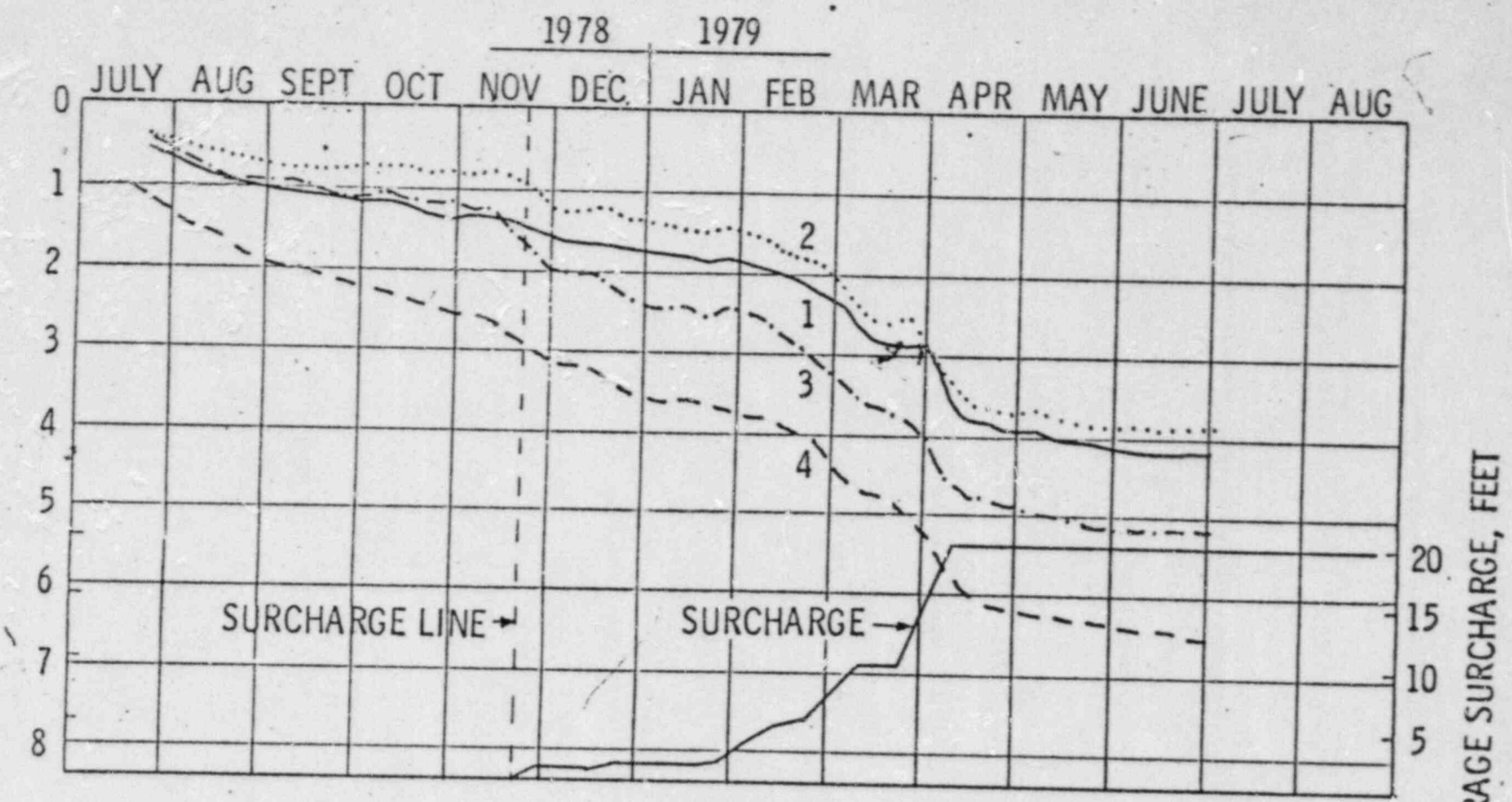
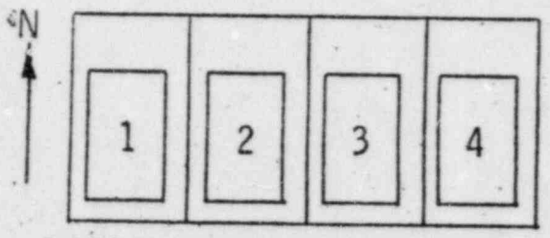


