REPORT ON THE
CONSTRUCTION SETTLEMENT MONITORING PROGRAM
FOR
NORTH ANNA NUCLEAR POWER STATION - UNITS 3 AND 4
VIRGINIA ELECTRIC AND POWER COMPANY

April 2, 1979

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1.0 GENERAL

A basic design criteria for all Category I structures, with the exception of the Service Water Pump House (SWPH), for Units 3 and 4 of the North Anna Power Station is that the structures be founded on rock, or on caissons socketed into rock, to absolutely minimize settlements. Therefore, structure settlements can be anticipated to be negligible.

At the direction of the Nuclear Regulatory Commission, a two-stage site settlement monitoring program will be developed for Units 3 and 4. The first stage (construction settlement monitoring program) will begin after the construction of the foundation mats. The second stage (permanent settlement monitoring program) will be initiated as certain critical safety-related pipes and/or duct line connections are completed. The objectives of the site settlement monitoring program are the following:

1. To provide a record of settlement versus time

2. To establish a technical specification for allowable settlement for all structures supporting safety-related piping and duct lines

3. To provide data necessary to evaluate the performance of structures relative to the referenced technical specification

The purpose of this report is to describe the scope of the construction settlement monitoring program and to provide the information requested in the October 6, 1978, letter from the Nuclear Regulatory Commission. The permanent settlement monitoring program will be described at a later time.

2.0 SETTLEMENT MONITORING POINTS

2.1 Location

All major plant structures whether Category I or not will be monitored during the construction settlement monitoring program. A site plot plan is shown in Figure 1. Proposed locations of the settlement monitoring points are shown in Figures 2 through 25. A summary of the locations and designation of the settlement monitoring points is given in Table I.

Settlement monitoring point locations have been chosen to provide a complete documentation of structure settlement and allow accurate determination of differential settlement between structures. The settlement monitoring point locations as shown in Figures 2 through 25 are the anticipated locations for the proposed points. Certain construction situations or interferences may dictate that some of the monitoring point locations be altered and that the points be

installed at locations other than those shown in the figures.

2.2 Design and Installation

Settlement monitoring points will consist of brass disks embedded in the concrete foundations, except as described in Section 8.0 for the SWPH. These points will be installed either during concrete placement of future foundations, or by chipping or coring the concrete in existing foundations, and then grouting the disks in place. The brass disks will be recessed below the top of the concrete and will be protected from damage during construction by a steel pipe coupling fitted with a countersunk pipe plug. A sketch of a typical settlement monitoring point is shown in Figure 26.

3.0 PERMANENT REFERENCE MONUMENTS

3.1 Location

Two permanent reference monuments will be installed near the Units 3 and 4 construction area. Surveys for the monitoring program will be referenced to the monuments. The locations of the permanent reference monuments are shown on Figure 27.

3.2 Design and Installation

The permanent reference monuments consist of concrete filled pipes socketed in rock. A typical section of a reference monument is shown in Figure 28. A series of "bumper guards," placed around each reference monument, is designed to provide protection from damage resulting from possible impact.

4.0 RECORDED DATA

The initial data to be recorded with the installation of each settlement monitoring point are the following:

1. Settlement monitoring point identification number (see Table I)

2. Elevation establishing the initial vertical location of the settlement monitoring point, as shown on Figure 29.

5.0 FREQUENCY OF SURVEY DATA

The initial elevation of each settlement monitoring point will be recorded after its installation. Subsequently, surveys will be made at a standard frequency of at least once every six months (plus or minus six weeks) for all structures.

The frequency of the existing settlement monitoring program for the partially completed SWPH is discussed in Section 8.0.

6.0 SUBMITTAL OF DATA

The data obtained during the construction settlement monitoring program for all Category I structures will be submitted annually. Changes in location, or additions to the initial settlement monitoring points, will be submitted with the annual reports.

As construction proceeds, the construction settlement monitoring program will gradually phase into the permanent settlement monitoring program. The beginning of the permanent settlement monitoring program will be noted in the annual reports as the transition occurs for each structure.

7.0 TECHNICAL SPECIFICATION FOR ALLOWABLE SETTLEMENTS

It is presently envisioned that the technical specification for allowable settlements will be in a form similar to Table II. These specifications will define limiting values of differential settlement that can be accommodated by the critical safety-related item. The actual limiting value for any given safety-related item will be determined later. Differential settlements between structures connected by a safety-related item are of significance only after structure-to-structure connections are made. Therefore, allowable settlements of structures are applicable only after the connections are completed.

A list of safety-related items is given in Table III. During the course of determining the settlement technical specifications, the most critical system (least capacity to accommodate differential settlement) between any two structures will be determined and noted with future annual reports. Hence, it is anticipated that the list in Table III will be reduced significantly with future submittals.

The final version of the technical specifications for allowable settlements will be submitted at a future time compatible with the Staff's review of all technical specifications.

8.0 EXISTING SETTLEMENT MONITORING PROGRAM

Settlement monitoring of the Service Water Pump House (SWPH) was initiated before the development of the construction settlement monitoring program. Well-defined scribe marks in the exterior

wall, at the location shown in Figure 19, have been and will continue to be used for settlement monitoring of the SWPH. The two existing reference monuments installed near the Service Water Reservoir have been used for survey control for settlement monitoring of the SWPH. Future surveys of the SWPH for the construction settlement monitoring program will be referenced to these monuments. The settlement data previously obtained from this structure will be incorporated into the construction settlement monitoring program.

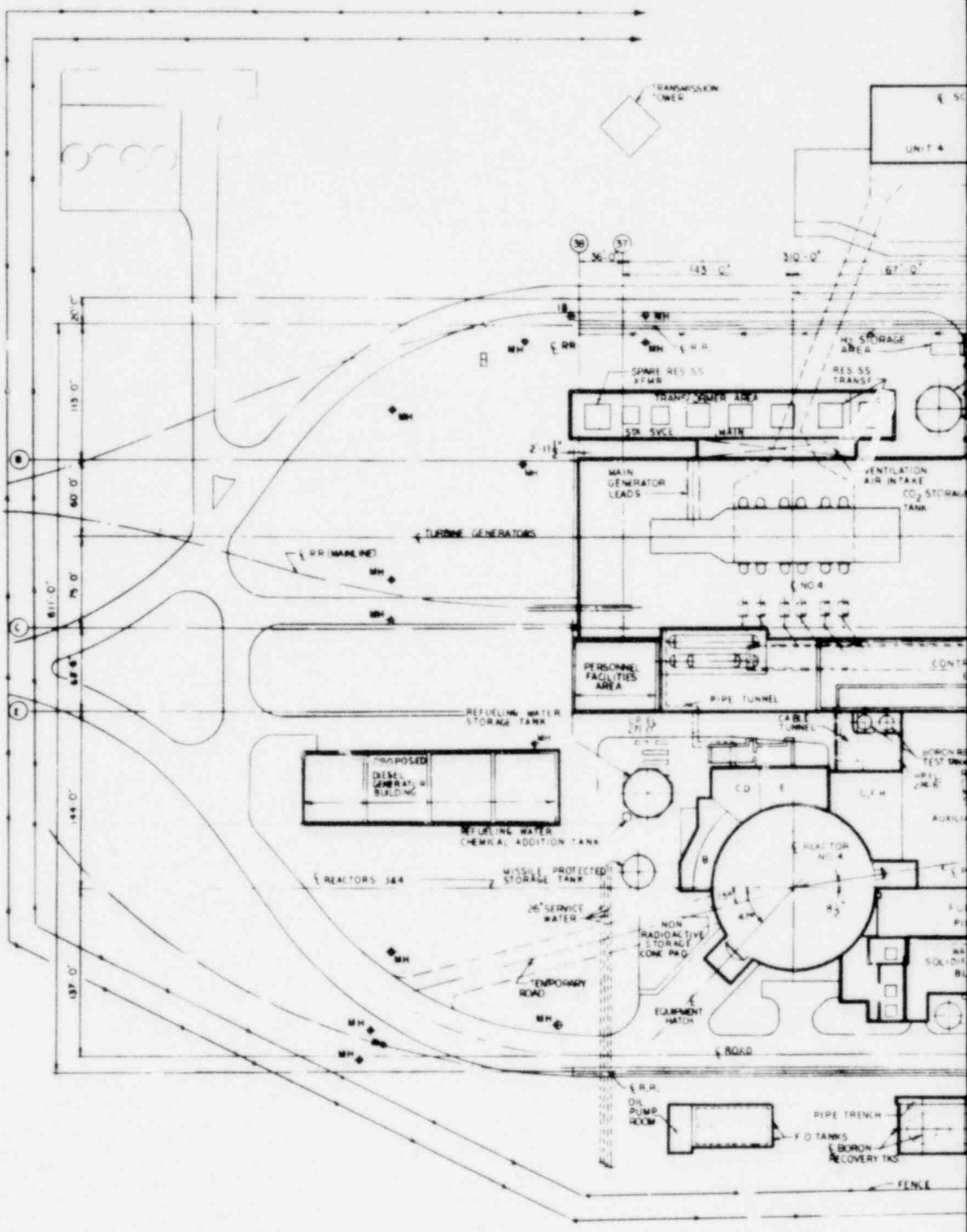
Settlement monitoring of the SWPH was initiated immediately after tne foundation mat was constructed in December 1974. The frequency of surveys has varied during the interim period to date.

Surveys for the construction settlement monitoring program will be taken on a monthly basis when construction of the SWPH resumes. The frequency of surveys will be converted to the standard frequency when evaluation of settlement data indicates that settlement of the SWPH has stabilized.

9.0 SUMMARY

The construction settlement monitoring program will establish a plan for the location, installation, survey, and evaluation of settlement monitoring points embedded in the foundations of the plant structures. The locations of the settlement monitoring points will be indicated on construction drawings. The settlement monitoring points will be installed in sleeves set below the top of concrete. This arrangement will minimize damage to the points and ensure continued survey readings of the settlement monitoring points. Periodic surveys will be made and recorded for each structure. The construction settlement monitoring program will develop settlement versus time for the Units 3 and 4 structures. The construction monitoring program will gradually phase into the permanent monitoring program. The transition to the permanent monitoring program will occur at the final connection of safety-related pipe and/or duct line installations.

The program herein described is envisioned as meeting the requirements for settlement monitoring during construction of Units 3 and 4. The program will be altered, changed, or modified when necessary to enhance the data or data collection effort.


TRANSMISSION TOWER
UNIT 4
36'-0"
143'-0"
310'-0"
67'-0"
H2 STORAGE AREA
SPARE RES SS XFMR
RES SS TRANSF
TRANS/SEWER AREA
STA SVCE
MAIN
2'-11½"
MAIN GENERATOR LEADS
VENTILATION AIR INTAKE
CO2 STORAGE TANK
TURBINE GENERATORS
NO 4
PERSONNEL FACILITIES AREA
PIPE TUNNEL
REFUELING WATER STORAGE TANK
PROPOSED DIESEL GENERATOR BUILDING
REFUELING WATER CHEMICAL ADDITION TANK
REACTORS 3&4
MISSILE PROTECTED STORAGE TANK
26" SERVICE WATER
NON RADIOACTIVE STORAGE CONC PAD
TEMPORARY ROAD
EQUIPMENT HATCH
ROAD
OIL PUMP ROOM
PIPE TRENCH
F O TANKS
BORON RECOVERY TKS
FENCE
REACTOR NO 4
311'-0"
144'-0"
137'-0"
113'-0"
60'-0"
75'-0"

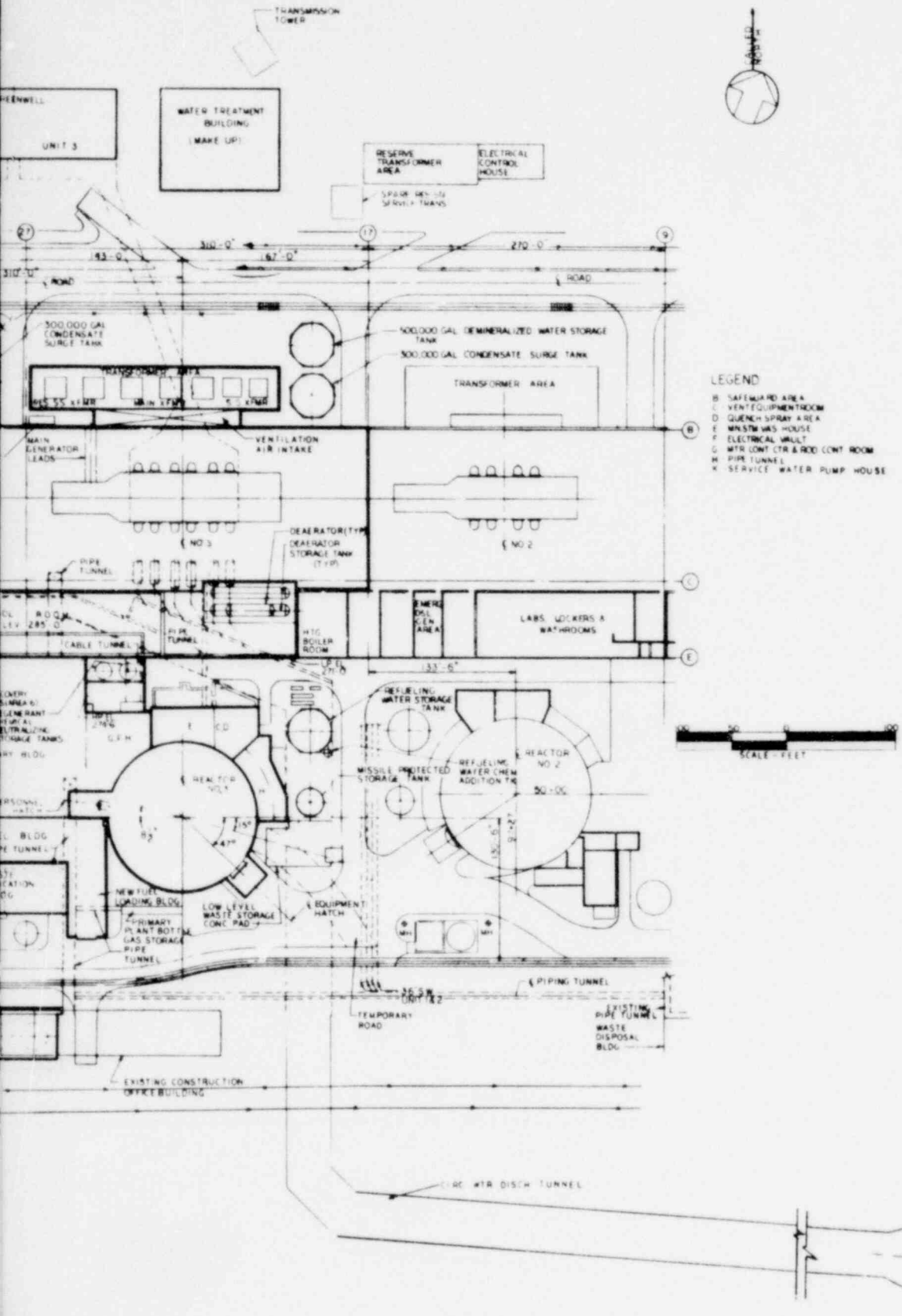


FIGURE 1
PLOT PLAN
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979

1. ⌖ Indicates location of settlement monitoring point

2. Coordinates are plant coordinates.

3. Settlement monitoring points are located 2 ft from adjacent walls, unless noted on figures.

4. Actual locations of settlement monitoring points will be adjusted slightly to avoid any interference with rebar and/or baseplates.

5. Foundation construction has been partially completed, as of the date of this report, on the following structures:

   Reactor containment - Units 3 and 4 (mat)

   Auxiliary building (mat)

   Intake structure (mat)

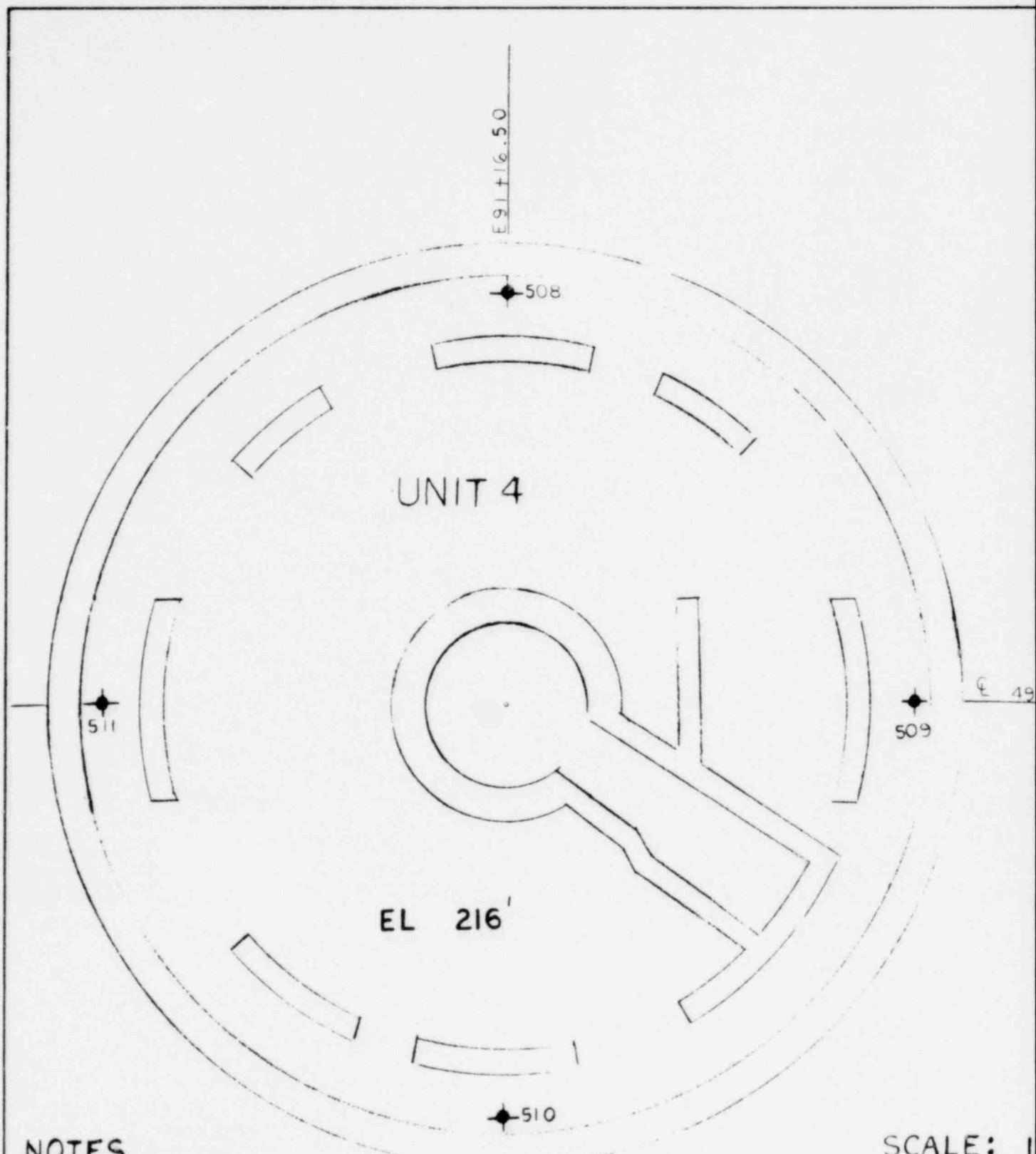
   Service water pump house (mat and walls up to el 326 ft)

   Intake tunnels

   Discharge tunnels

6. Existing settlement monitoring points are located on the roof of the soil-founded tunnel sections. Additional points shall be placed on the roof, as shown in Figures 17 and 18, on all completed rock-founded tunnel sections. When construction resumes on both soil- and rock-founded tunnel sections, the construction monitoring program will include additional settlement monitoring points on the mats as shown in Figures 16, 17, and 18.

FIGURE 2
NOTES TO FIGURES
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4
FEB 1, 1979



NOTES

✦ INDICATES LOCATION OF SETTLEMENT MONITORING POINTS INSTALLED IN INTERIOR SLAB AT EL. 216 FT

SCALE: 1

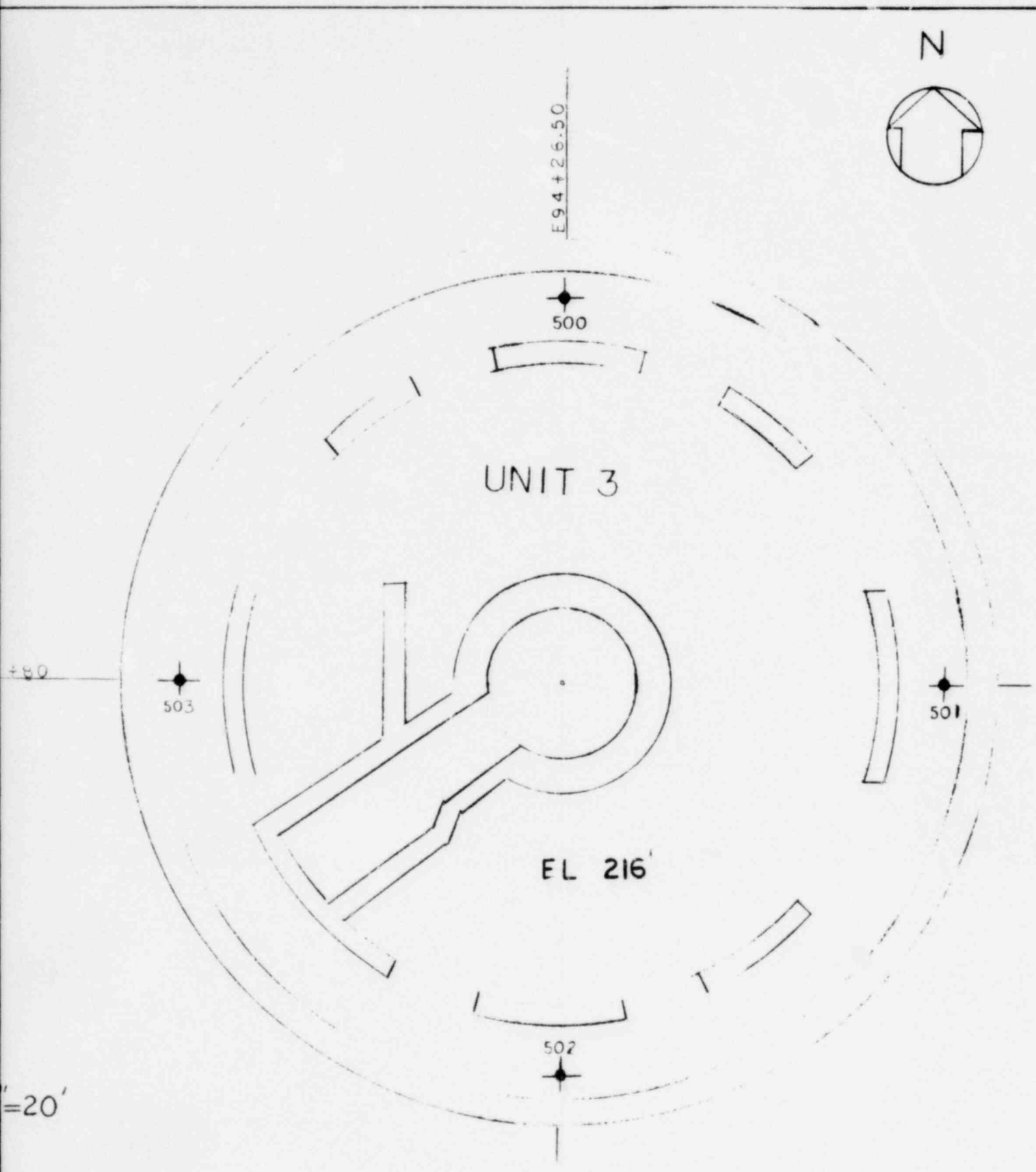
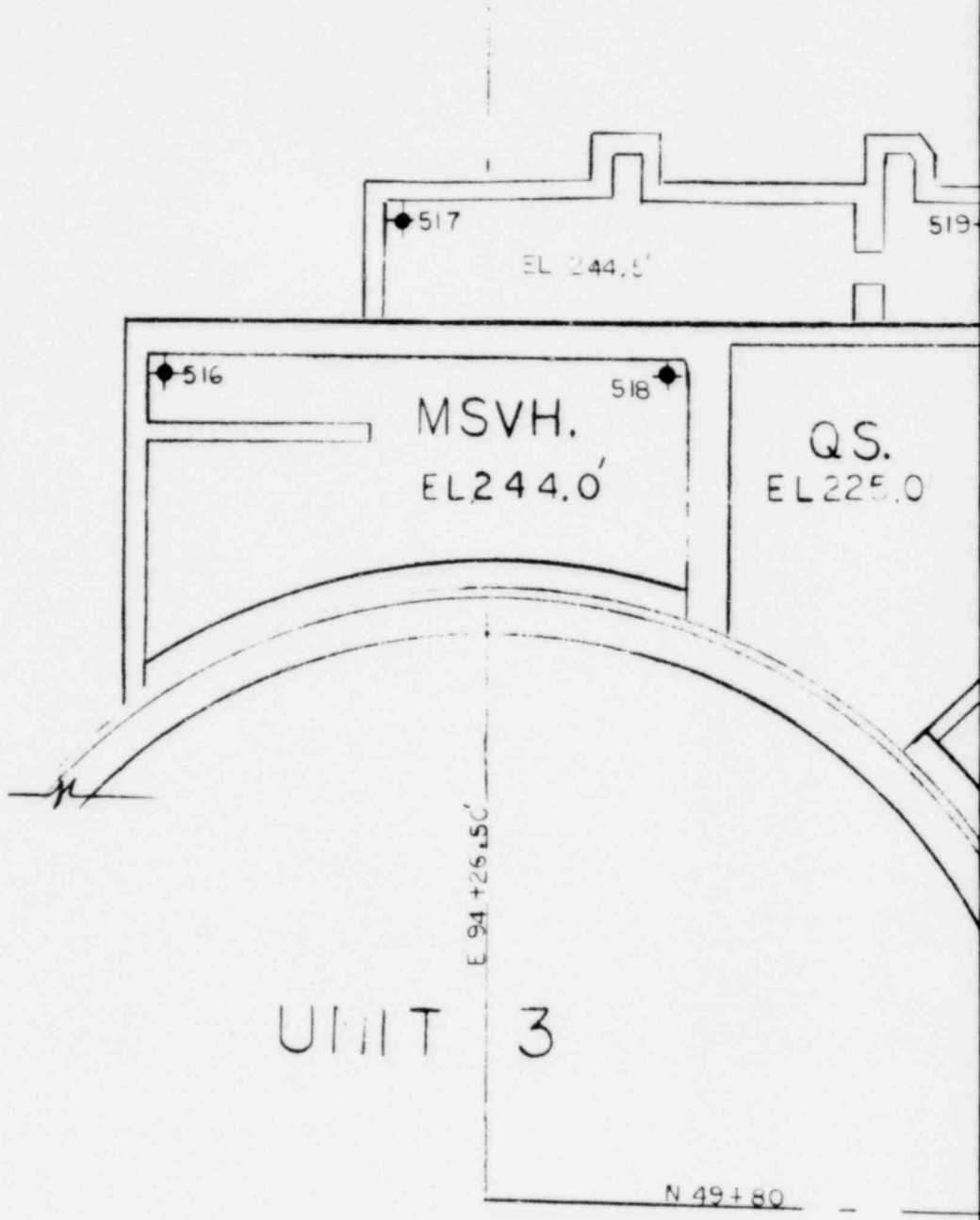
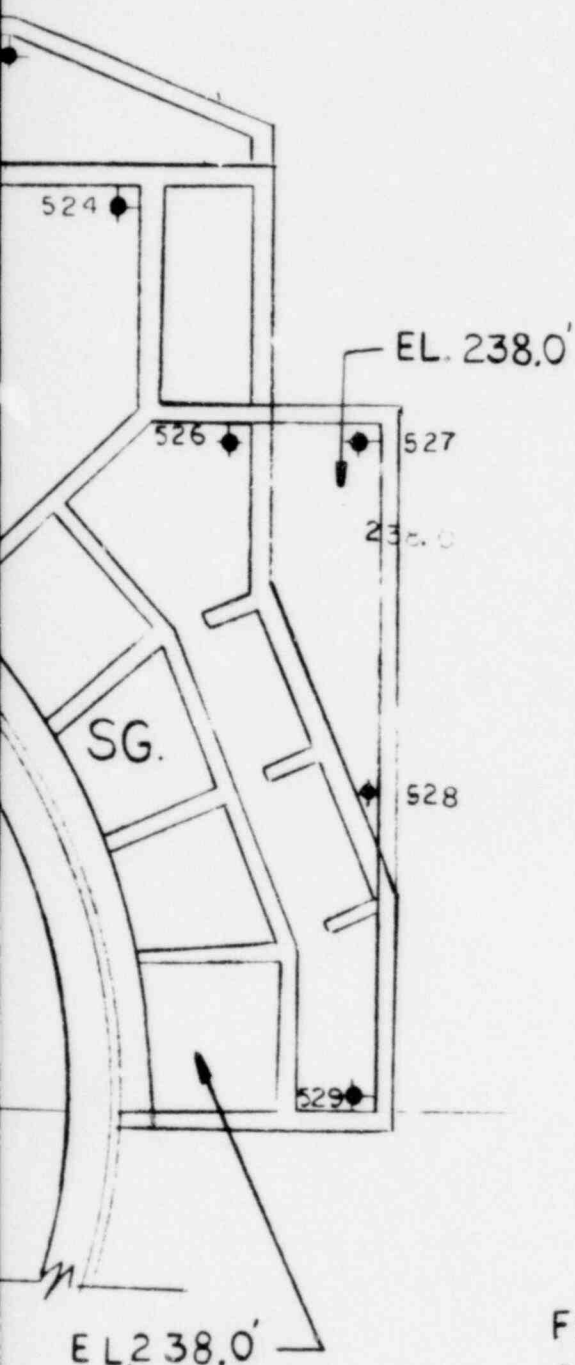


FIGURE 3

REACTOR CONTAINMENT
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979

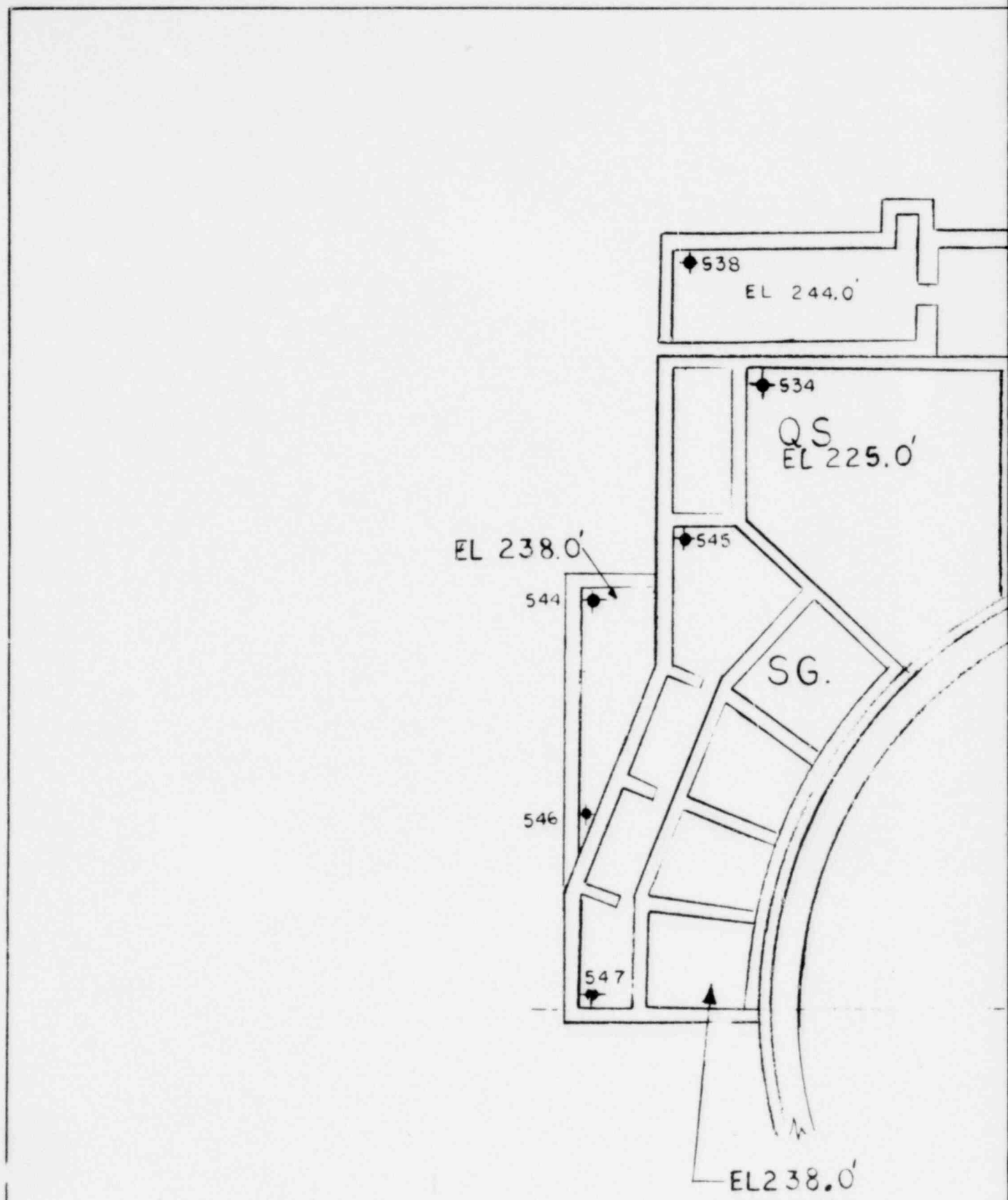

517
519
EL 244.5'
516
518
MSVH.
EL244.0'
QS.
EL225.0
E 94+26.5C'
UNIT 3
N 49+80



SCALE 1" = 20'

FIGURE 4
SAFEGUARD AREA (SG)
QUENCH SPRAY BUILDING (QS)
MAIN STEAM VALVE HOUSE (MSVH)
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979


538
EL 244.0'
534
QS
EL 225.0'
EL 238.0'
545
544
SG.
546
547
EL238.0'

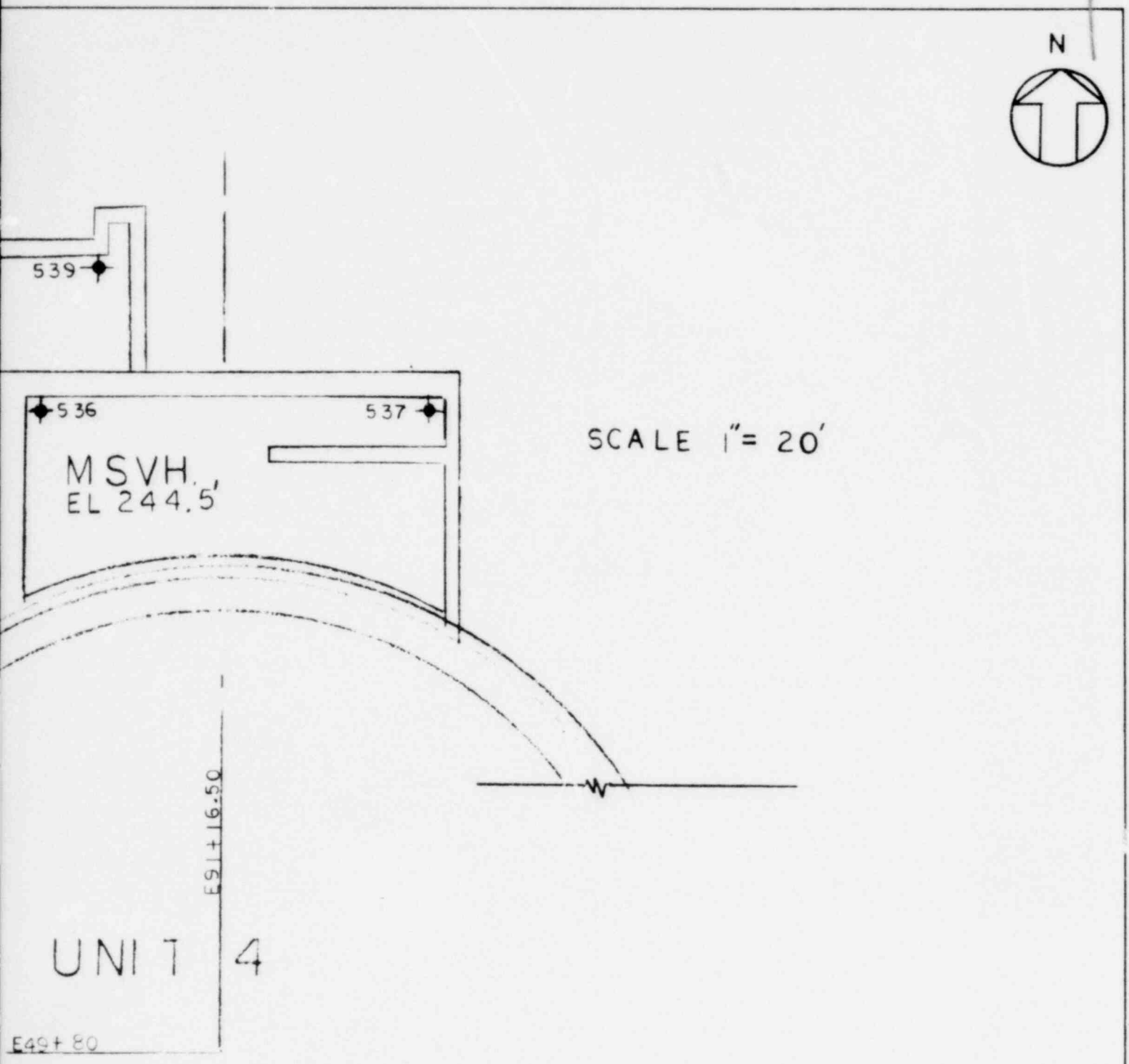


FIGURE 5

SAFEGUARD AREA (SG)

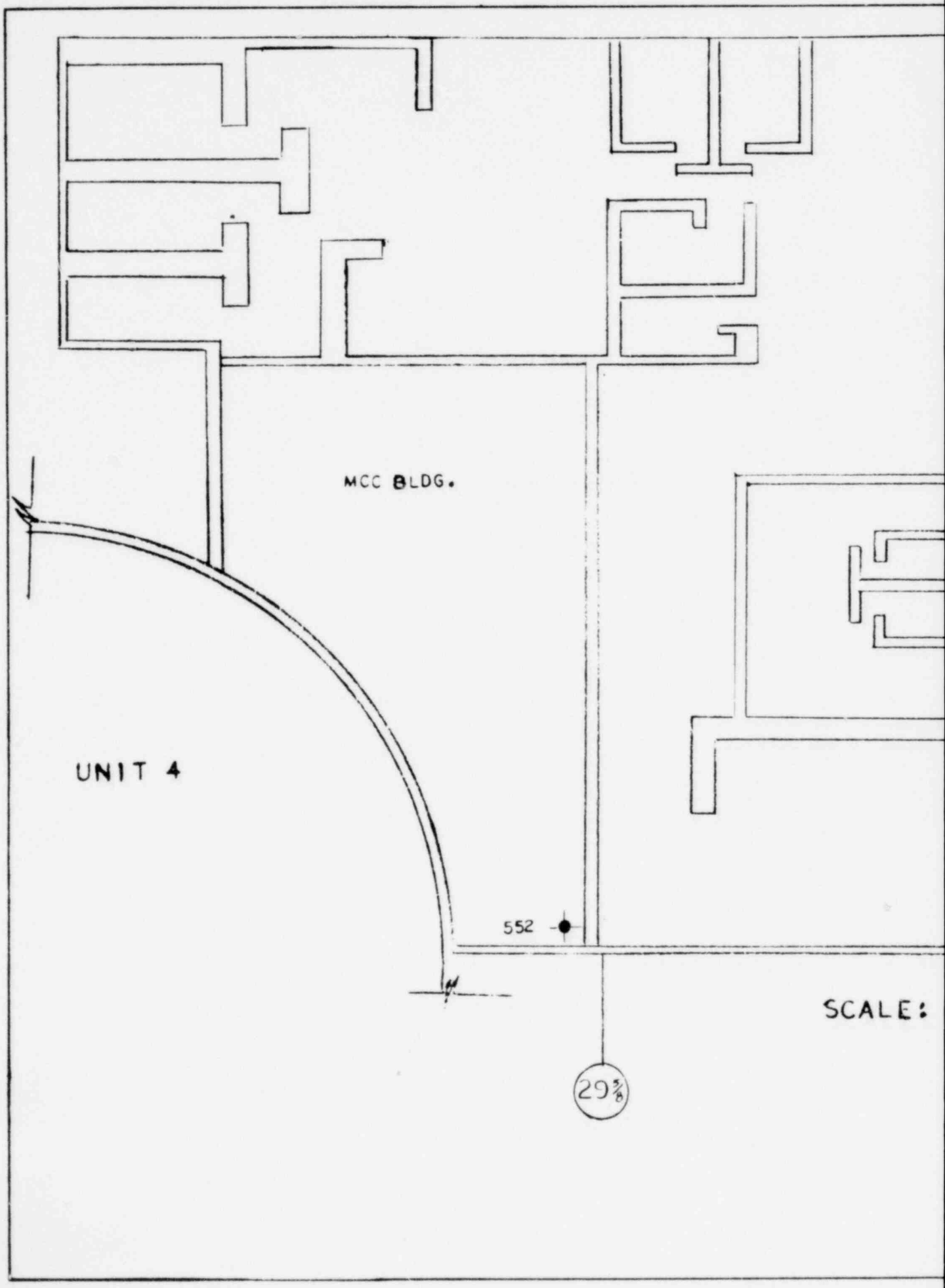
QUENCH SPRAY BUILDING (QS)

MAIN STEAM VALVE HOUSE (MSVH)

SETTLEMENT MONITORING PROGRAM

NORTH ANNA UNITS 3 AND 4

FEB 1, 1979


MCC BLDG.
UNIT 4
552
SCALE:
29 3/8

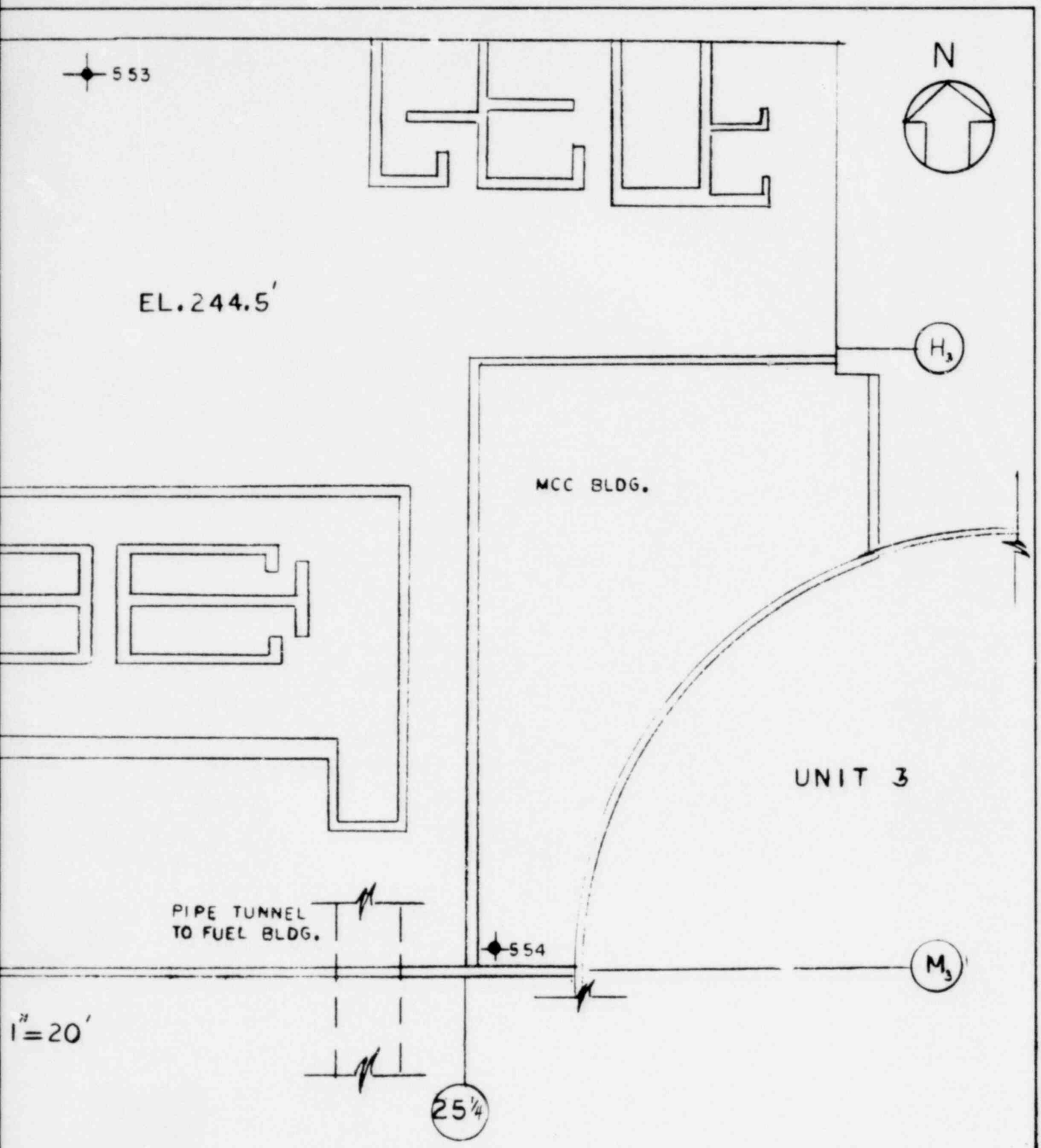
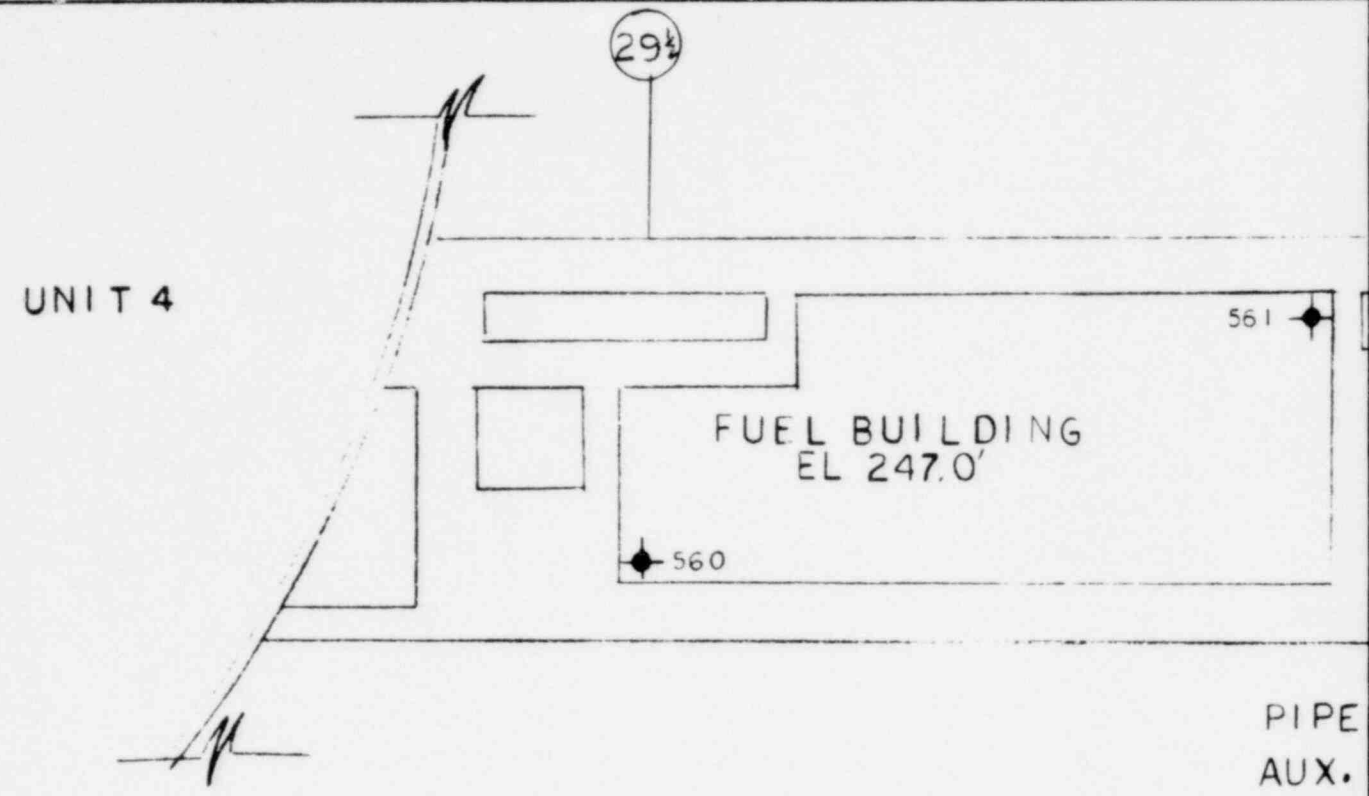


FIGURE 6

AUXILIARY BUILDING
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979



SCALE: 1"=20'