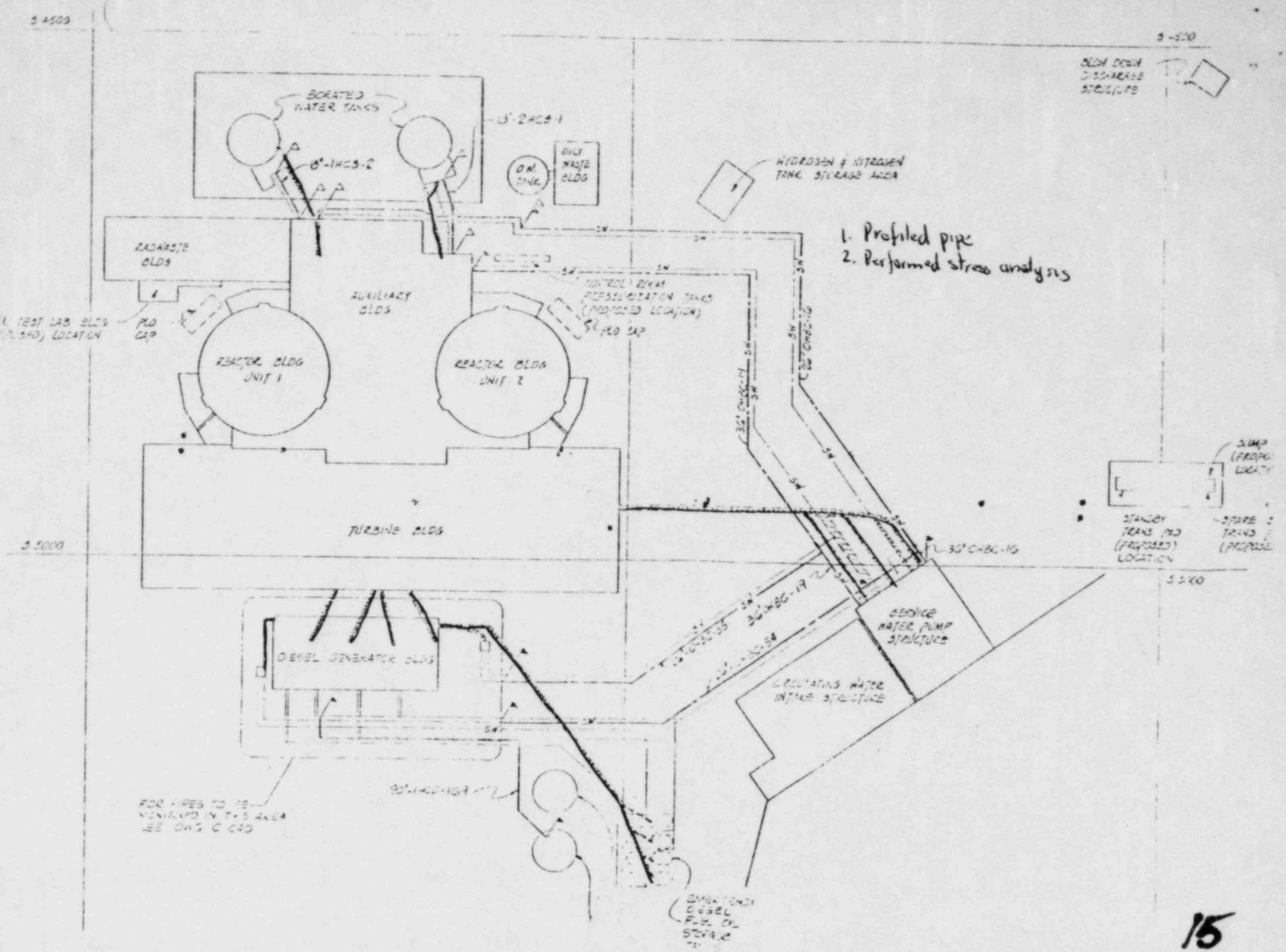
FIGURE 13

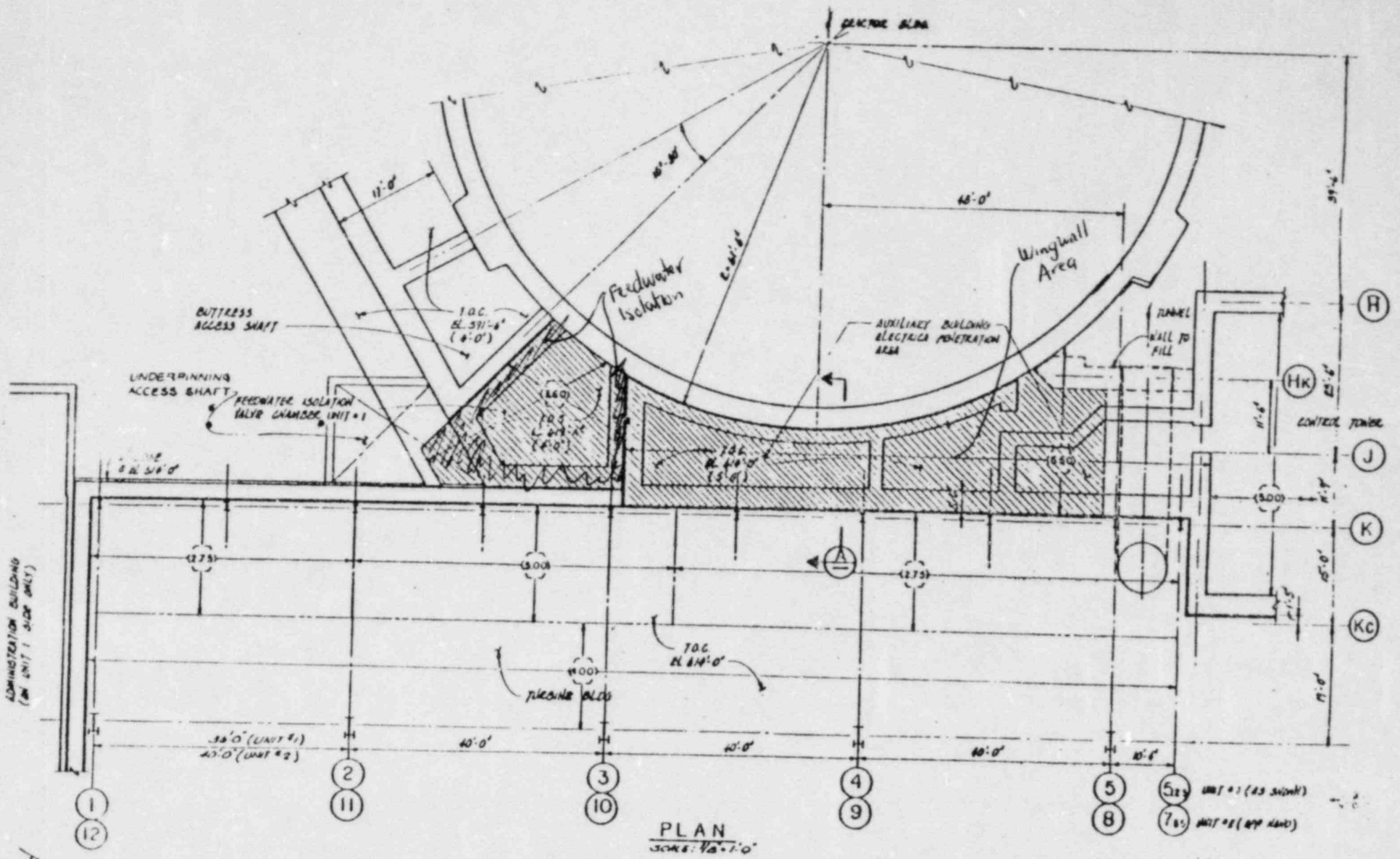




DIESEL GENERATOR BUILDING
AVERAGE PEDESTAL SETTLEMENT VS TIME

FIGURE 14


BORATED WATER TANKS
8"-HCB-2
3"-2HCB-1
OIL WASTE BLDG
O.W. TANK
HYDROGEN & NITROGEN TANK STORAGE AREA
RADWASTE BLDG
AUXILIARY BLDG
REACTOR BLDG UNIT 1
REACTOR BLDG UNIT 2
TURBINE BLDG
DIESEL GENERATOR BLDG
SERVICE WATER PUMP STRUCTURE
CIRCULATING WATER INTAKE STRUCTURE
FOR PIPES TO BE MONITORED IN THIS AREA SEE DWG C-250
EMERGENCY DIESEL FUEL OIL STORAGE
1. Profiled pipe
2. Performed stress analysis
15
Tom Cooke