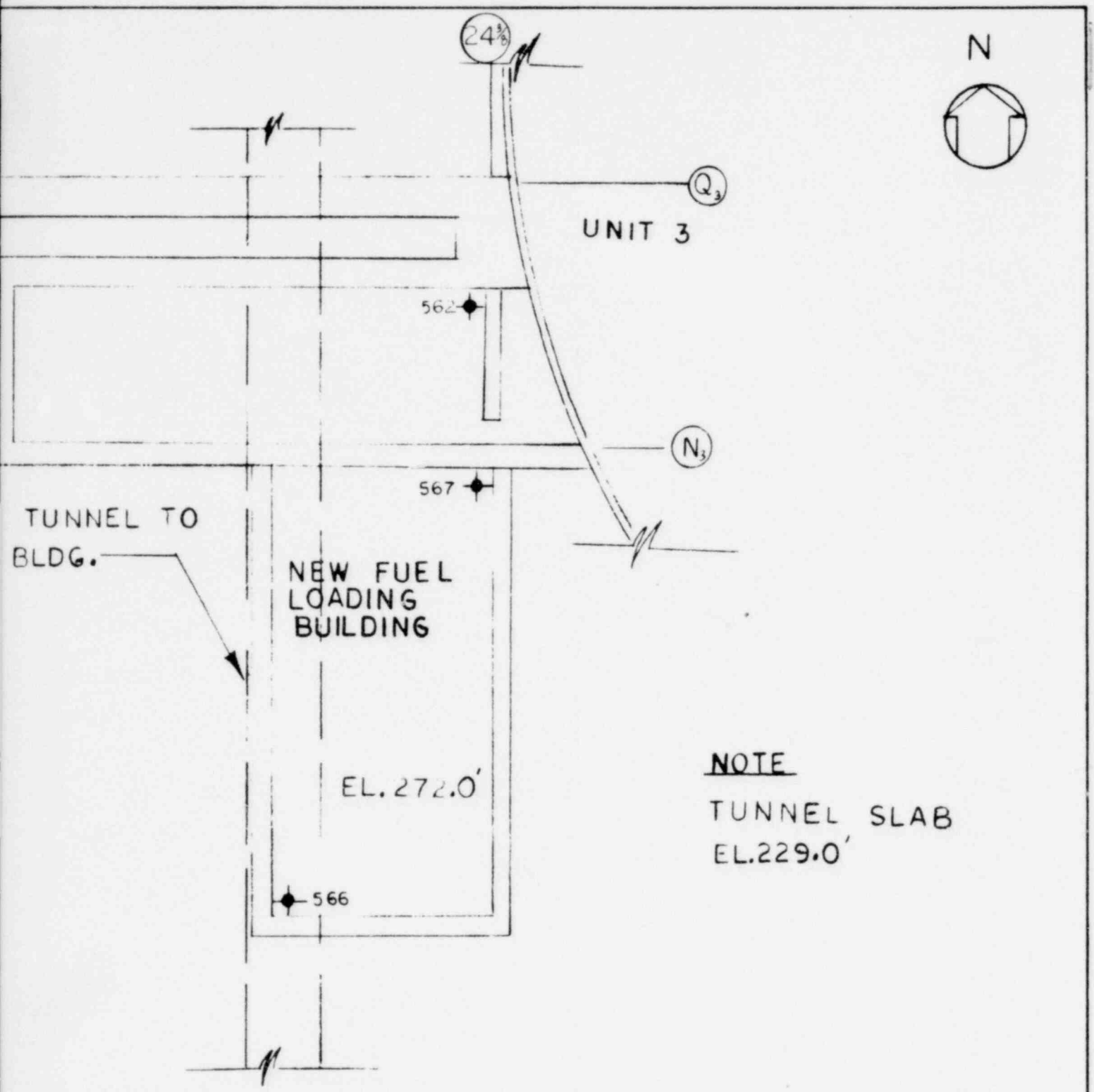
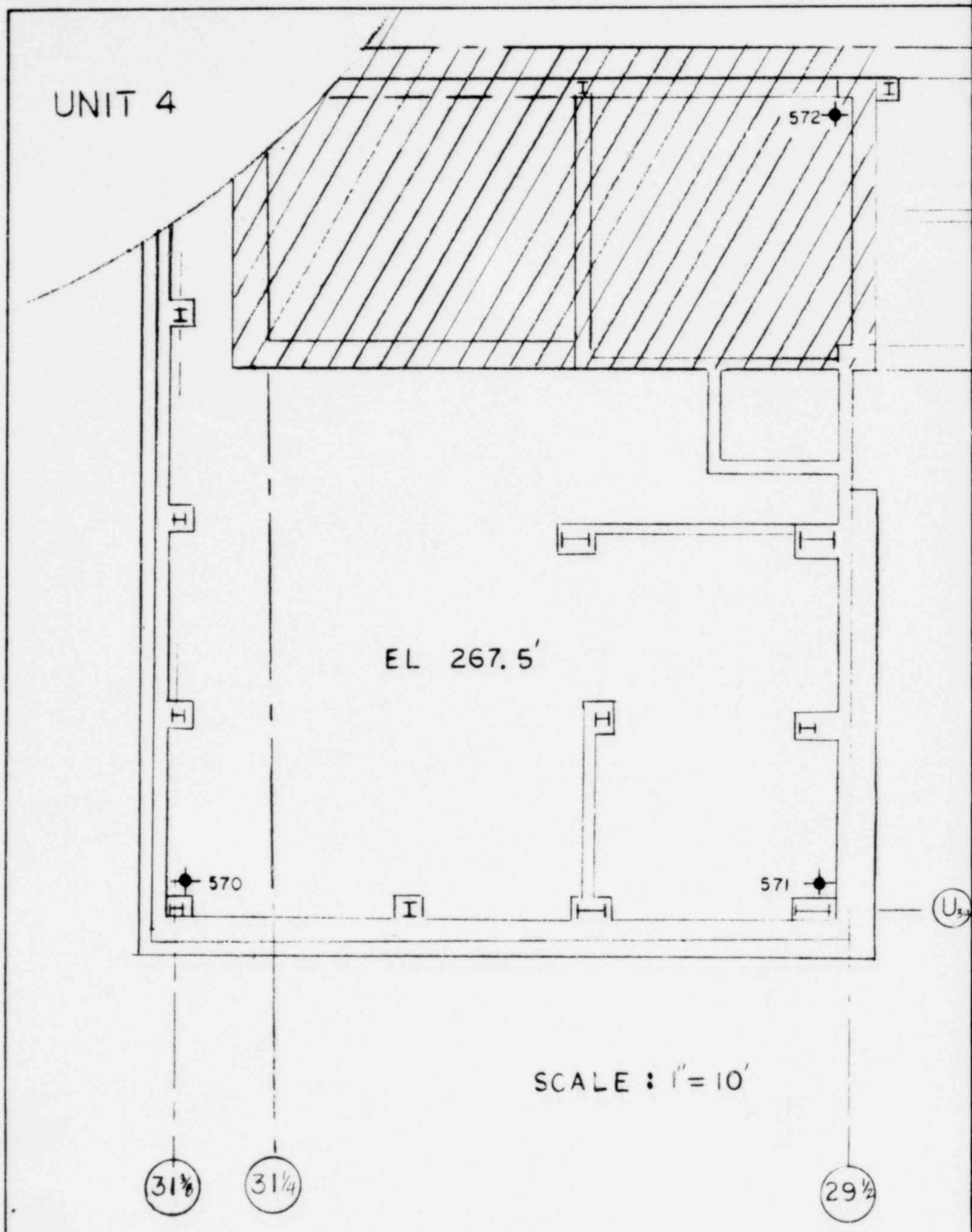


FIGURE 7

FUEL BUILDING

NEW FUEL LOADING BUILDING
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


UNIT 4
572
EL 267.5'
570
571
SCALE : 1" = 10'
31⅜
31¼
29½

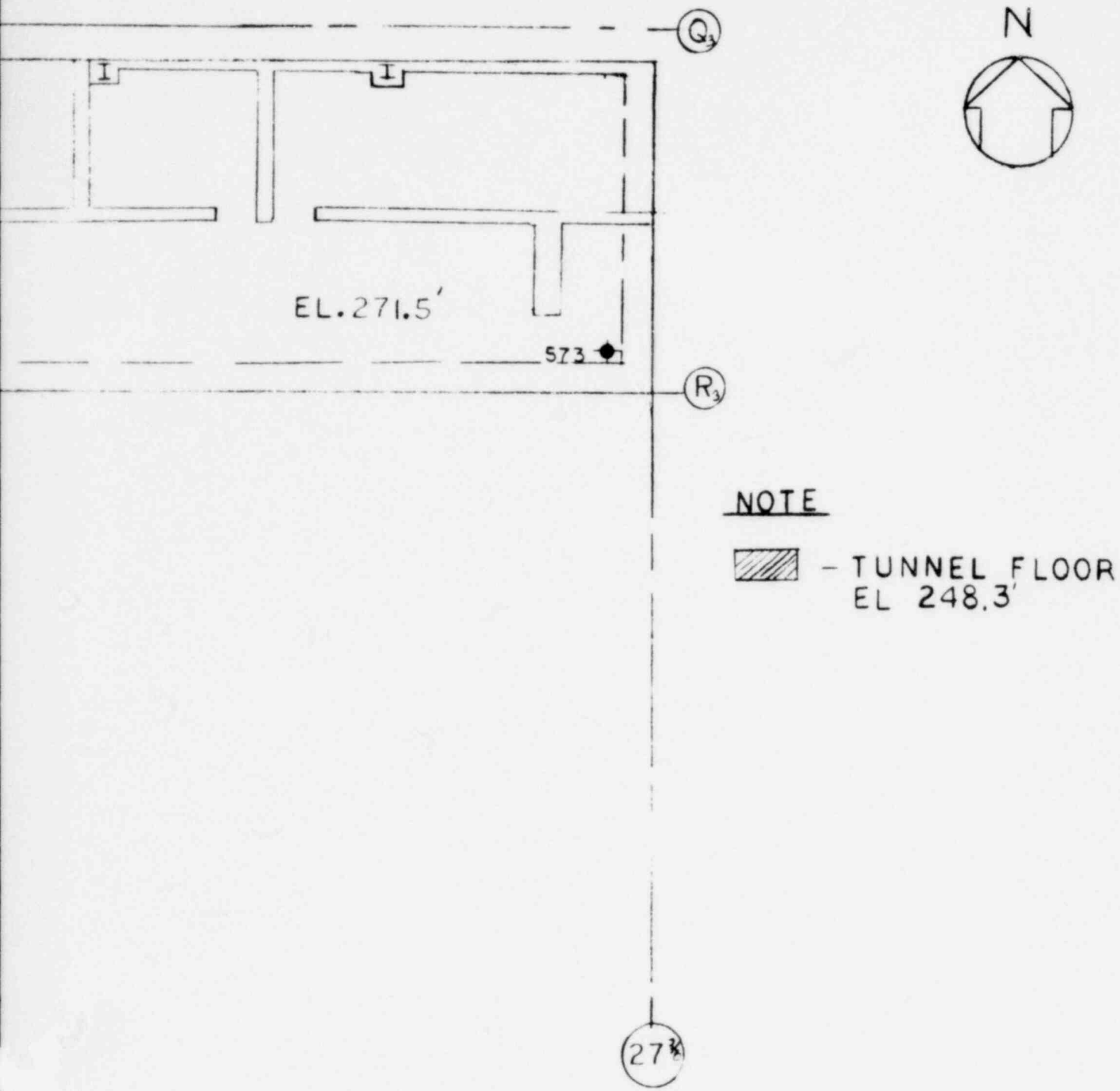
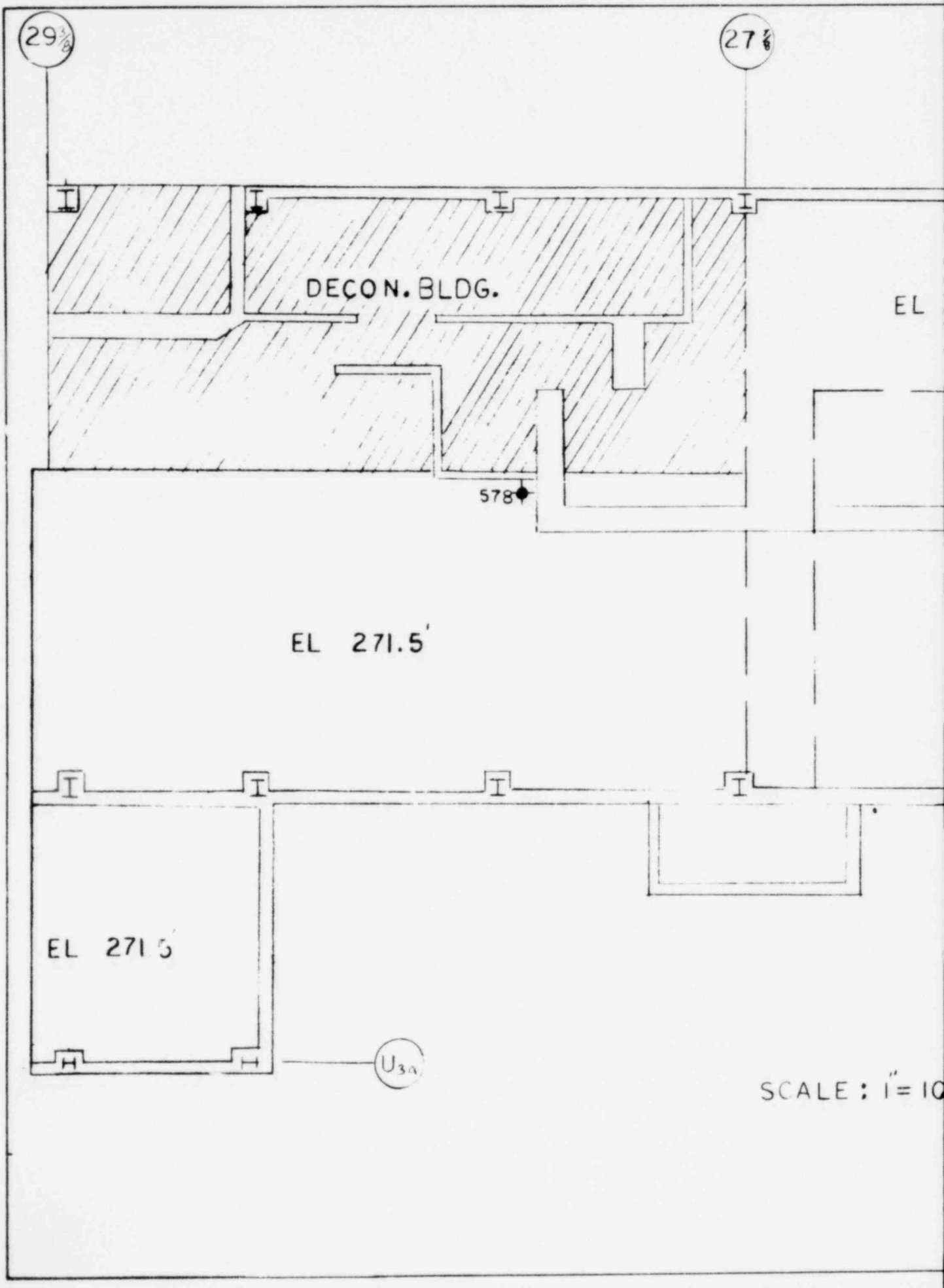


FIGURE 8

DECONTAMINATION BUILDING
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979


29 3/8
27 1/8
DECON. BLDG.
EL
578
EL 271.5'
EL 271.5'
U3A
SCALE : 1" = 10

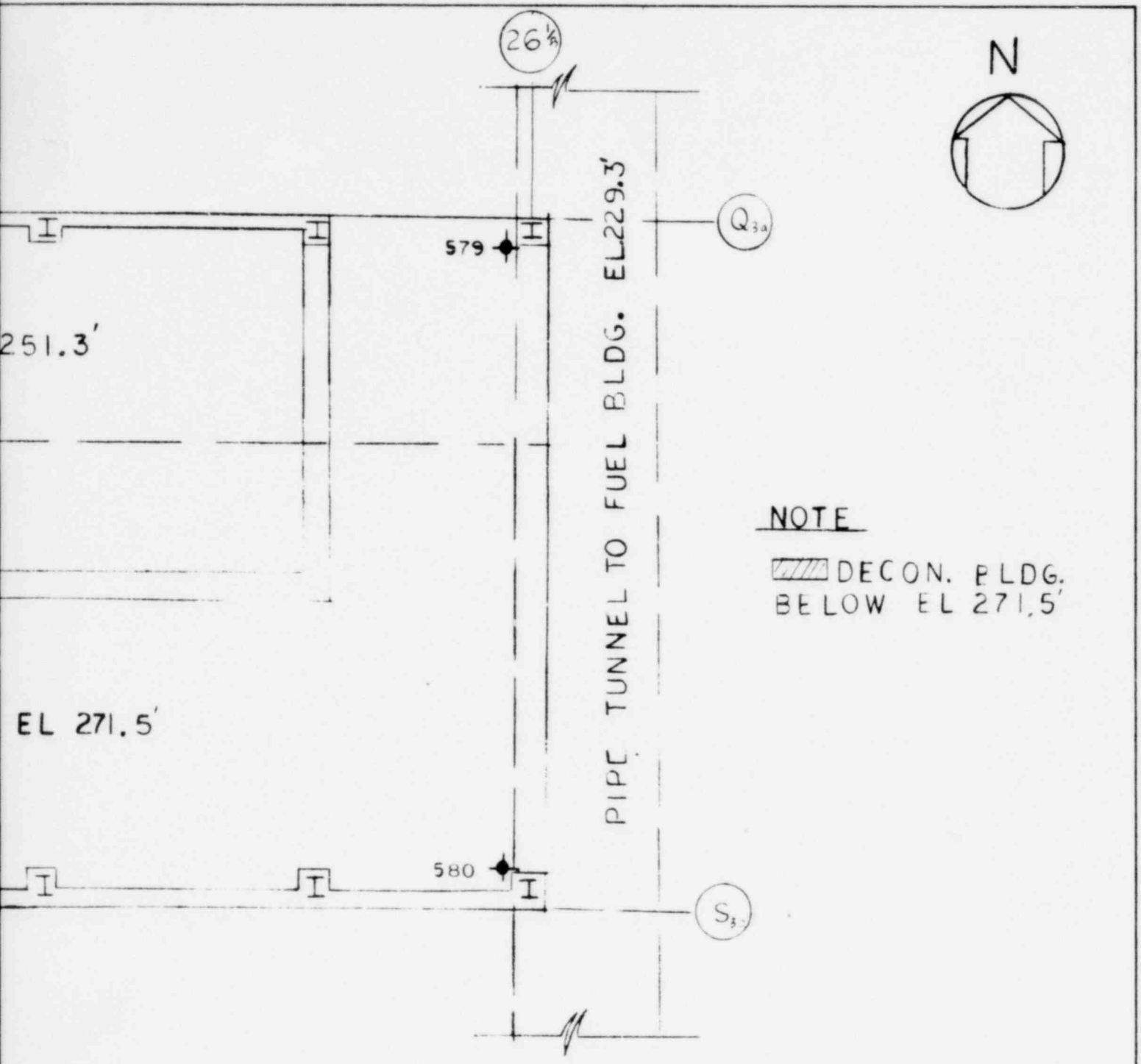
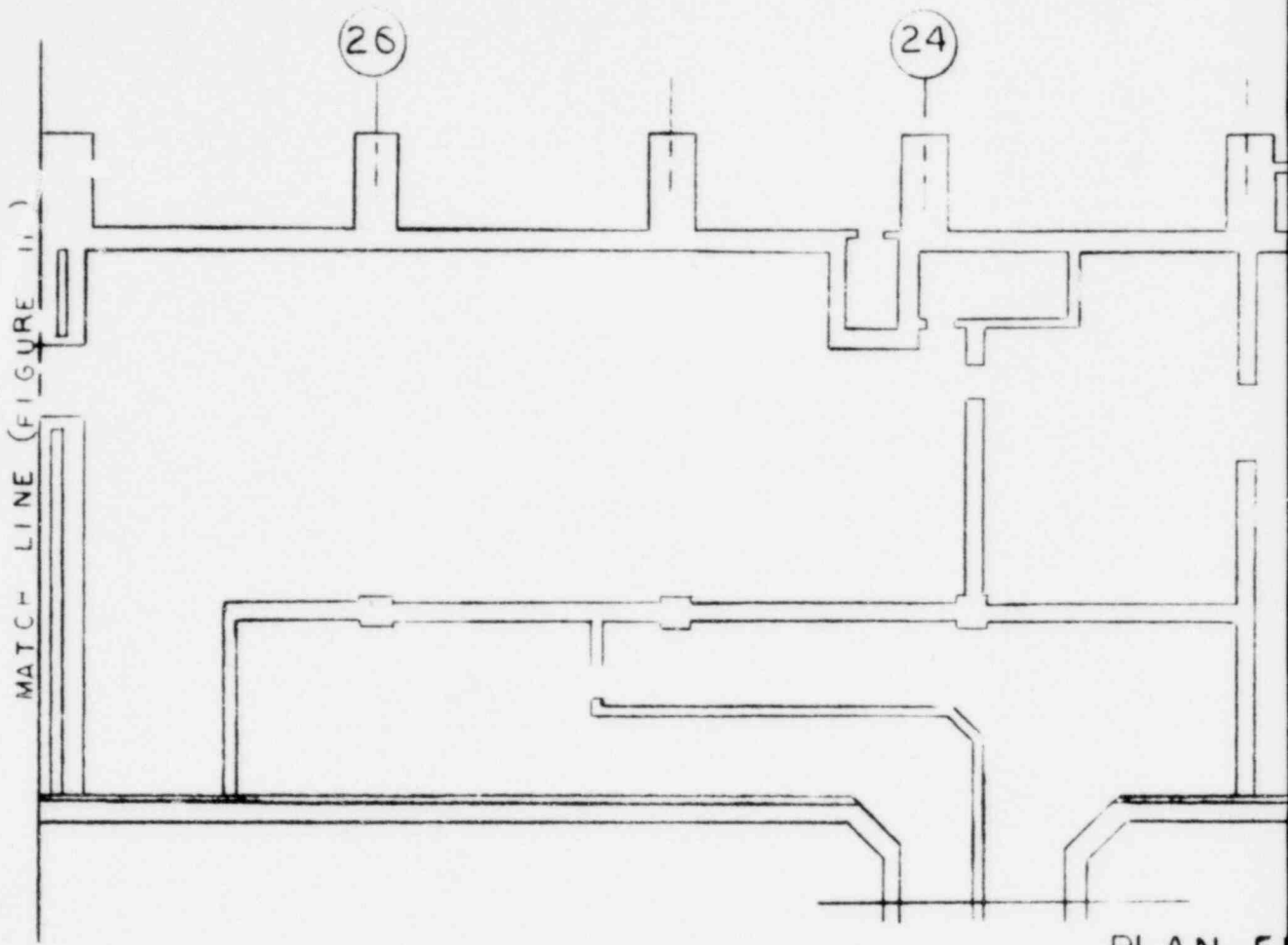


FIGURE 9

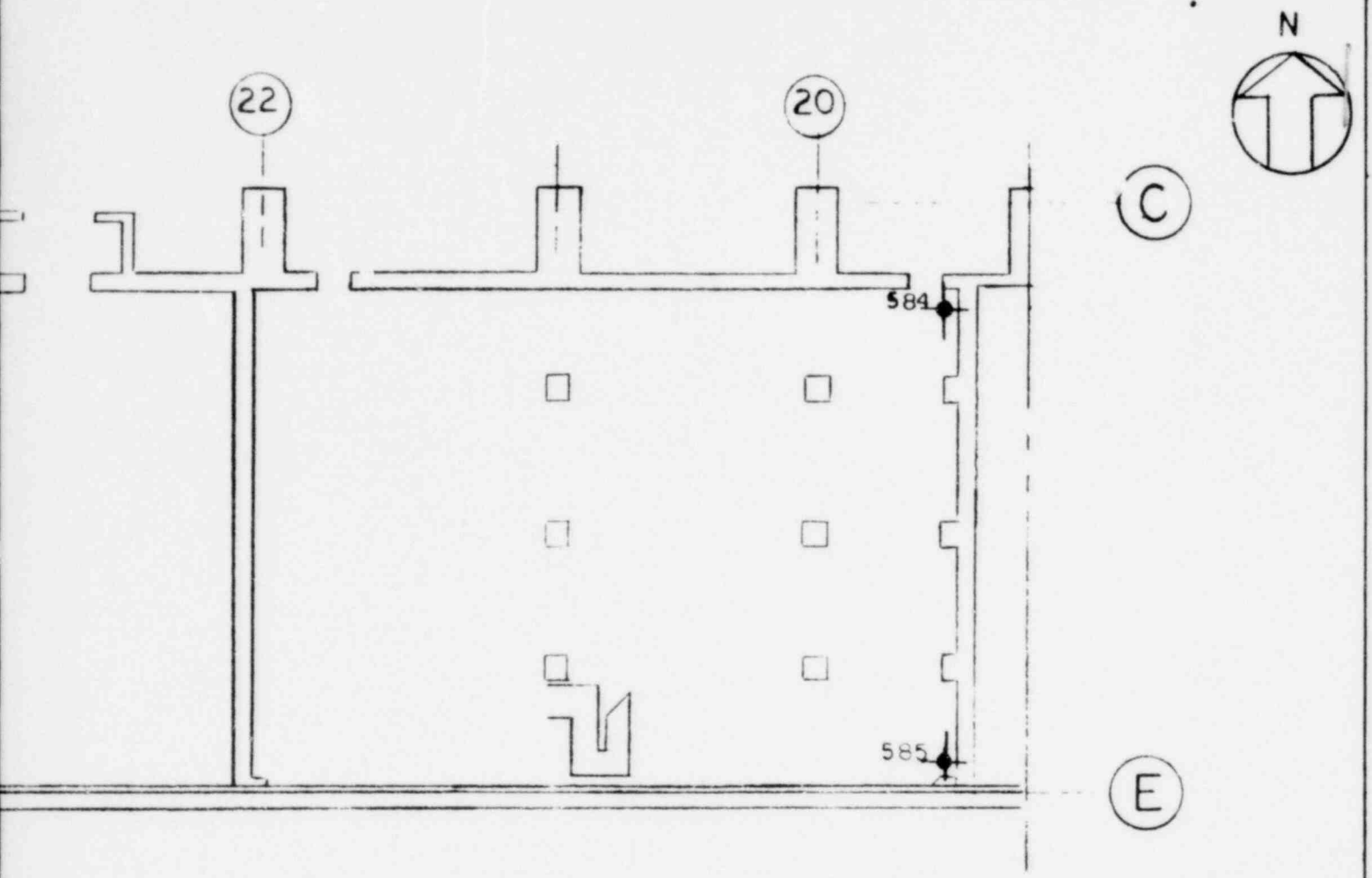
WASTE SOLIDIFICATION BUILDING
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979



PLAN E

SCALE

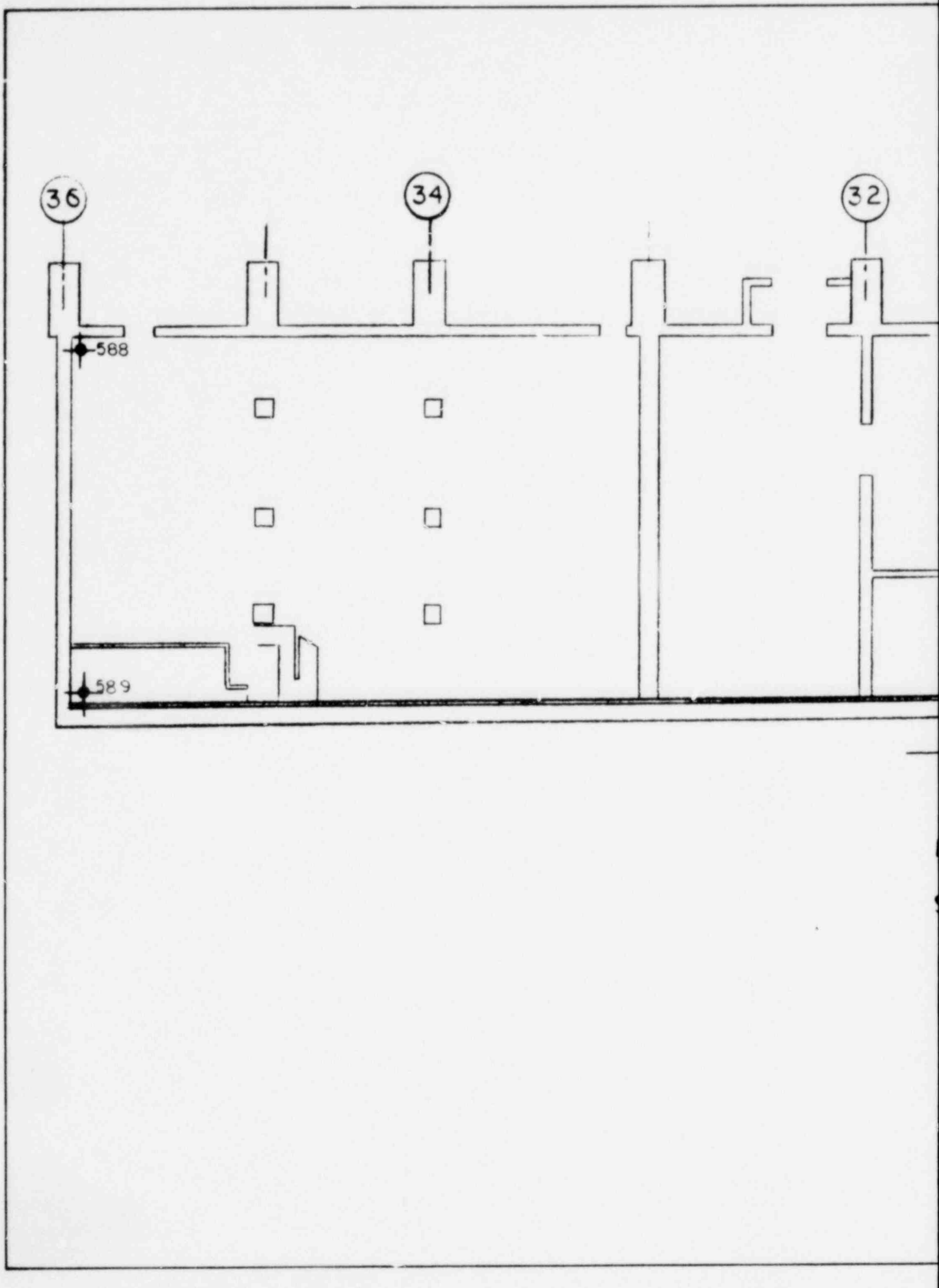


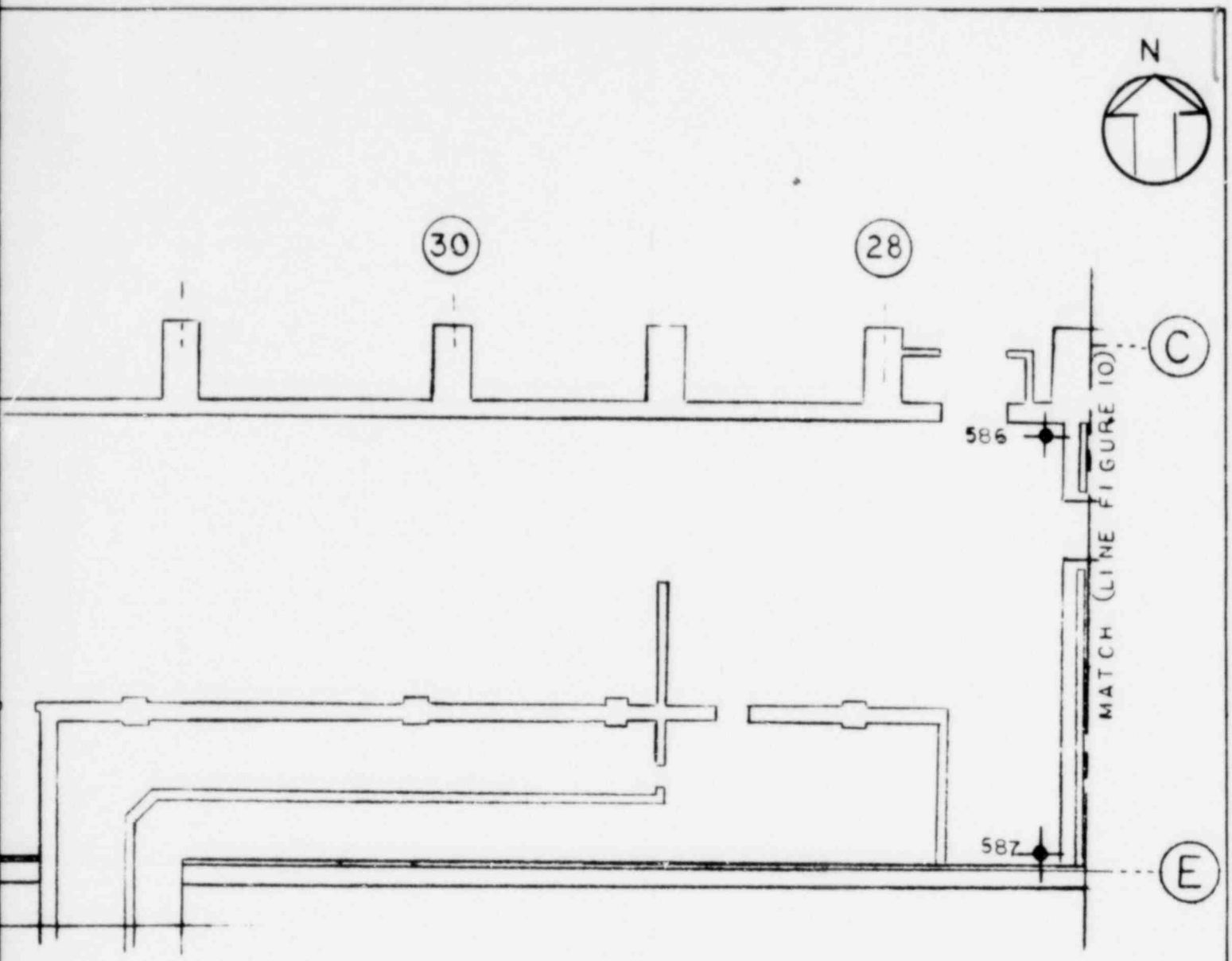
254.0'

1" = 20'

FIGURE 10

SERVICE BUILDING, UNIT 3
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


36
34
32
588
589

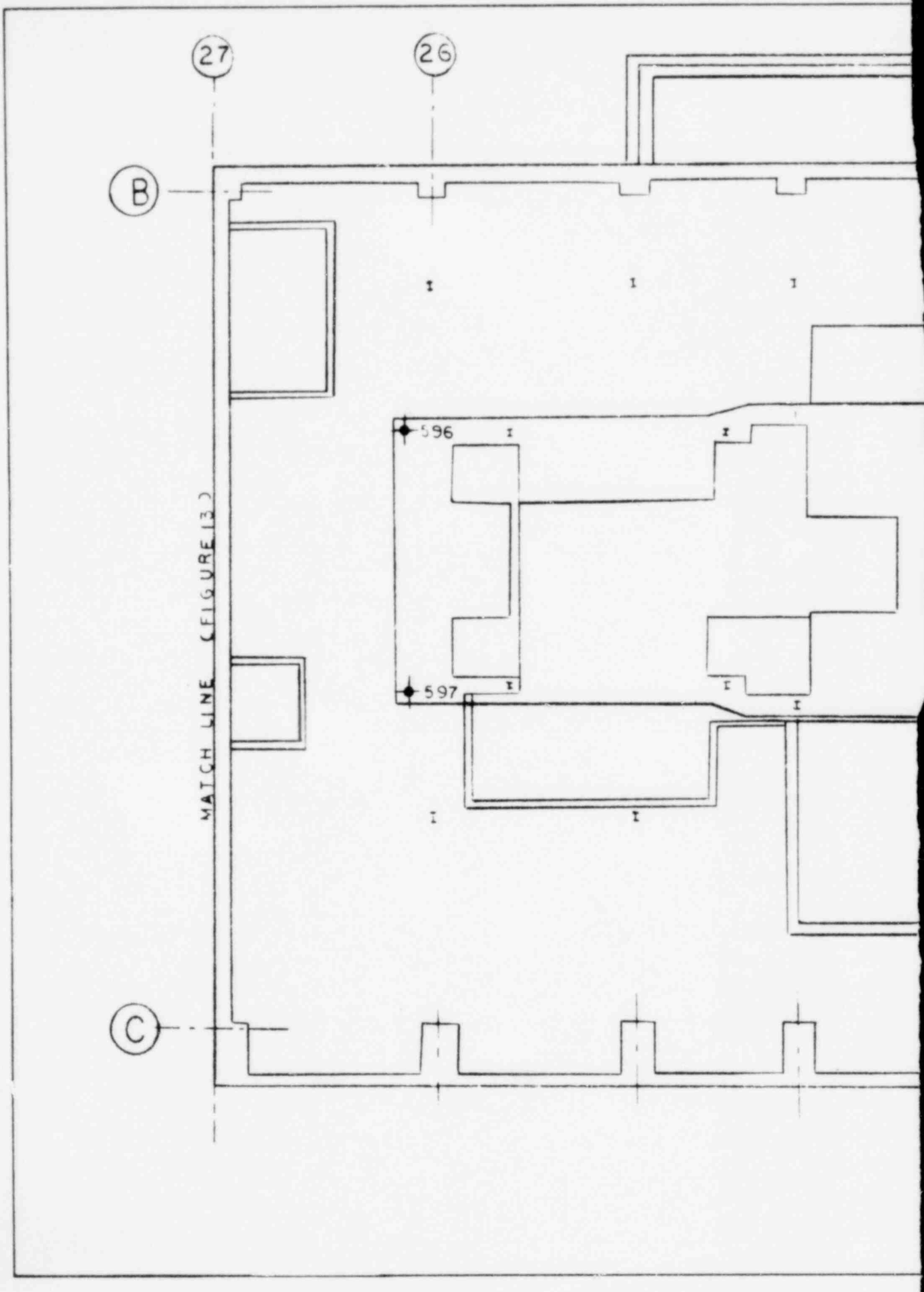


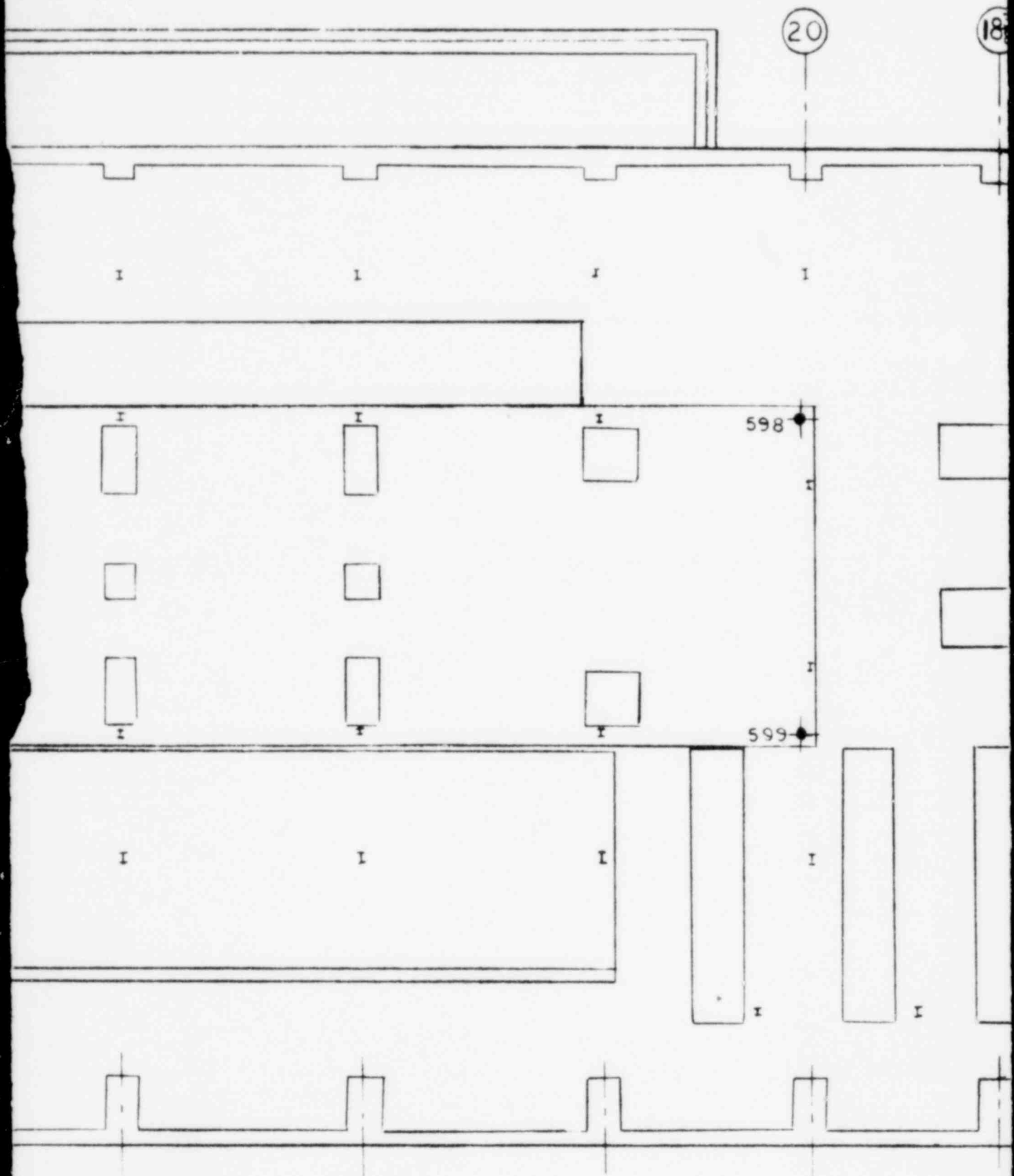
PLAN EL 254.0'

SCALE 1"= 20'

FIGURE 11

SERVICE BUILDING, UNIT 4
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


27
26
B
C
596
597
MATCH LINE (FIGURE 13)



PLAN EL 254.0'

SCALE 1" = 20'

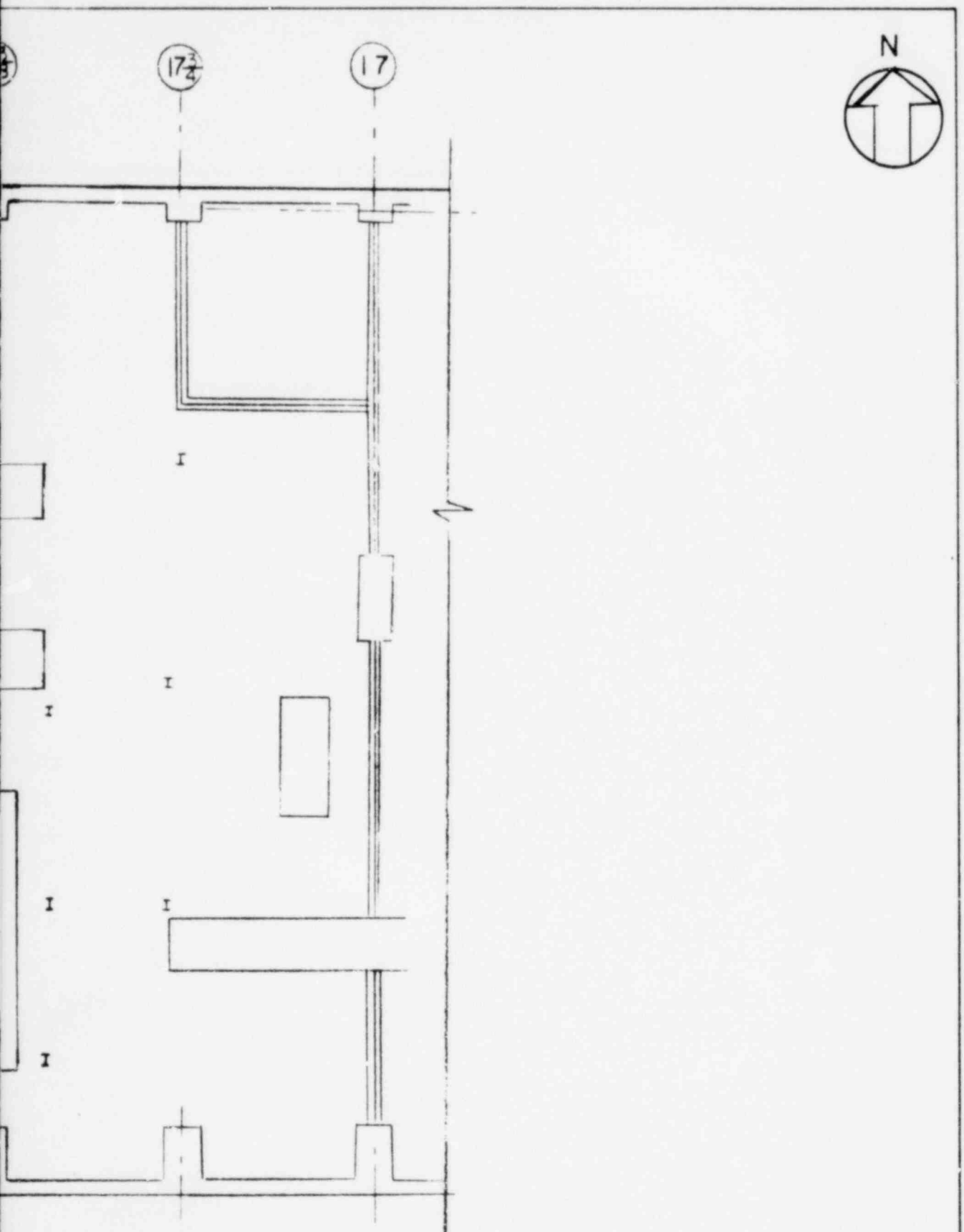
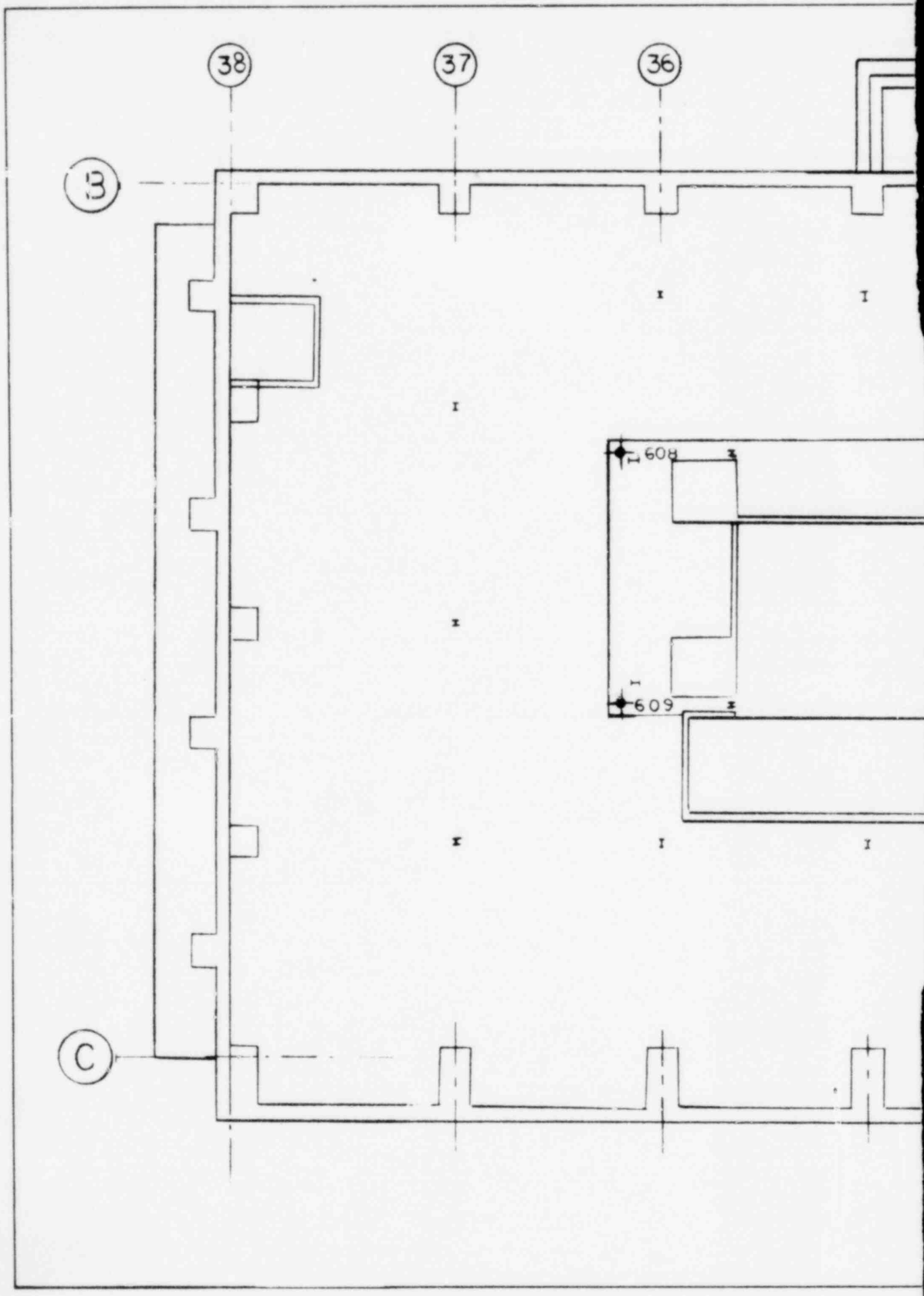
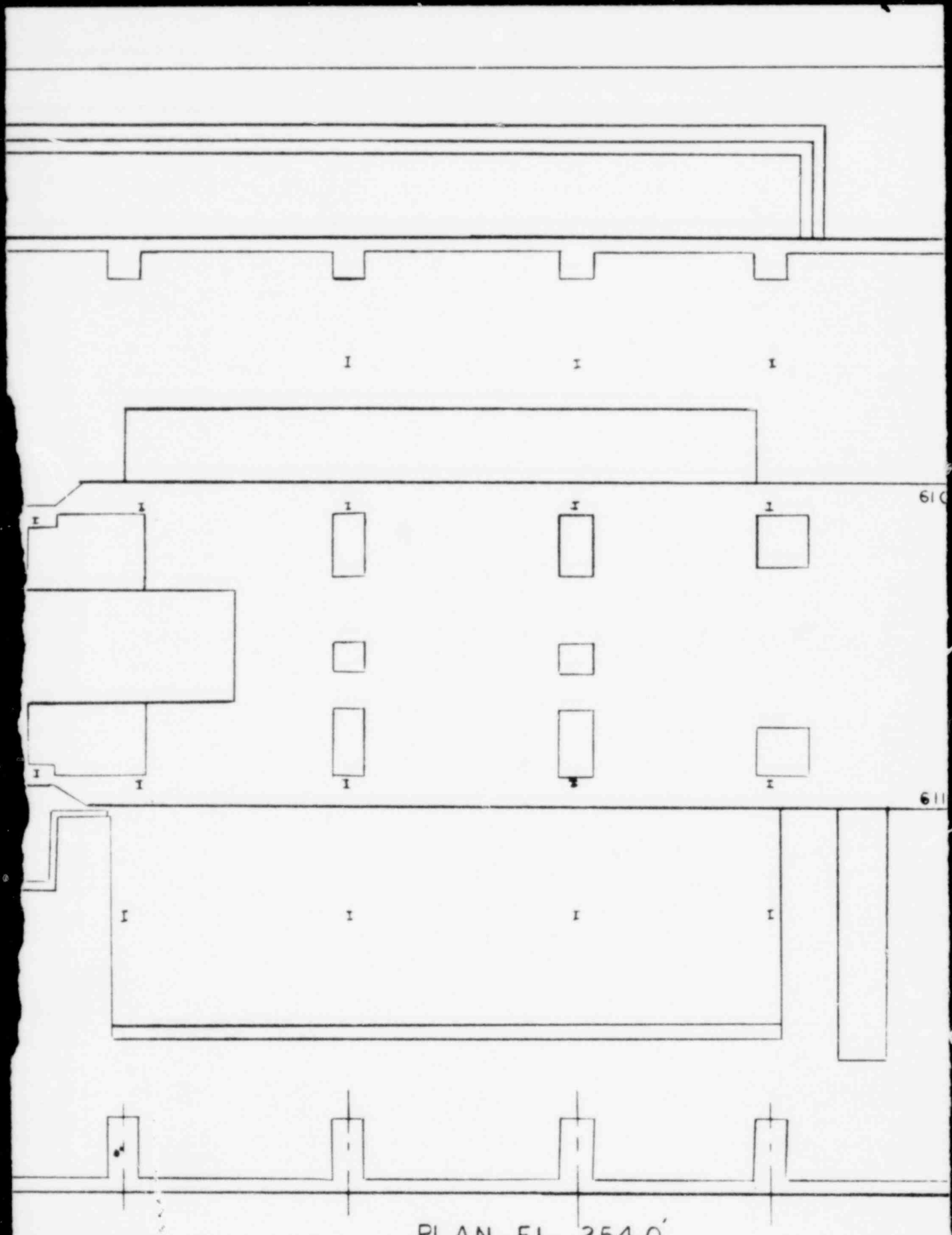


FIGURE 12

TURBINE BUILDING, UNIT 3
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


38
37
36
B
C
608
609



PLAN EL 254.0'

SCALE 1" = 20'