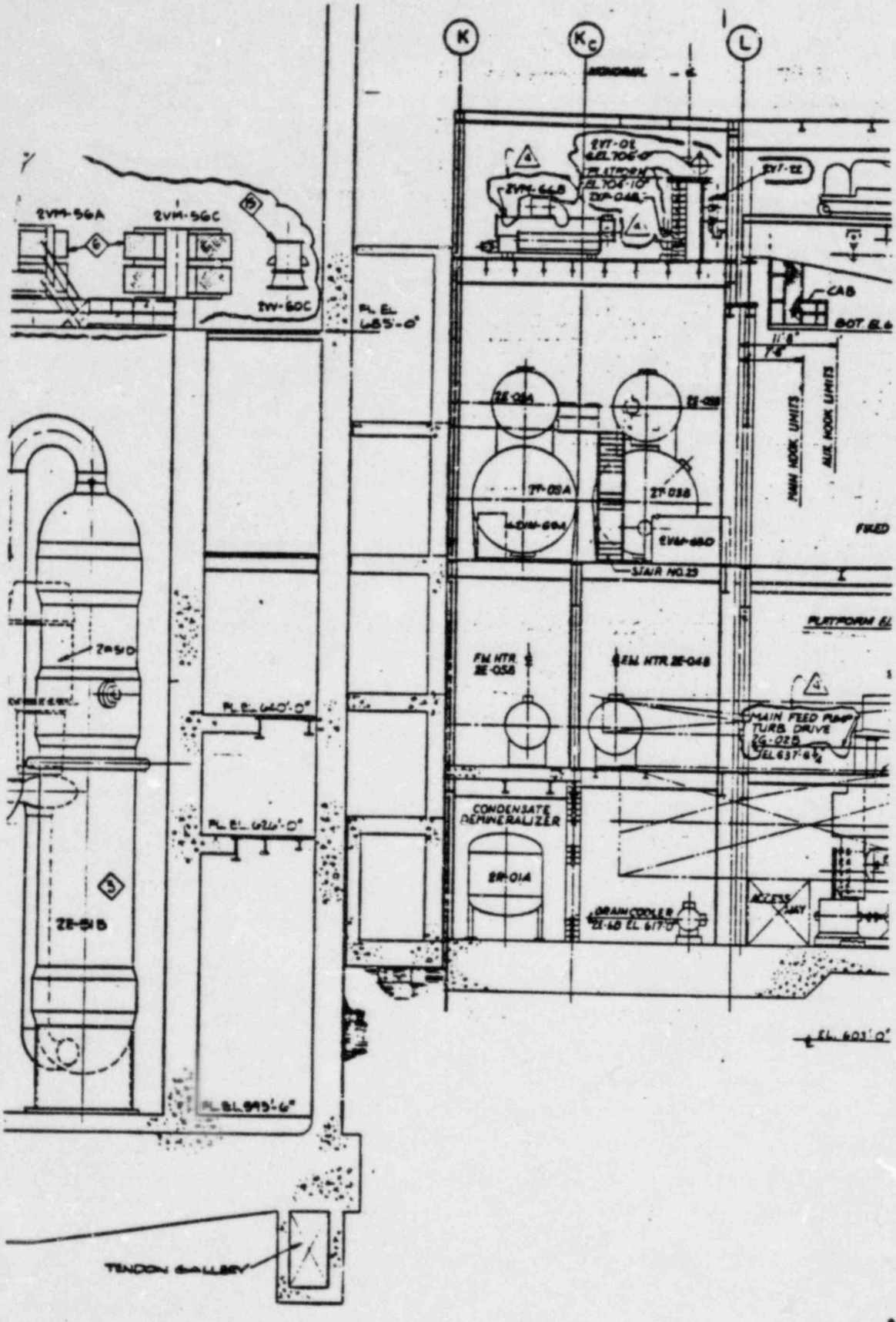
PLAN

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

F16 29

16A

Tom Cooke



16B

Tom Cooke

J. Kane
Rec'd. 4/28/80
from D. Hood
1/86

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

MAR 31 1980

Docket Nos.: 50-329/330

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 & 2

SUBJECT: SUMMARY OF FEBRUARY 27 & 28, 1980 MEETING AND SITE TOUR WITH CONSULTANTS TO REVIEW SOIL SETTLEMENT

On February 27 and 28, 1980, the NRC staff and three organizations recently acquired to support the staff safety review of geotechnical and interfacing matters, met with Consumers Power Company (the applicant), Bechtel and Bechtel consultants at the site for Midland Plant, Units 1 & 2. The three organizations supporting the staff review are the U. S. Army Corps of Engineers, Energy Technology Engineering Center, and U. S. Naval Surface Weapons Center. The purpose of the visit was to review and observe site backfill deficiencies and effects. This was the initial visit for the staff's consultants and the meeting was held to assist these consultants with their review of existing documentation on the background, remedial work and present status of this matter. Meeting attendees are listed in Enclosure 1.

The information reviewed at this meeting is contained in Amendment 72 to the Midland FSAR, December 19, 1979, for which referenced material is forwarded in two volumes by the applicant's letter of February 11, 1980. One of the volumes entitled "10 CFR 50.55(e), Interim Reports, Settlement of Diesel Generator Foundations and Building," consists of the 10 CFR 50.55(e) reports sent by the applicant to the staff's Office of Inspection and Enforcement from November 7, 1978 through September 5, 1979. The other volume, entitled "Responses to NRC Requests Regarding Plant Fill," consists of the applicant's 10 CFR 50.54(f) responses to the Office of Nuclear Reactor Regulation submitted April 24, 1979 through November 13, 1979. These documents represent the applicant's reports upon which the staff's order of December 6, 1979 requiring modification of the construction permits is based. The meeting also included a preview of information to be contained in Revision 5 to the applicant's responses in the latter volume intended for submittal about the end of February, 1980. Revision 5 will include responses to the staff's supplemental requests of November 19, 1979. Only information not contained in these documents is included in this meeting summary.

In opening remarks, Mr. G. Keeley announced that Consumers Power Company has elected to defer all remedial work on inadequately supported structures until acceptance of the proposed work is received from the staff. This action is