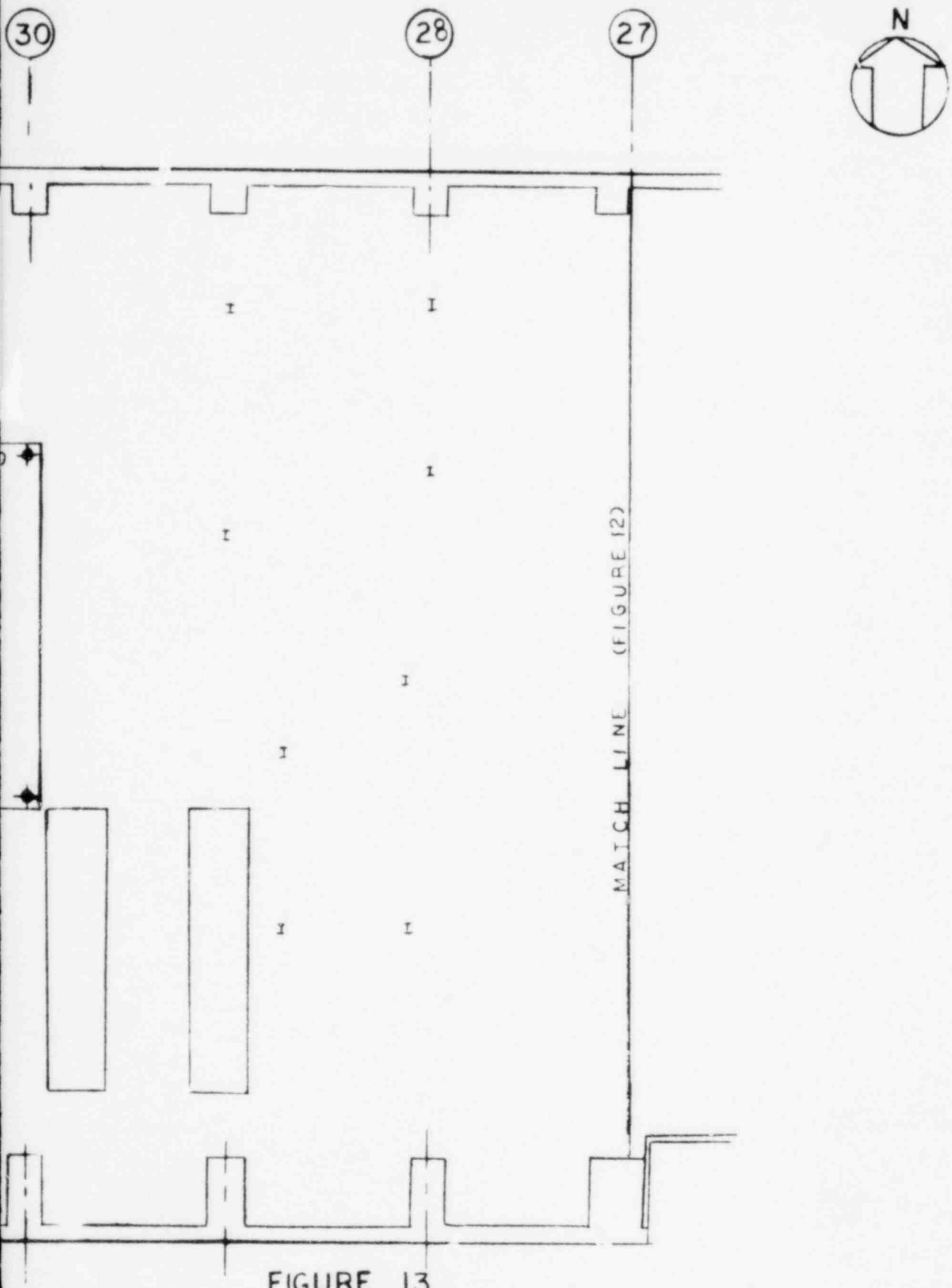
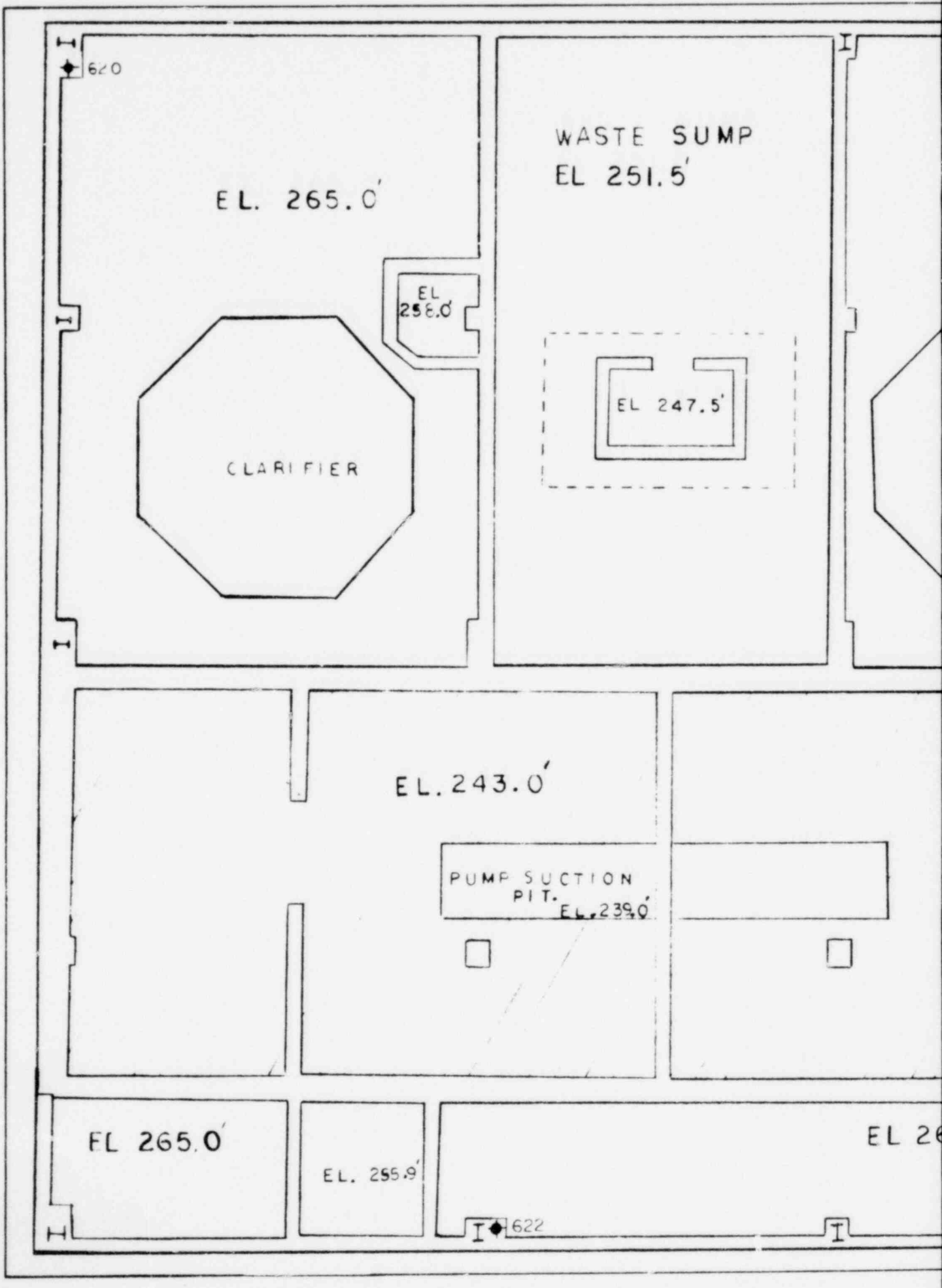


FIGURE 13

TURBINE BUILDING, UNIT 4
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


620
EL. 265.0'
WASTE SUMP
EL 251.5'
EL 256.0'
EL 247.5'
CLARIFIER
EL. 243.0'
PUMP SUCTION PIT.
EL. 239.0'
FL 265.0'
EL. 255.9'
622

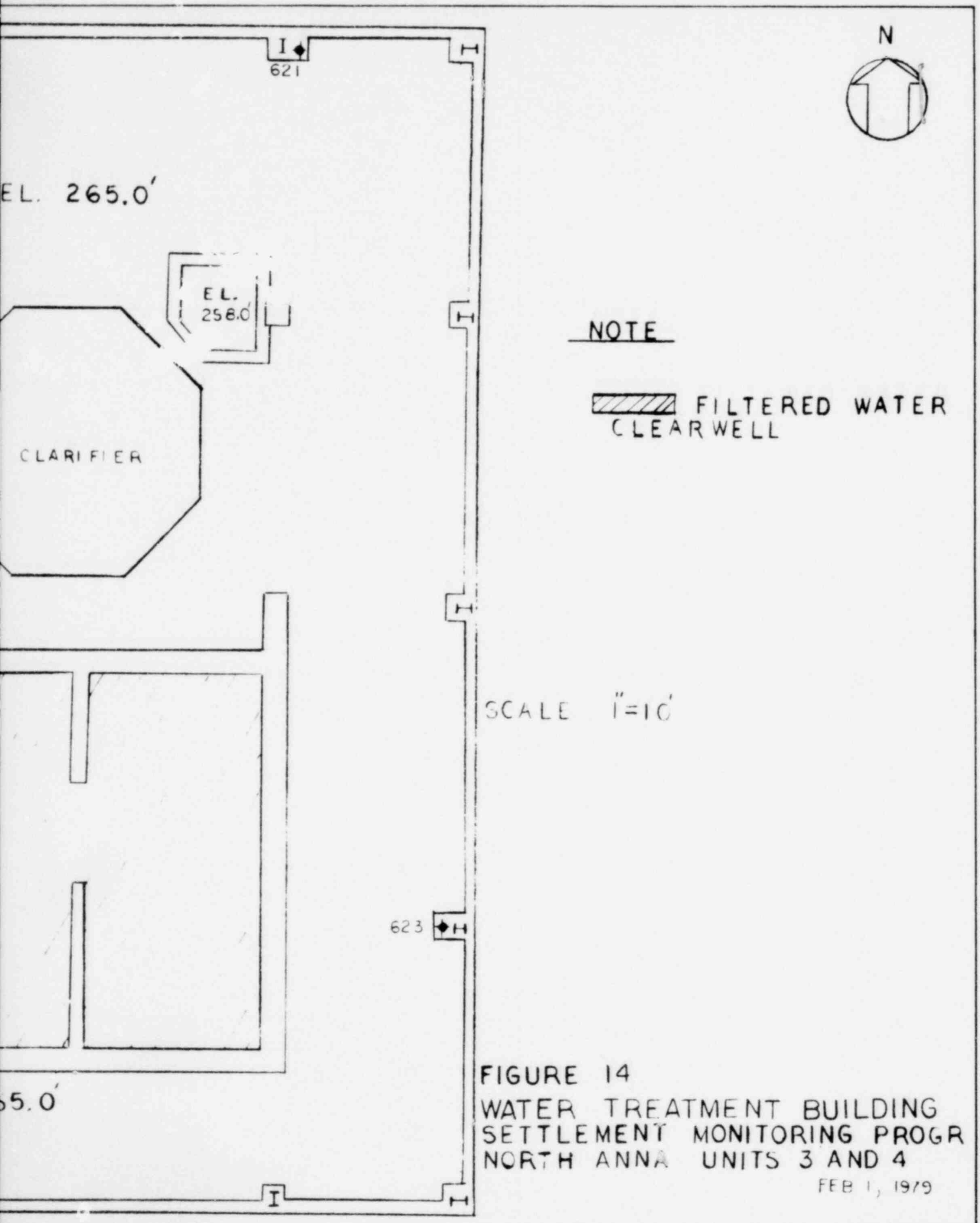
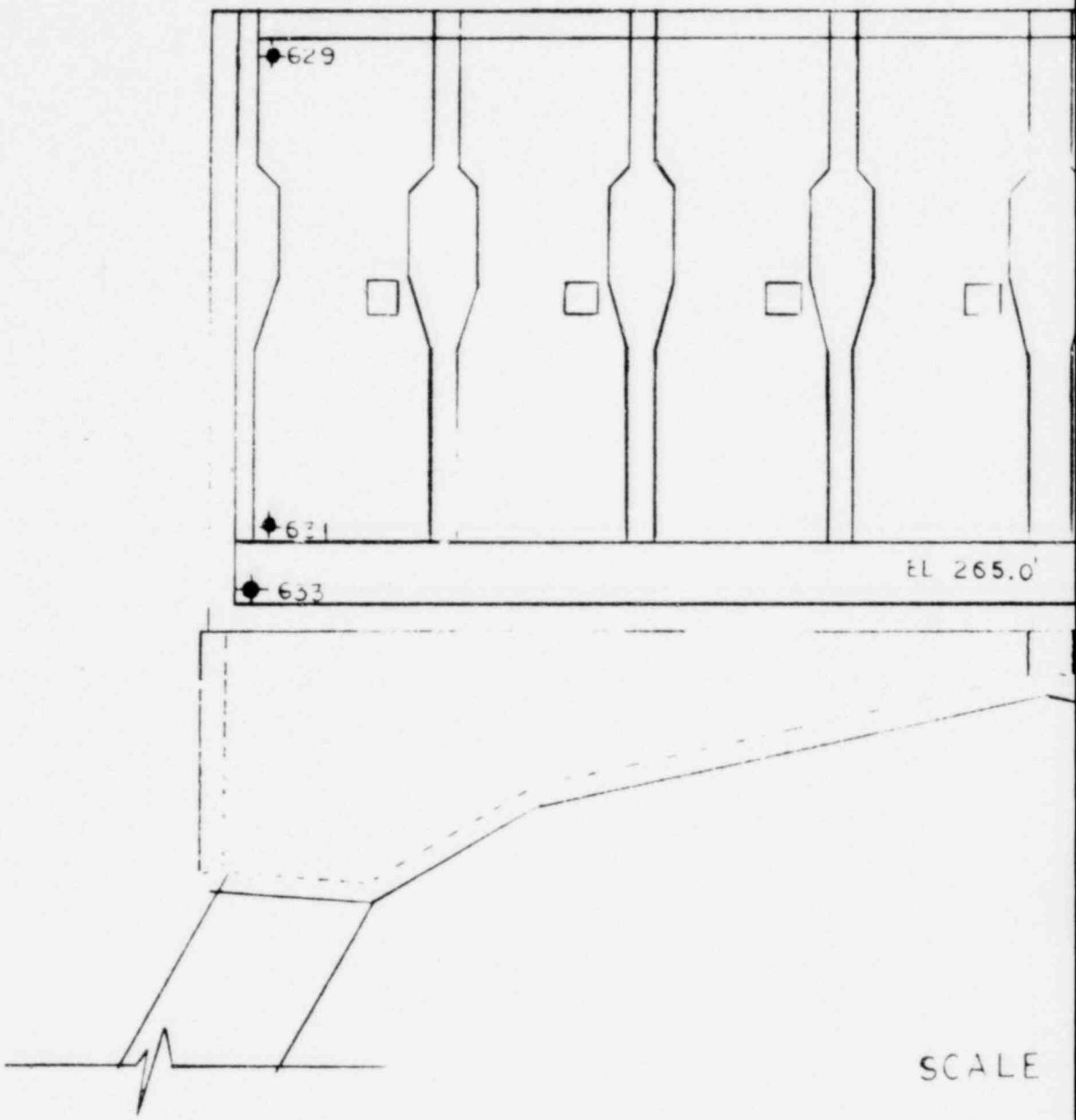


FIGURE 14
WATER TREATMENT BUILDING
SETTLEMENT MONITORING PROGR
NORTH ANNA UNITS 3 AND 4
FEB 1, 1979


629
621
633
EL 265.0'
SCALE

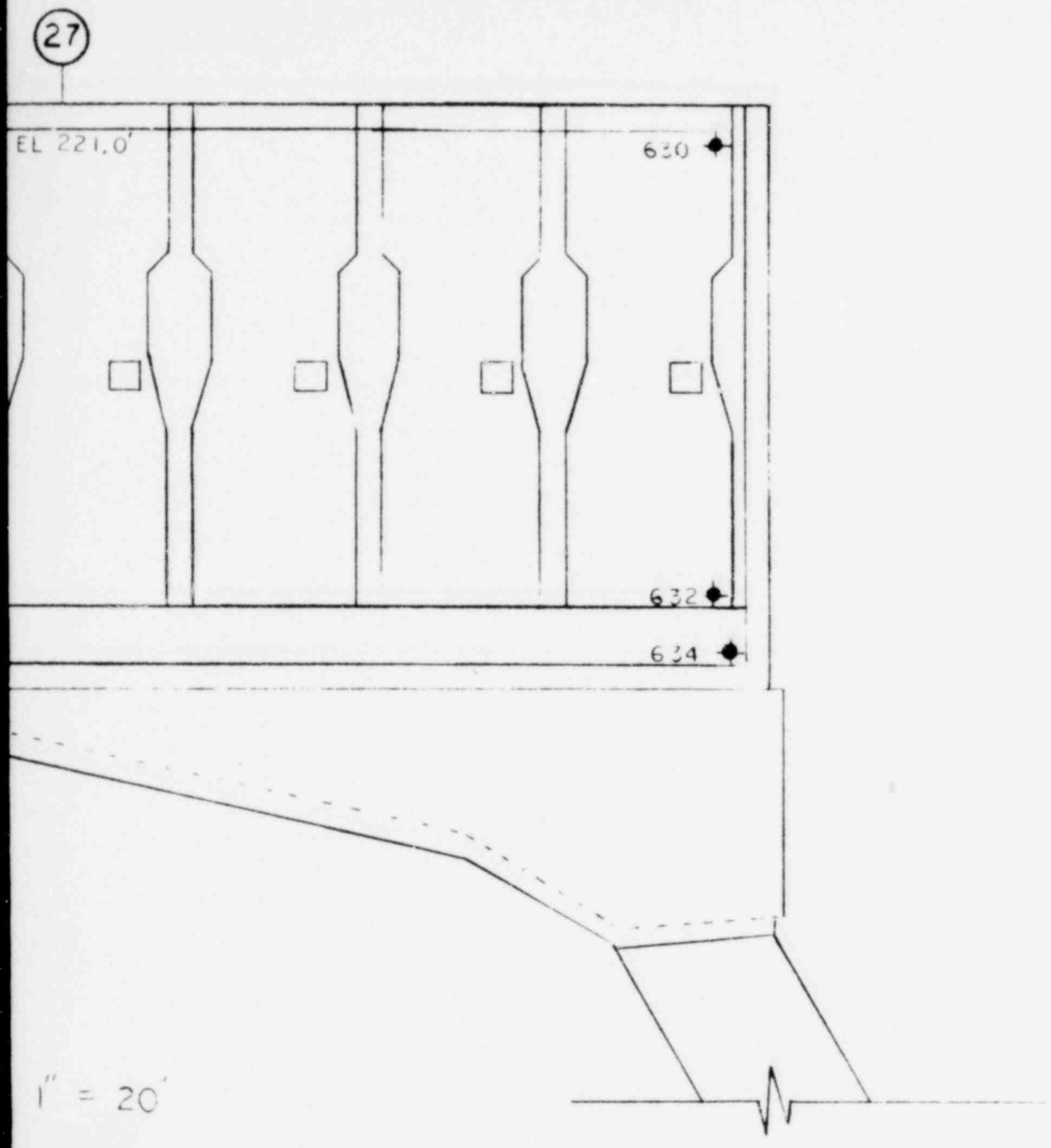
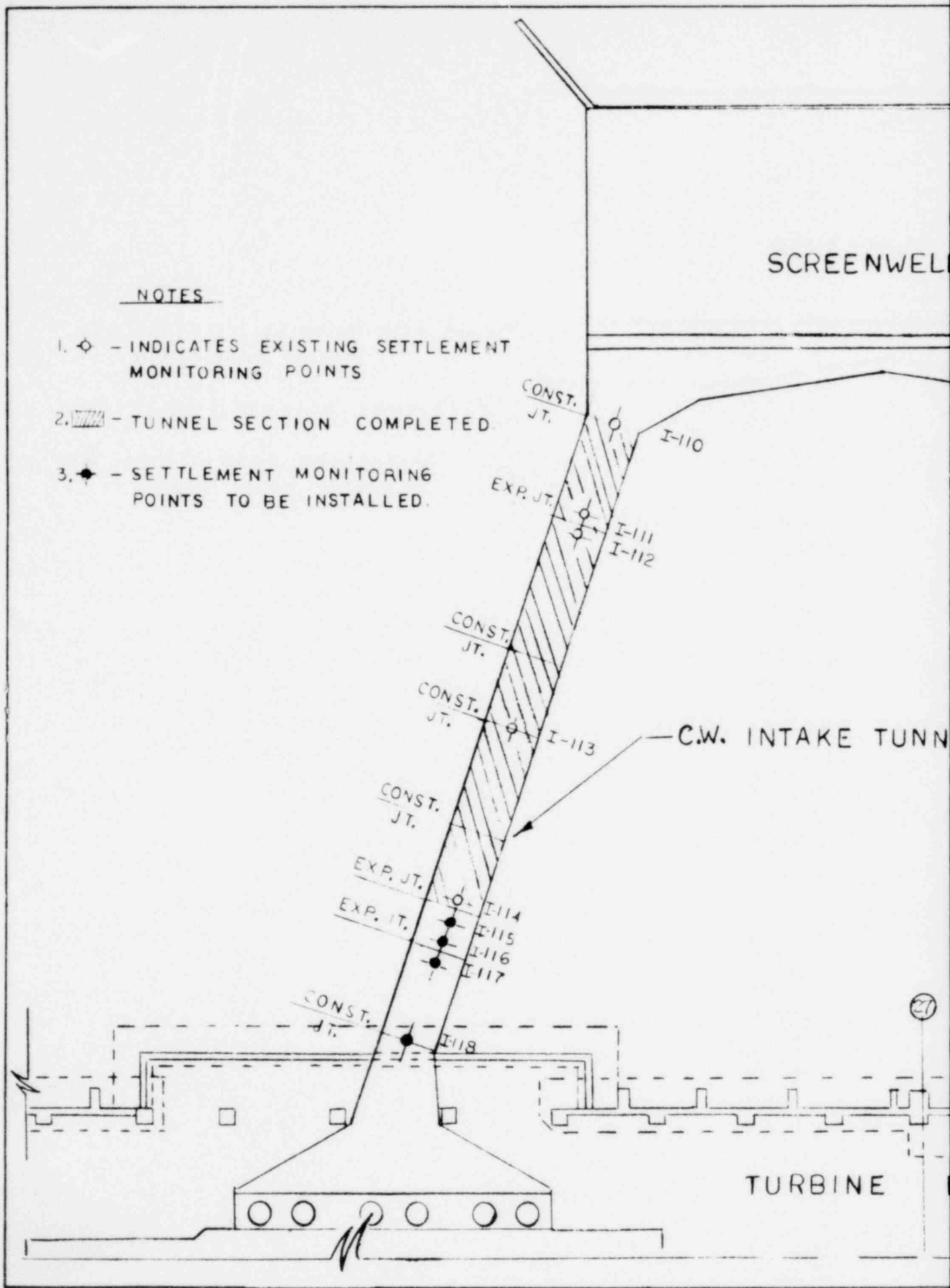


FIGURE 15

INTAKE STUCTURE
SETTLEMENT MONITORING PROGAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 19?9


NOTES
1. ⊙ – INDICATES EXISTING SETTLEMENT MONITORING POINTS
2. ▨ – TUNNEL SECTION COMPLETED.
3. ✦ – SETTLEMENT MONITORING POINTS TO BE INSTALLED.
SCREENWELL
CONST. JT.
I-110
EXP. JT.
I-111
I-112
CONST. JT.
CONST. JT.
I-113
C.W. INTAKE TUNN
CONST. JT.
EXP. JT.
EXP. JT.
I-114
I-115
I-116
I-117
CONST. JT.
I-118
TURBINE

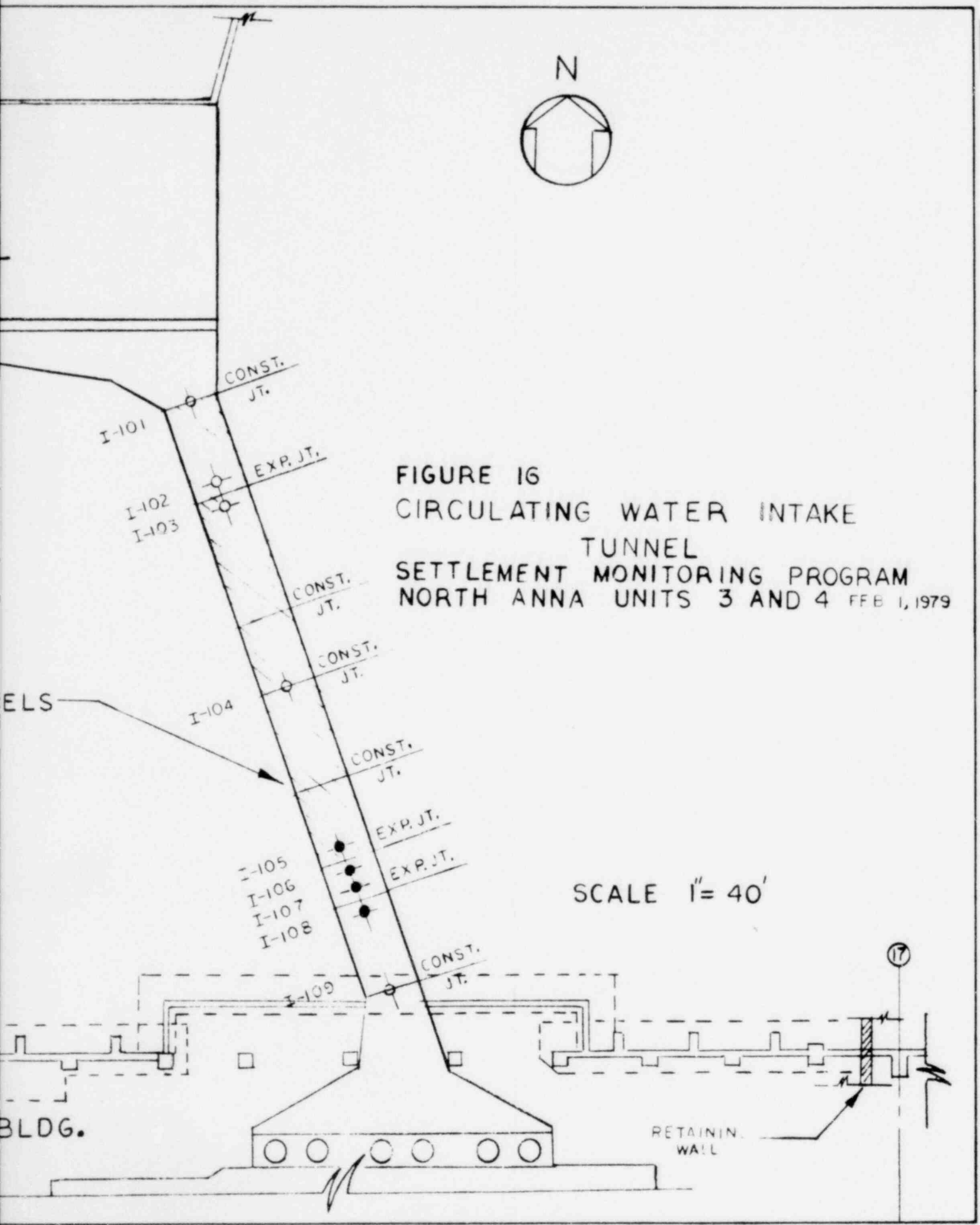
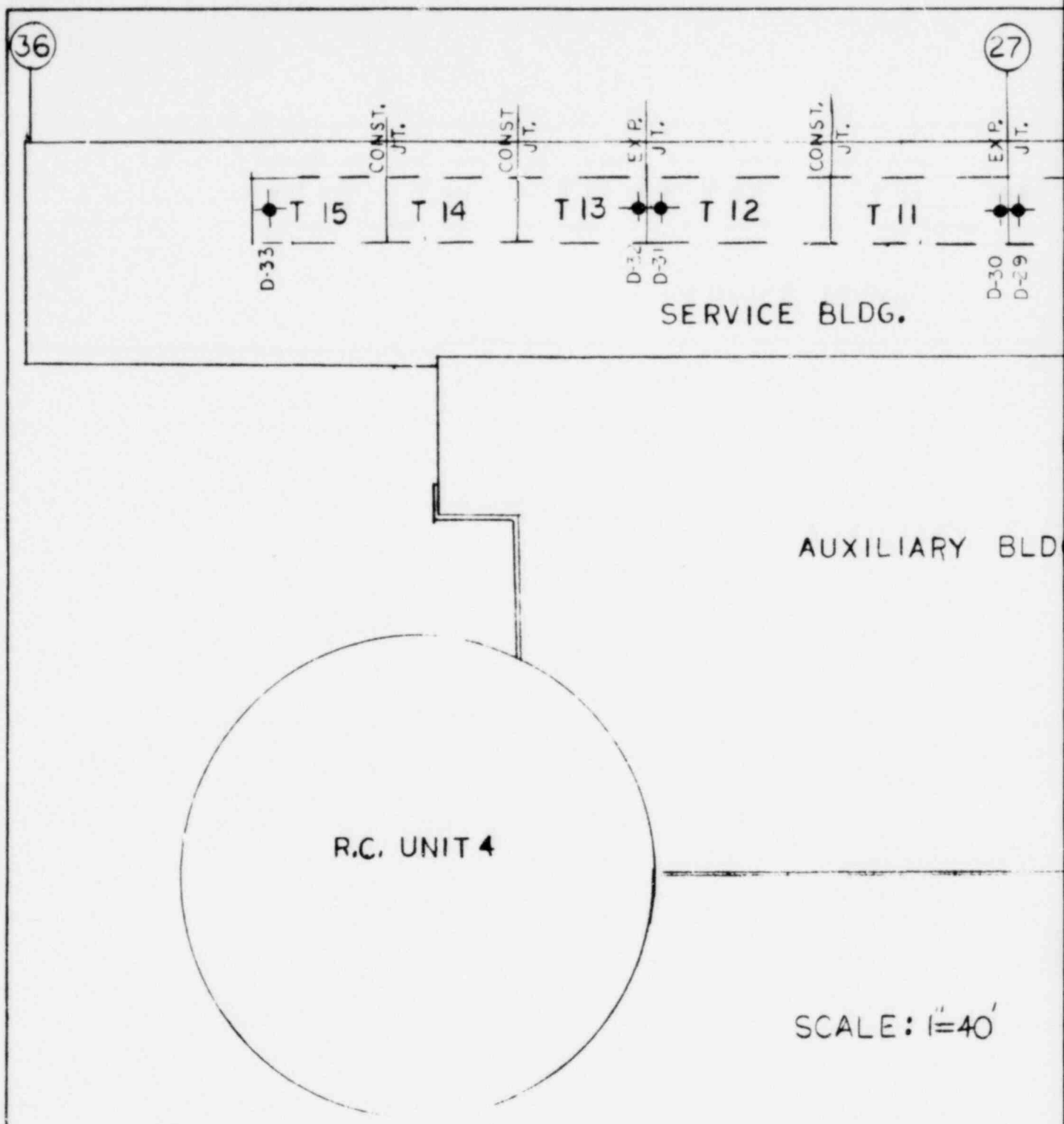


FIGURE 16
CIRCULATING WATER INTAKE TUNNEL
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979



NOTES.

1. TOP OF TUNNEL EL. 245.0'
2. ▨ — TUNNEL SECTIONS COMPLETED.,

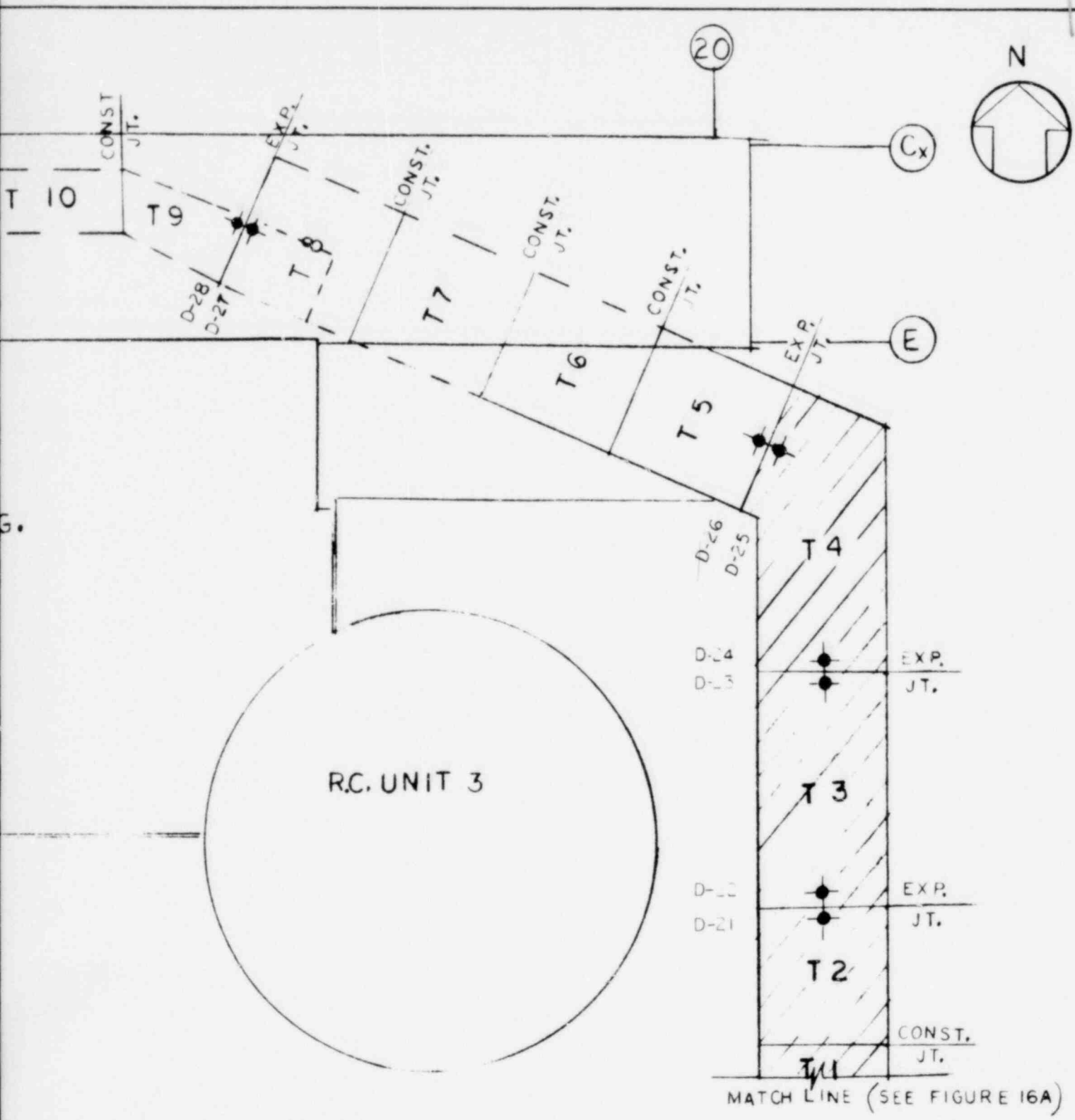
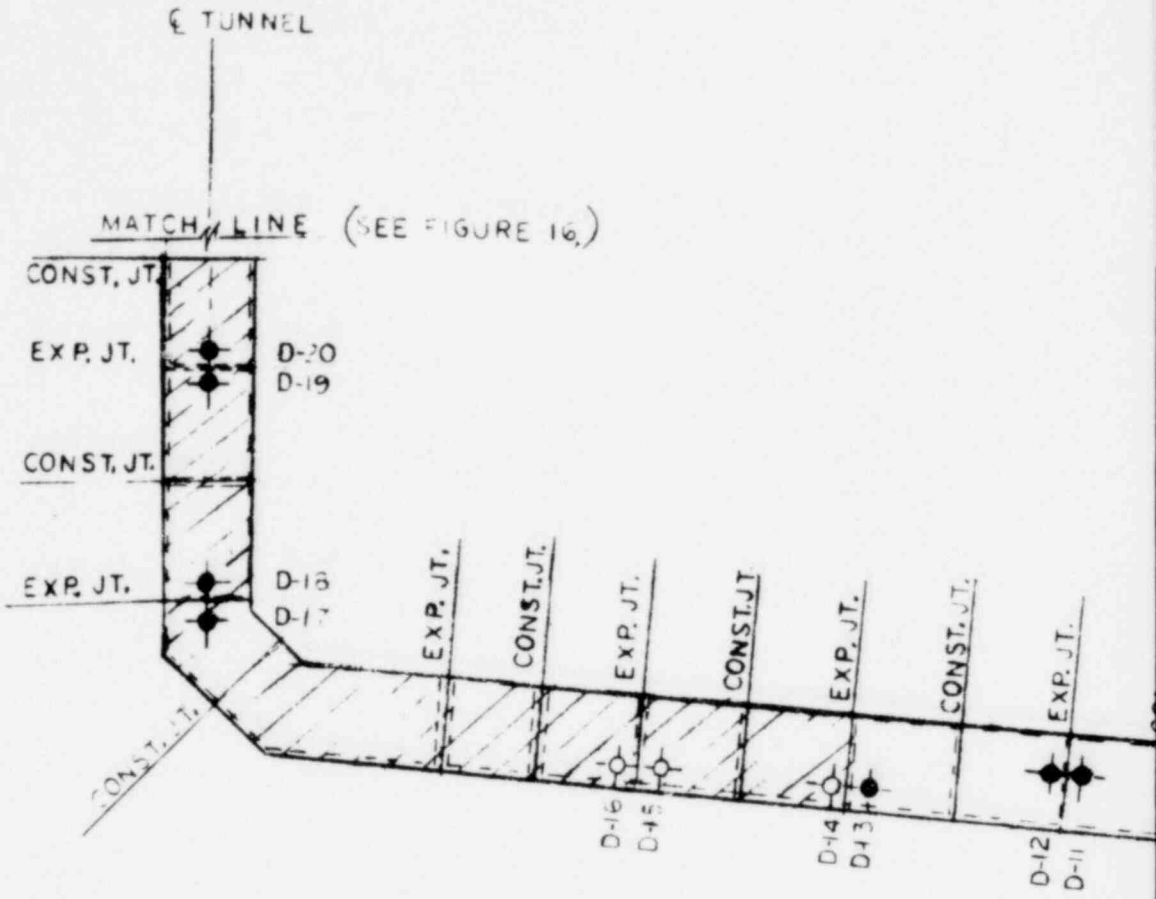


FIGURE 17

CIRCULATING WATER DISCHARGE TUNNEL
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979



SCALE: 1"=

NOTES.

1. ✧ EXISTING SETTLEMENT MONITORING POINTS.
2. ✦ SETTLEMENT MONITORING POINTS TO BE INSTALLED.
3. ▨ -TUNNEL SECTIONS COMPLETED.

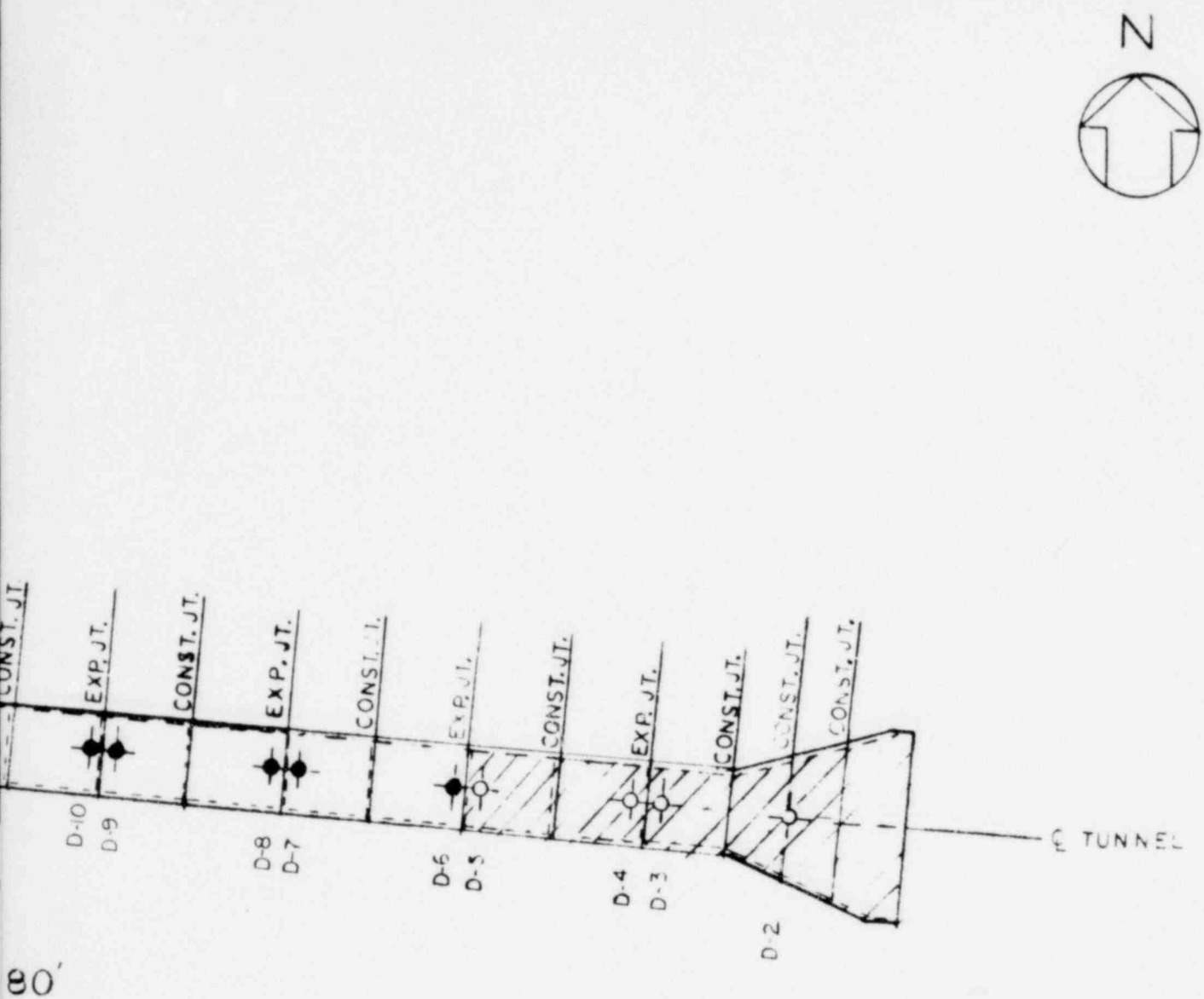


FIGURE 18

CIRCULATING WATER DISCHARGE TUNNEL
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979

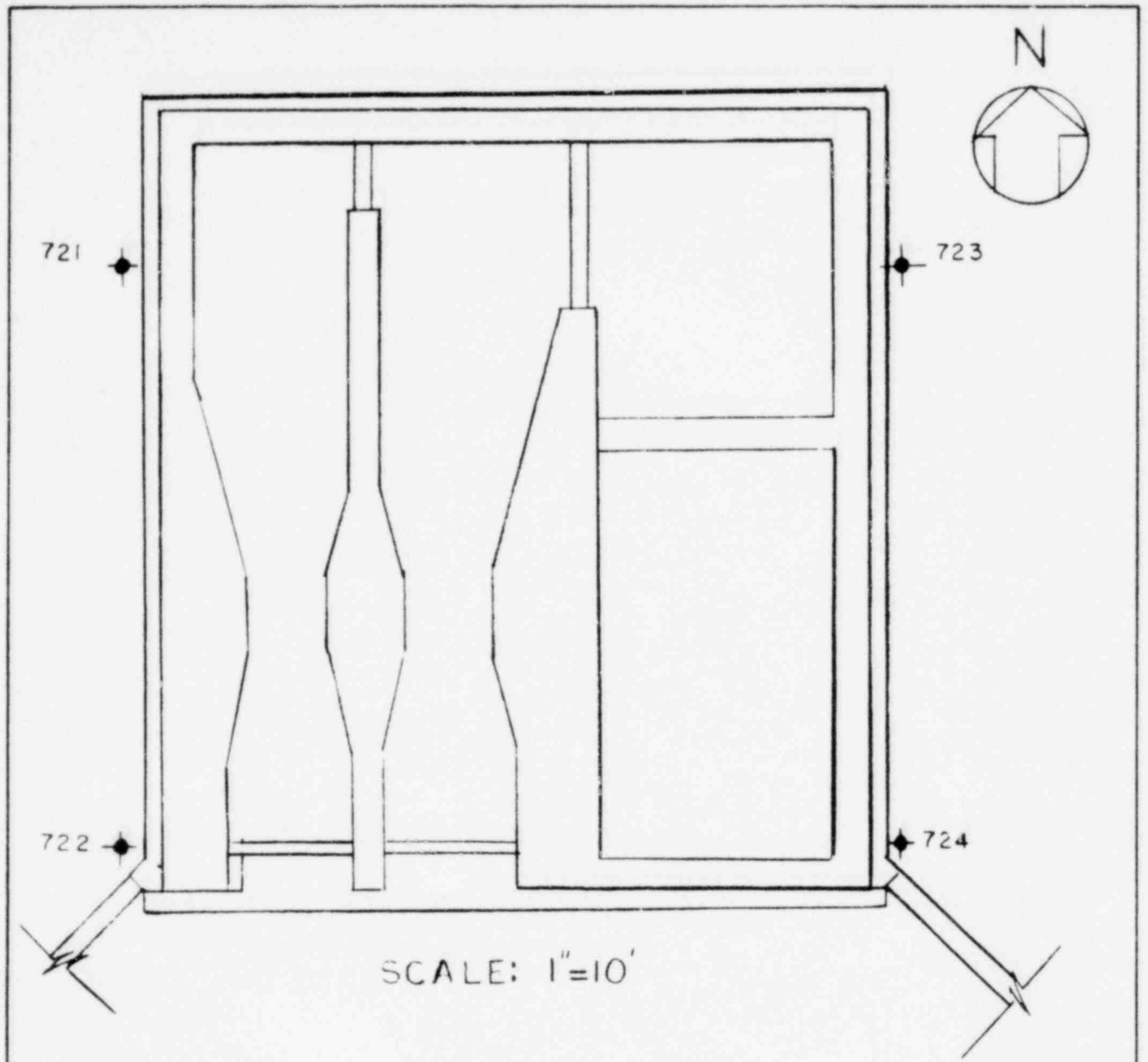
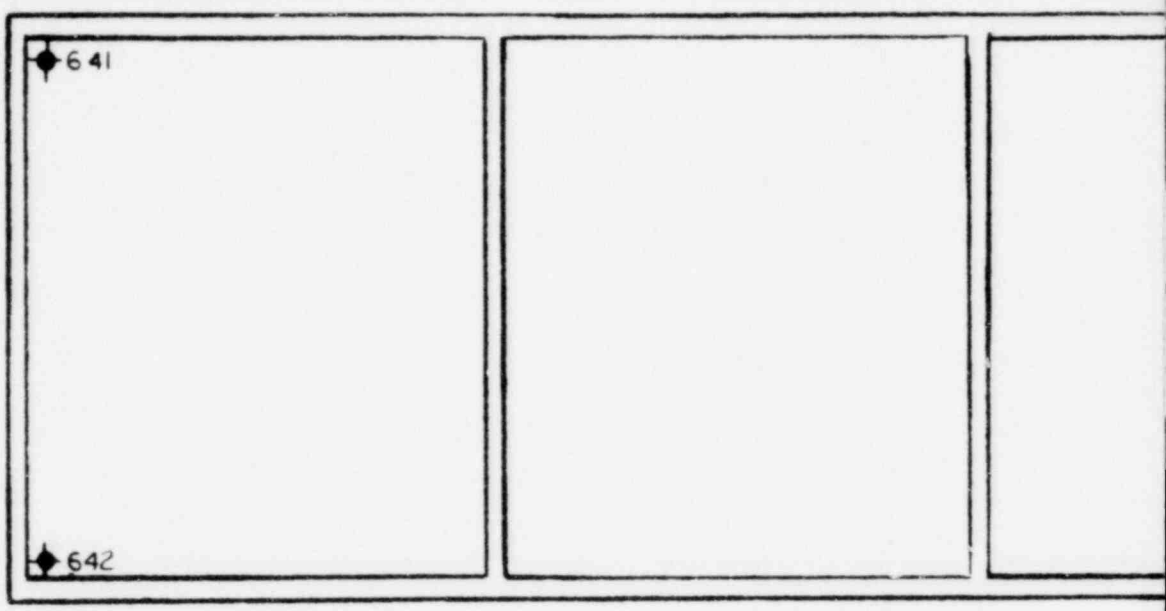


FIGURE 19

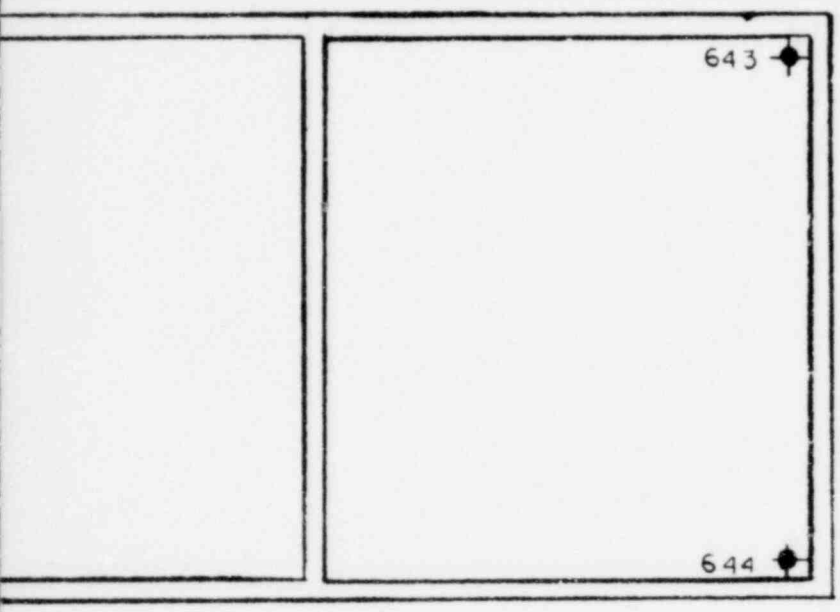
SERVICE WATER PUMP HOUSE
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979



SCALE 1"=

PLAN EL 27



20'
0.0'

FIGURE 20
DIESEL GENERATOR BUILDING
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979

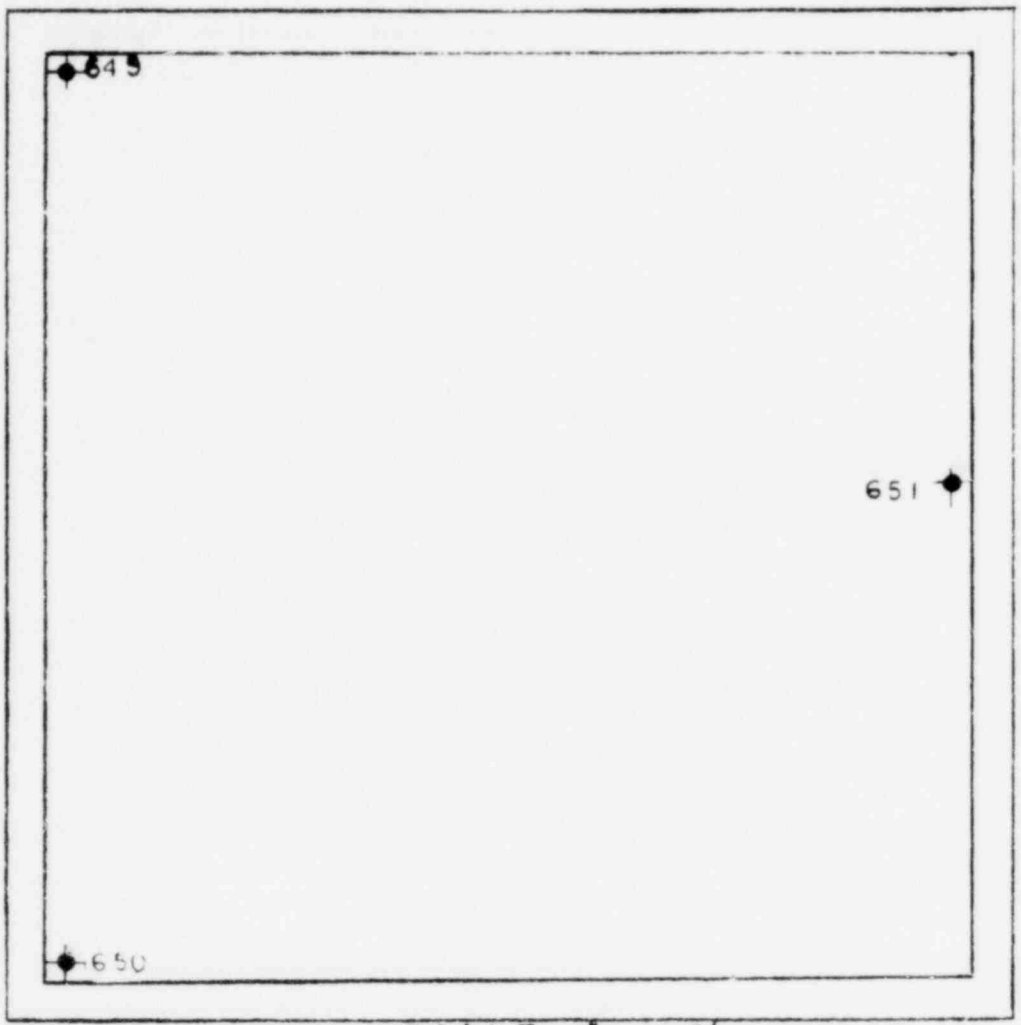
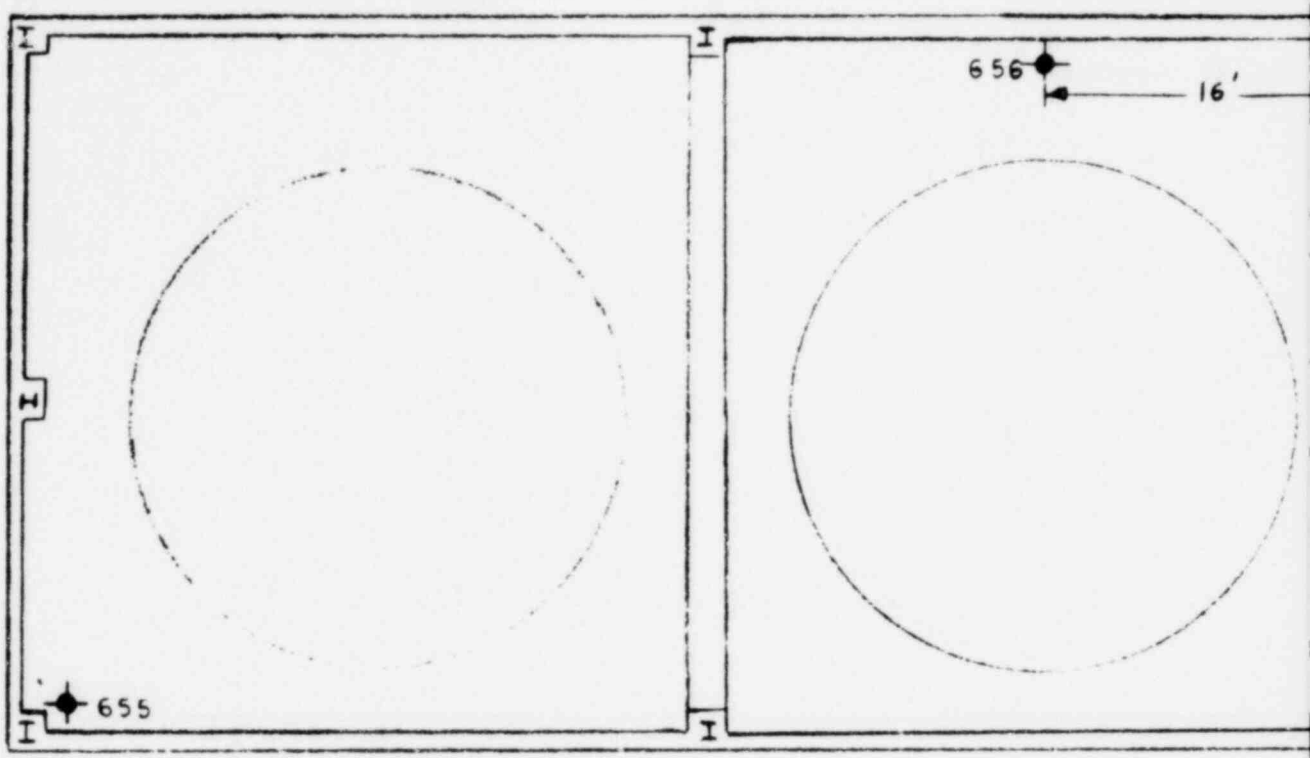