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9pp.

voluntary on the applicant's part since the effective date for the staff's December 6, 1979 order is to be established by the Hearing Board pursuant to 10 CFR 2.204. The basis for this decision was said to be to preclude potential loss of revenue associated with expenditures for which staff approval has not been granted. The staff observed that this was a prudent decision, particularly in view of the significant slip in construction completion projected by Bechtel and currently under review by the applicant and due to other causes, principally the TMI-2 accident.

Presentations were also given by Bechtel consultants. Mr. C. H. Gould described the procedure for placement of caissons beneath the electrical penetration area (i.e., wing walls) of the Auxiliary Building and beneath the Feedwater Isolation Valve Pit area. Mr. M. T. Davisson described the procedure for placement of piles to support the northern portion of the Service Water Building. Dr. A. J. Hendron, Jr. reviewed the preloading program completed for the Diesel Generator Building and discussed why the preload option was elected in lieu of other possible corrective alternatives. Dr. R. B. Peck summarized the recommendations of the Bechtel consultants and emphasized that the preloading option is considered to eliminate the need for any further testing or measurements as a basis for establishing confidence for future settlement potential of the Diesel Generator Building. A summary of these discussions by the Bechtel consultants will be submitted as an amendment to the FSAR.

During the meeting, references were made to certain information and reports which have not been made available to the NRR staff, although some of these have been examined by I&E through the audit mechanism. Examples include:

1. Some of the figures listed in the drawing summary for the interim reports to MCAR #24 which are not included with the compilation of reports forwarded by the applicant's letter of February 11, 1980, even after noted figure replacements and redundancy are taken into account.

2. Installation details of each piezometer used to monitor pore water pressures during the preload program (e.g., type and actual elevations of installed piezometers, backfill materials and zone thickness).

3. Reports, meeting summaries, or other written communications with or by consultants recommending or supporting remedial measures for structures and utilities located upon or in questionable soils.

4. Reports of the evaluation (e.g., bases, procedure, execution and results)of the initial qualification and subsequent requalification of compaction equipment.

5. The report "Tank Farm Investigation; Midland Units 1 & 2," issued October, 1979.

MAR 31 1980

The staff noted that such documents as above are needed by its consultants for their independent assessment of the adequacy of the proposed remedial measures and requested that these be made publicly available. The applicant indicated a reluctance to this end, and noted that these were available through the I&E audit mechanism. The staff will issue a formal request for these documents. The staff also noted that the boring logs provided in Appendix 2A of the FSAR did not reflect those borings associated with piezometer installation; the applicant replied that these would be added.

Site tours were provided in groups based upon the following engineering disciplines: (1) Geotechnical, (2) Structural, (3) Mechanical, and (4) Hydrologic.

During the tour the Corps noted that except for the use of temporary blocks, the service water pipe would otherwise be in direct contact with the base of the penetration through the northern wall of the Service Water Building. It is postulated that this results from the more rapid settlement of the buried pipe relative to the building's cantilevered settlement. The Corps emphasized that special attention should be given this area to avoid stressing the pipe at the penetration, particularly during pile driving and after attachment of the piles to the structure.

The staff noted that the presentation by Mr. C. H. Gould included the specification of some quantitative criteria to be applied during the remedial action for the Auxiliary Building. The staff asked if similar criteria were specified by the other Bechtel consultants, but was advised that these other criteria were more of a qualitative, subjective nature.

The staff also requested the applicant to submit a description of the services to be performed by consultants R. B. Peck, A. J. Hendron, Jr., C. H. Gould and M. T. Davisson through the completion of construction on the remaining remedial fixes. This description should identify the extent of continued involvement of the consultants in overseeing construction operations and in evaluating the effectiveness of completed fixes for which they have provided major design input.

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

Enclosures:
1. Attendees
2. Agenda

cc w/enclosures:
See next page.

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NCEED - T
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ENCLOSURE 1

ATTENDEES

Consumers Power

G. S. Keeley
T. C. Cooke
T. Thiruvengadam
U. E. Horn

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
Walter Ferris

Consultants

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

NRC

L. Heller

J. Kane
A. Cappucci
F. Rinaldi
R. Gonzalis

D. Hood
G. Gallagher
R. Cook

US Corp Of Engineers

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

J. Norton

R. Erickson

ETEC

W. P. Chen
J. Brammer

US Navy Weapons Center

P. Huang
J. Matra

ENCLOSURE 2

AGENDA FOR

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

Feb 27, 1980

7/86

L. Shelley	CRC
J.O WANZECK	BECHTech - GEOTECH
Paul L Hood	NRR/DPM
Pao HUANG	NSUIC
D.S. Rich	Bechtel
W.C. Parks, Jr	Bechtel - Geotech
[illegible]	[illegible] - DEGR
Harris H. Burke	Bechtel - SF
WALTER R. FERRIS	Bechtel - SF
Joseph D. Kane	NRC/DSS, Geotech. Engr.
B. DHAR	BECHTEL - ENGG.
J.V. Rohr	" Civil Struct
[illegible] Heller	NRC - Geotechn
[illegible] C Otto	Corps Engrs Detroit
James W. Simpson	" " NCD Chicago
PAUL F. HADALA	Corps of Engineers, WES
JOHN F. NORTON	Corps of Eng North Cen Div. Chicago IL
John Brammer	ETEC
A.J. CAPPUCCI	NRC/DSS, HEB
W. PAUL CHEN	ETEC
Neal A Gehring	Corps of Engineers, Detroit Dist
JOHN GRUNDSTROM	" "
Ronald Erickson	" "
THIRU R THIRUVENGADAM	CONSUMERS POWER
L. H. Curtis	Bechtel
JOHN RUTGERS	BECHTEL
D. E. HORN	CONSUMERS POWER P, E & C - QA
William Lawhead	C of E, Detroit
Gil Kelly	Consumers Power Proj.
TC Cooke	" " "

Meeting 2/21/80

NRC / CPCo / Bechtel
Bechtel Consultants / US Corp of Eng
E TEC / US Navy Weapons Center

B.C. McConnel — Bechtel - Ann Arbor
Ray Gonzales — NRC
Gene Gallagher — NRC RIII I:E
Frank Rinaldi — NRC NRR/DSS/SEB
John F Hoffa Jr — NSWC