FIGURE 21

PERSONNEL FACILITIES BLDG
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979



PLAN EL 271.5

SCALE 1"= 10'

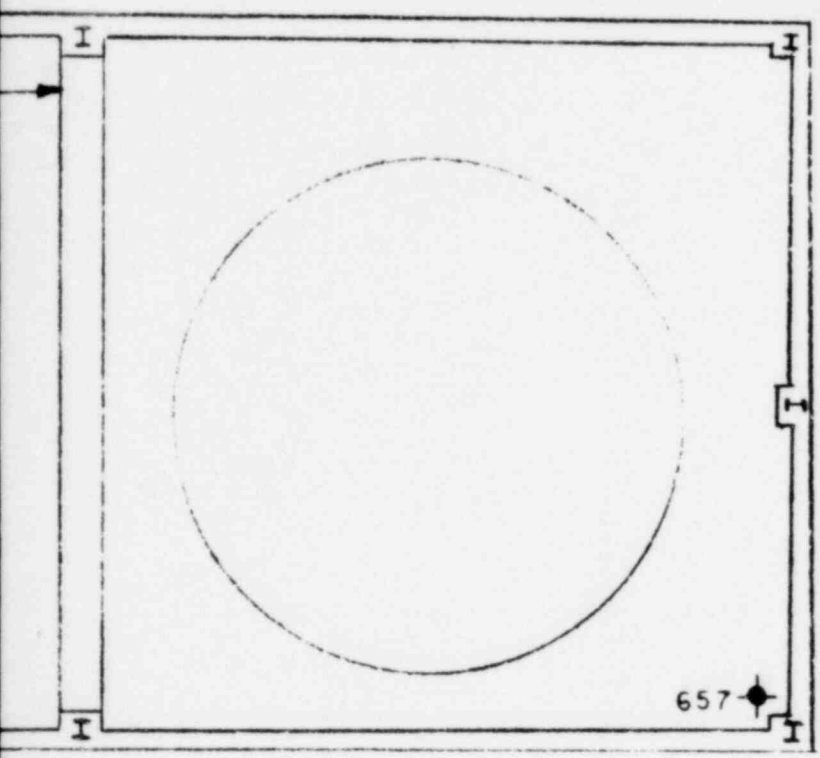
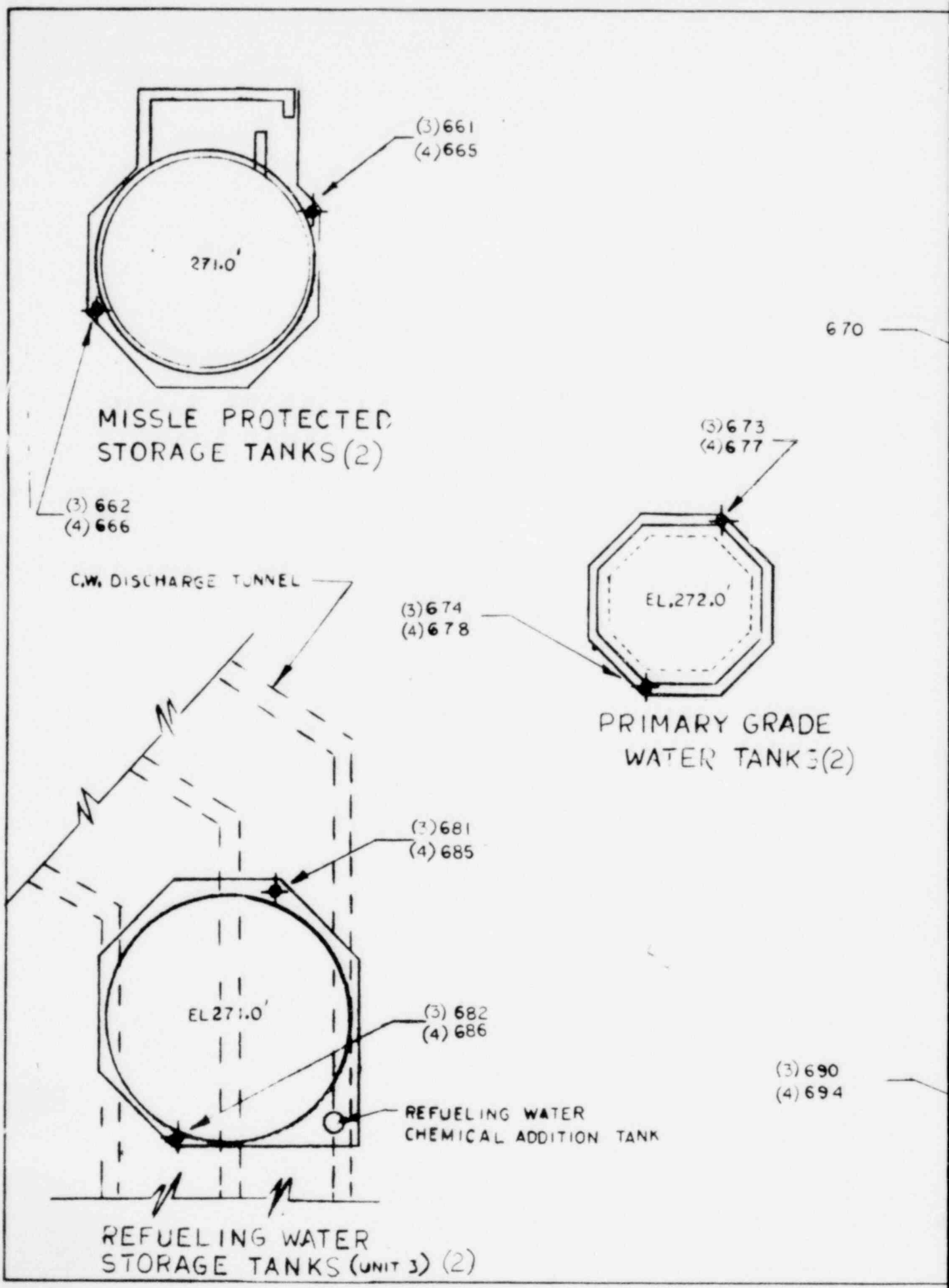
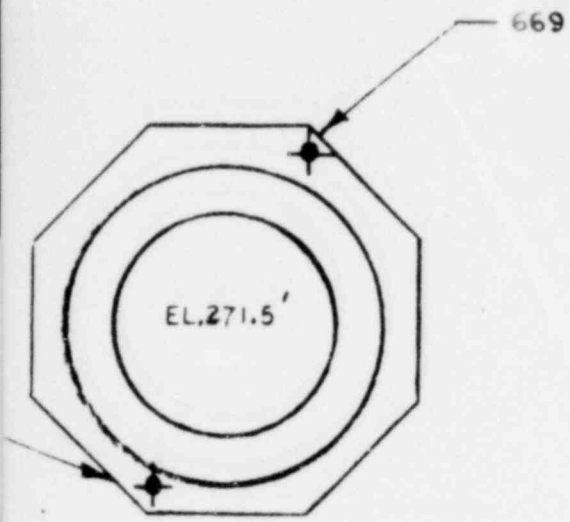


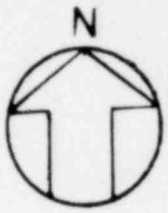
FIGURE 22

BORON RECOVERY TANKS
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


(3)661
(4)665
271.0'
MISSLE PROTECTED
STORAGE TANKS (2)
(3) 662
(4) 666
670
(3)673
(4)677
EL.272.0'
(3)674
(4)678
PRIMARY GRADE
WATER TANKS (2)
C.W. DISCHARGE TUNNEL
(3)681
(4)685
EL 271.0'
(3) 682
(4) 686
(3)690
(4)694
REFUELING WATER
CHEMICAL ADDITION TANK
REFUELING WATER
STORAGE TANKS (UNIT 3) (2)



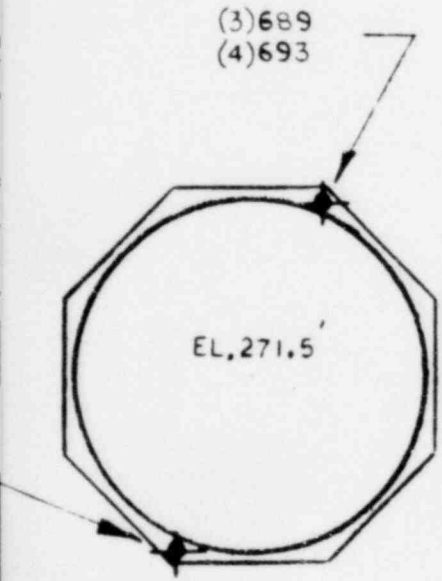
DEMINERALIZED WATER
STORAGE TANK



NOTES.

1. TANKS (2) - INDICATES TWO TANKS
2. (3) 690-INDICATES SETTLEMENT POINT 690, UNIT 3
3. (4) 693-INDICATES SETTLEMENT POINT 693, UNIT 4

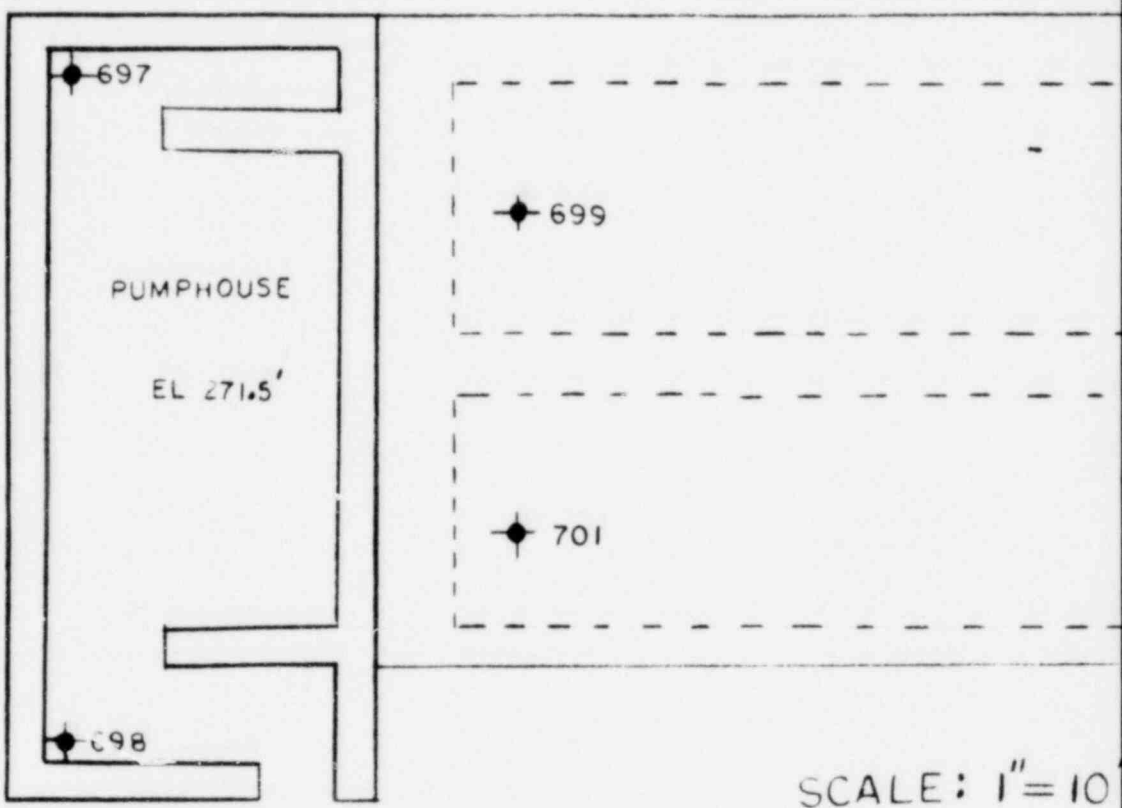
SCALE 1" = 20'

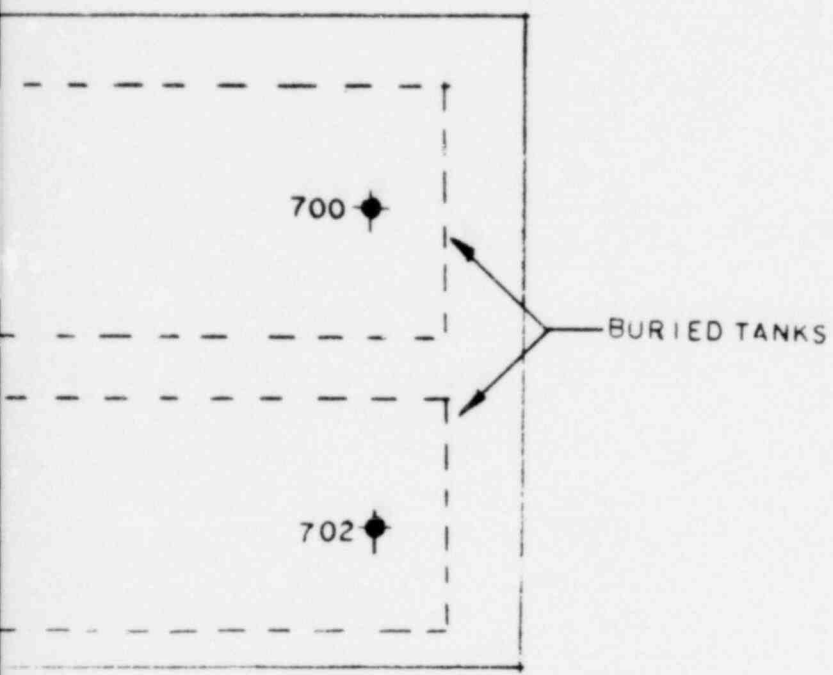


CONDENSATE SURGE
TANKS (2)

FIGURE 23

YARD TANK FOUNDATIONS
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


697
699
PUMPHOUSE
EL 271.5'
701
698
SCALE: 1"=10

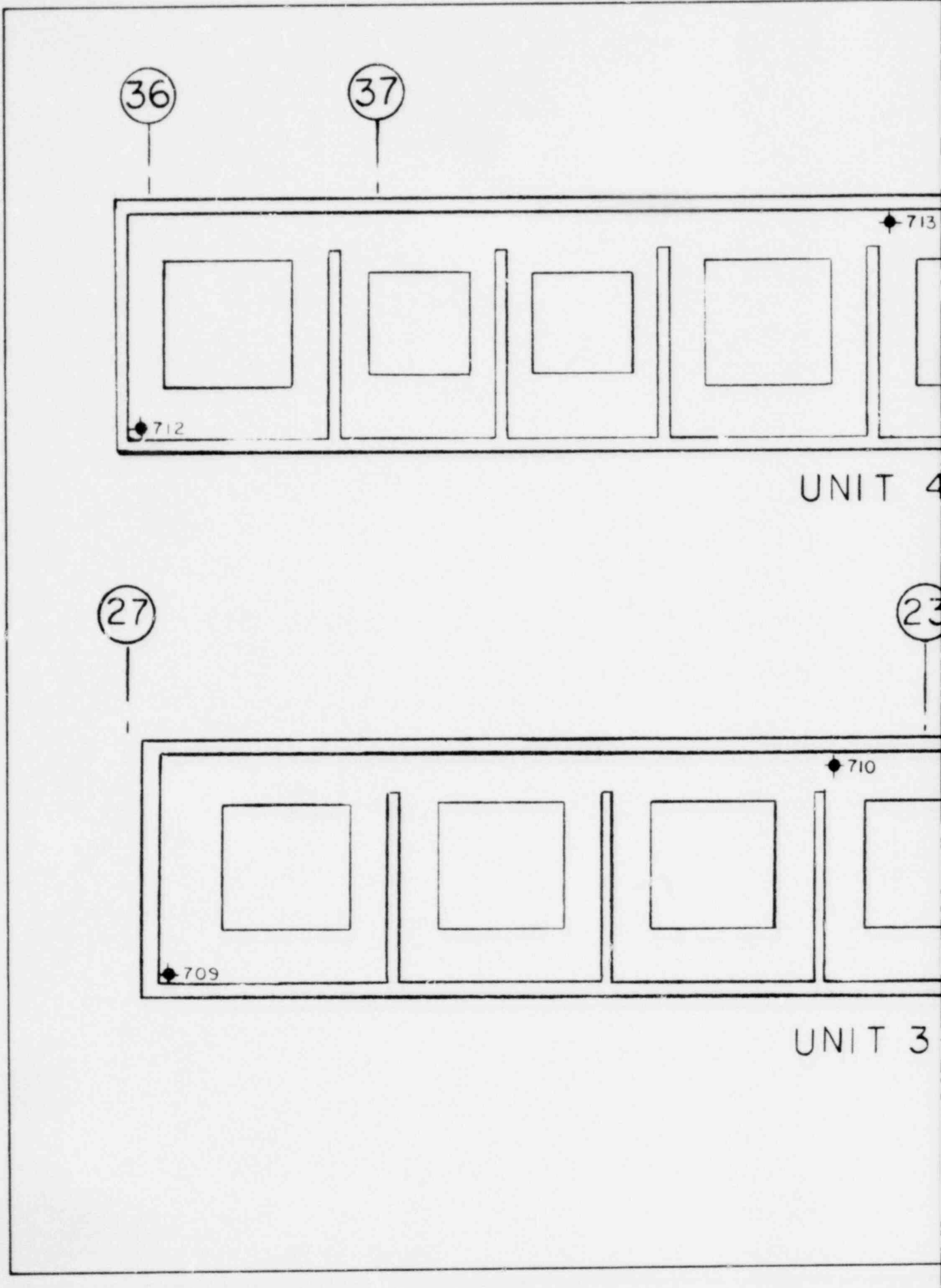


NOTE.

– BOTTOM OF TANK EXC–
AVATION EL.253.0'

FIGURE 24

FUEL OIL TANKS AND PUMP HOUSE
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979


36
37
713
712
UNIT 4
27
23
710
709
UNIT 3

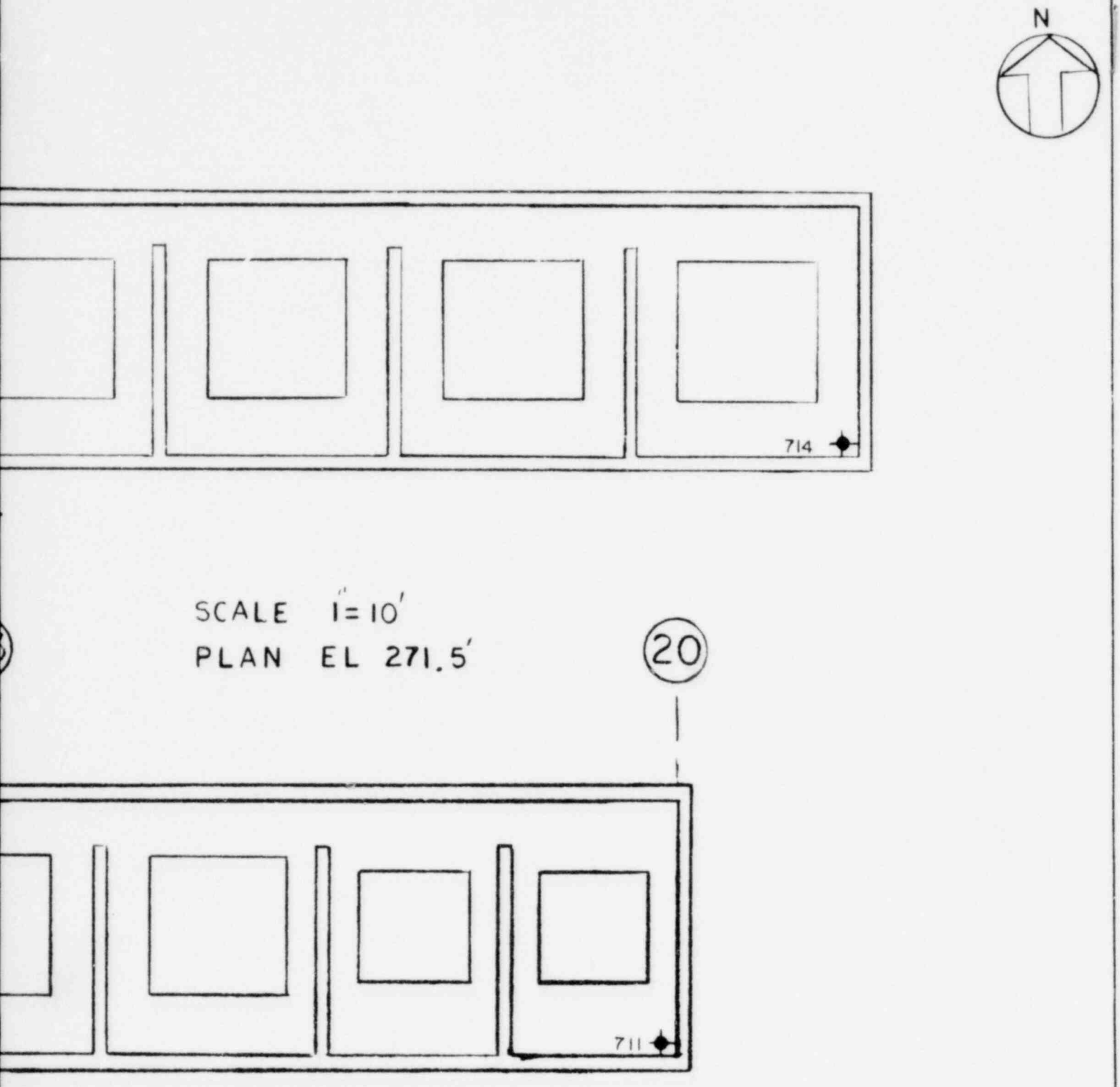


FIGURE 25
TRANSFORMER AREA
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979

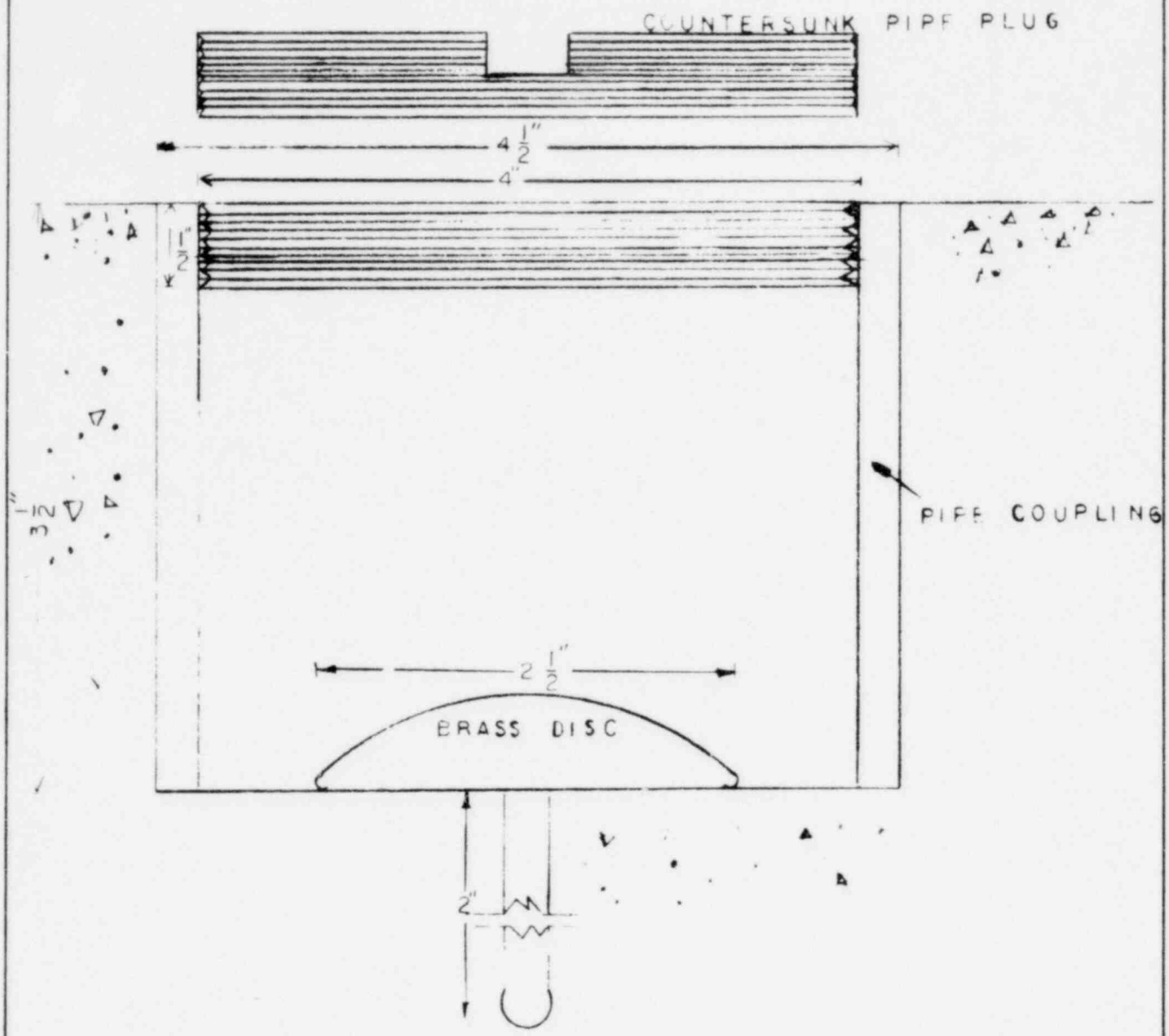
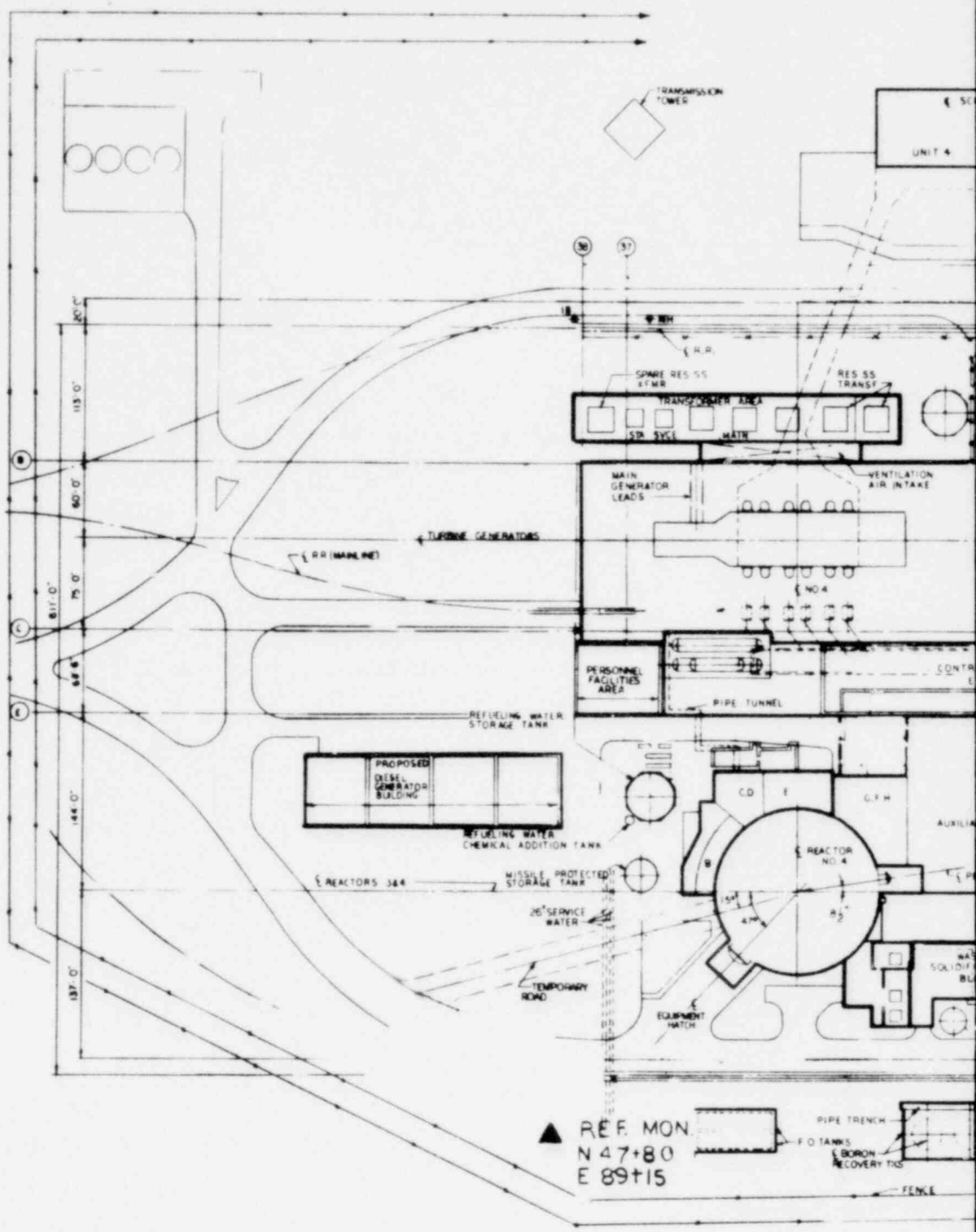


FIGURE 26
TYPICAL SETTLEMENT
MONITORING POINT
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4
FEB 1, 1979


TRANSMISSION TOWER
UNIT 4
SPARE RES 5S XFMR
RES 5S TRANSF
TRANSFORMER AREA
STA SYSE
MAIN
MAIN GENERATOR LEADS
VENTILATION AIR INTAKE
TURBINE GENERATORS
RR (MAINLINE)
NO 4
PERSONNEL FACILITIES AREA
PIPE TUNNEL
REFUELING WATER STORAGE TANK
PROPOSED DIESEL GENERATOR BUILDING
REFUELING WATER CHEMICAL ADDITION TANK
REACTOR NO 4
REACTORS 3&4
MISSILE PROTECTED STORAGE TANK
26" SERVICE WATER
TEMPORARY ROAD
EQUIPMENT HATCH
REF. MON.
N 47+80
E 89+15
PIPE TRENCH
F.O. TANKS
BORON RECOVERY TKS
FENCE
115'-0"
80'-0"
75'-0"
144'-0"
137'-0"

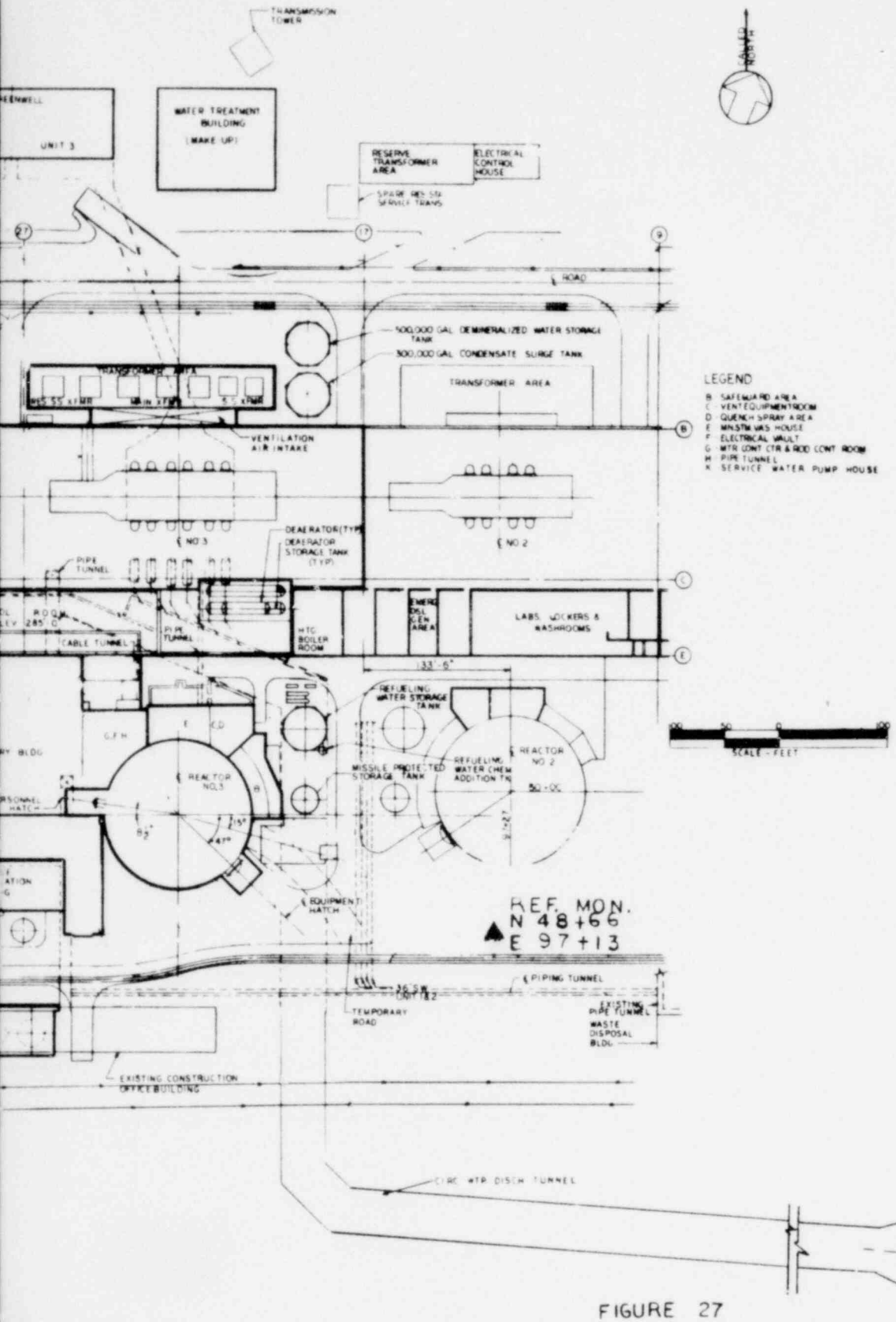
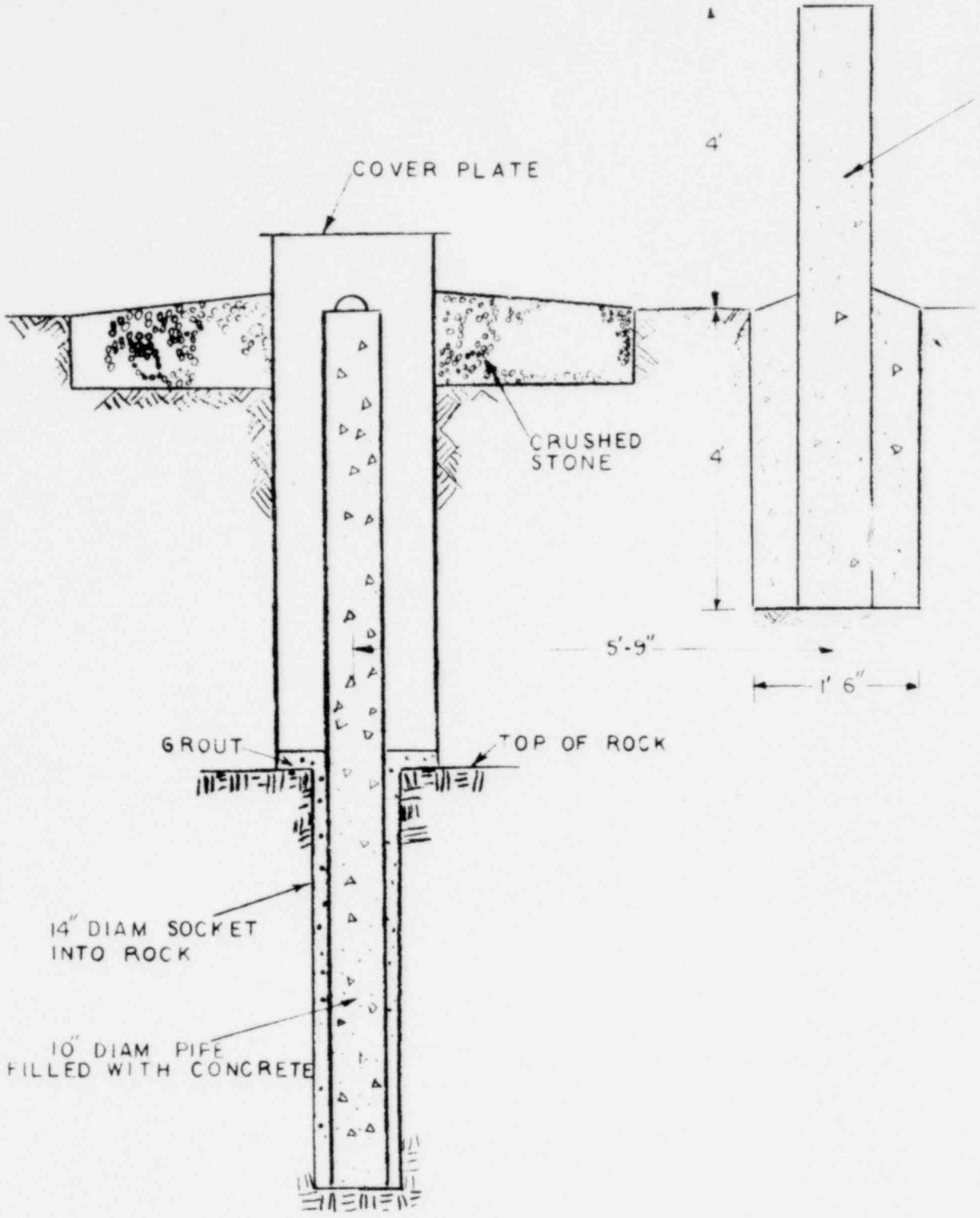


FIGURE 27

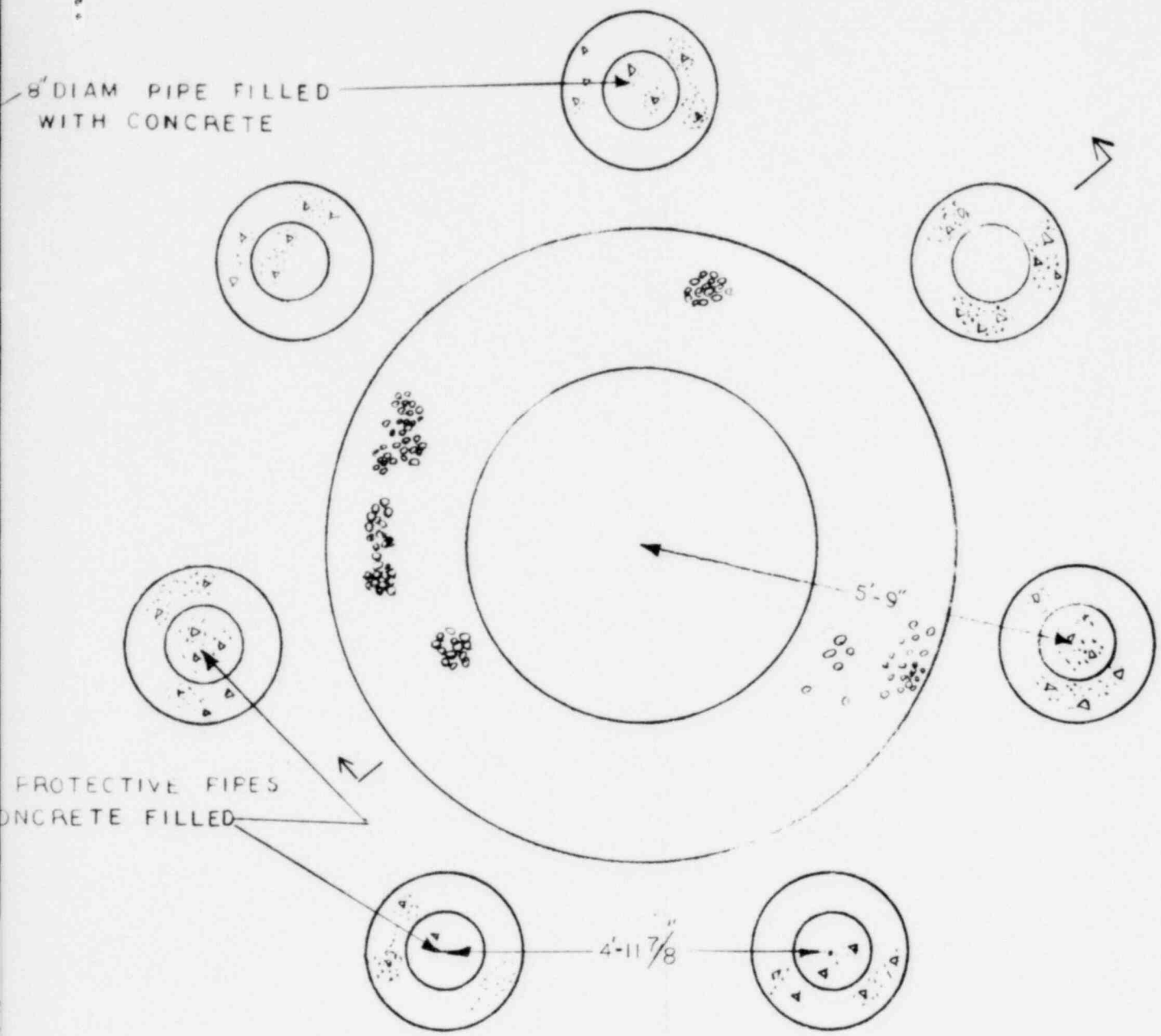
LOCATION PLAN OF PERMANENT REFERENCE MONUMENTS

SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4

FEB 1, 1979


COVER PLATE
CRUSHED STONE
4'
4'
5'-9"
1' 6"
GROUT
TOP OF ROCK
14" DIAM SOCKET INTO ROCK
10" DIAM PIPE FILLED WITH CONCRETE

SECTION



PLAN

FIGURE 28

PERMANENT REFERENCE MONUMENT
SETTLEMENT MONITORING PROGRAM
NORTH ANNA UNITS 3 AND 4 FEB 1, 1979

FIGURE 29 - FEB 1, 1979

VIRGINIA ELECTRIC AND POWER CO.
NORTH ANNA POWER STATION – UNITS 3 & 4

ELEVATIONS OF SETTLEMENT MONITORING POINTS

STRUCTURE: _____

DATE	POINT No.	POINT No.	POINT No.	POINT No.	POINT No.	POINT No.

REMARKS _____

TABLE I: PRELIMINARY LOCATIONS AND DESIGNATION OF SETTLEMENT MONITORING POINTS

Structure	Safety Category	No. of Points Per Structure	Points I.D. No.	Figure Reference No.
Reactor Containments (both Units)	I	4	500-503 508-511	Figure 3
Main Steam Valve House - Unit 3	I	4	516-519	Figure 4
Quench Spray Building - Unit 3	I	1	524	Figure 4
Safeguards Area - Unit 3	I	4	526-529	Figure 4
Quench Spray Building - Unit 4	I	1	534	Figure 5
Main Steam Valve House - Unit 4	I	4	536-539	Figure 5
Safeguards Area - Unit 4	I	4	544-547	Figure 5
Auxiliary Building	I	3	552-554	Figure 6
Fuel Building	I	3	560-562	Figure 7
New Fuel Loading Building	II	2	566-567	Figure 7
Decontamination Building	I	4	570-573	Figure 8
Waste Solidification Building	III	3	578-580	Figure 9
Service Building	I	6	584-589	Figures 10, 11
Turbine Building (both units)	II, III	4	596-599 608-611	Figures 12, 13
Water Treatment Building	II, III	4	620-623	Figure 14
Intake Structure	I	6	629-634	Figure 15

TABLE I: PRELIMINARY LOCATIONS AND DESIGNATION OF SETTLEMENT MONITORING POINTS

Structure	Safety Category	No. of Points Per Structure	Points I.D. No.	Figure Reference No.
Circulating Water Intake Tunnels	II, III	18	I-101 - I-118	Figure 16
Circulating Water Discharge Tunnels	I, II	19	D-2 - D-33	Figures 17, 18
Service Water Pump House	I	4	721-724	Figure 19
Diesel Generator Building	I	4	641-644	Figure 20
Personnel Facilities Building	II, III	3	649-651	Figure 21
Boron Recovery Tanks	I	3	655-657	Figure 22
Missile Protected Storage Tanks	I	2	661-662 665-666	Figure 23
Demineralized Water Storage Tank	I	2	669-670	Figure 23
Primary Grade Water Tanks	I	2	673-674 677-678	Figure 23
Refueling Water Storage Tanks	I	2	681-682 685-686	Figure 23
Condensate Surge Tanks	I	2	689-690 693-694	Figure 23
Fuel Oil Tanks and Pump House	I	6	697-702	Figure 24
Transformer Area (both units)	III	3	709-711 712-714	Figure 25

TABLE II: PRELIMINARY SKELETAL PLAN OF TECHNICAL SPECIFICATIONS FOR ALLOWABLE SETTLEMENT

System Identification	Settlement Monitoring Point	Structure	Settlement Monitoring Point	Structure	Settlement Technical Specification for Allowable Differential Settlement	
					Limiting Value	75 Percent of Limiting Value

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification		Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
A. Unit 3 Penetrations			
Main Steam	MS		
Penetration No. 1		33	Main Steam Valve House to Reactor Containment
Penetration No. 2		33	Main Steam Valve House to Reactor Containment
Penetration No. 3		33	Main Steam Valve House to Reactor Containment
Penetration No. 4		33	Main Steam Valve House to Reactor Containment
Feedwater	FW		
Penetration No. 5		18	Main Steam Valve House to Reactor Containment
Penetration No. 6		18	Main Steam Valve House to Reactor Containment
Steam Drain	SD		
Penetration No. 7		6	Auxiliary Building to Reactor Containment
Penetration No. 8		6	Auxiliary Building to Reactor Containment
Service Air	SA		
Penetration No. 53		2	Auxiliary Building to Reactor Containment
Condenser Air Removal	AR		
Penetration No. 58		12	Main Steam Valve House to Reactor Containment
Auxiliary Feedwater	AF		
Penetration No. 120		6	Main Steam Valve House to Reactor Containment
Penetration No. 121		6	Main Steam Valve House to Reactor Containment
Penetration No. 122		6	Main Steam Valve House to Reactor Containment
Penetration No. 123		6	Main Steam Valve House to Reactor Containment
Penetration No. 124		6	Main Steam Valve House to Reactor Containment
Penetration No. 125		6	Main Steam Valve House to Reactor Containment

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification		Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
B. Unit 3 Sleeves and Pipes			
Sleeve No.	Pipe No.		
1	MS 25	32	Main Steam Valve House to Service Building
2	MS 4	32	Main Steam Valve House to Service Building
3	MS 3	32	Main Steam Valve House to Service Building
4	MS 26	32	Main Steam Valve House to Service Building
23	FW 51	18	Main Steam Valve House to Service Building
24	FW 52	18	Main Steam Valve House to Service Building
41	AF 3	8	Main Steam Valve House to Buried Line
42	AF 2	8	Main Steam Valve House to Buried Line
43	AF 21	2	Main Steam Valve House to Buried Line
44	AF 31	2	Main Steam Valve House to Buried Line
C. Unit 4 Penetrations			
Main Steam	MS		
Penetration No. 1		33	Main Steam Valve House to Reactor Containment
Penetration No. 2		33	Main Steam Valve House to Reactor Containment
Penetration No. 3		33	Main Steam Valve House to Reactor Containment
Penetration No. 4		33	Main Steam Valve House to Reactor Containment
Feedwater	FW		
Penetration No. 5		18	Main Steam Valve House to Reactor Containment
Penetration No. 6		18	Main Steam Valve House to Reactor Containment
Steam Drain	SD		
Penetration No. 7		6	Auxiliary Building to Reactor Containment
Penetration No. 8		6	Auxiliary Building to Reactor Containment
Service Air	SA		
Penetration No. 53		12	Main Steam Valve House to Reactor Containment
Condenser Air Removal	AR		
Penetration No. 58		12	Main Steam Valve House to Reactor Containment
Auxiliary Feedwater	AF		
Penetration No. 120		6	Main Steam Valve House to Reactor Containment
Penetration No. 121		6	Main Steam Valve House to Reactor Containment
Penetration No. 122		6	Main Steam Valve House to Reactor Containment
Penetration No. 123		6	Main Steam Valve House to Reactor Containment

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification	Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
Penetration No. 124	6	Main Steam Valve House to Reactor Containment
Penetration No. 125	6	Main Steam Valve House to Reactor Containment
D. Unit 4 Sleeves and Pipes		
Sleeve No. / Pipe No.		
1 MS 1025	32 1/4	Main Steam Valve House to Service Building
2 MS 1004	32 1/4	Main Steam Valve House to Service Building
3 MS 1003	32 1/4	Main Steam Valve House to Service Building
4 MS 1026	32 1/4	Main Steam Valve House to Service Building
21 FW 1052	18	Main Steam Valve House to Service Building
23 FW 1051	18	Main Steam Valve House to Service Building
41 AF 1003	8	Main Steam Valve House to Buried Line
42 AF 1002	8	Main Steam Valve House to Buried Line
43 AF 1021	2	Main Steam Valve House to Buried Line
44 AF 1031	2	Main Steam Valve House to Buried Line
50 AF 1061	12	Main Steam Valve House to Buried Line
Pipe No.		
AF 1061	12	Buried Line to Tank Vert
AF 1003	8	Buried Line to Tank Vert
AF 1002	8	Buried Line to Tank Vert
AF 1021	2	Buried Line to Tank Vert
AF 1031	2	Buried Line to Tank Vert
E. Piping to Containment Penetrations (1)		
25-IE 1 1/2-RC-111-153-2	1 1/2	Auxiliary Building to Reactor Containment
25-IE 1 1/2-RC-1163-153-2	1 1/2	Auxiliary Building to Reactor Containment
25-IE 2 1/2-RC-80-153-3	2 1/2	Auxiliary Building to Reactor Containment
25-IE 2 1/2-RC-1162-153-3	2 1/2	Auxiliary Building to Reactor Containment
26-1A2-MU-18-1502-1	2	Auxiliary Building to Reactor Containment
26-1A2-MU-18-1018-1502-1	2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-233-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-234-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-235-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-236-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-243-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-244-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-246-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-248-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1M 2 MU-265-1502-2	2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-1233-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-1234-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-1235-1502-1	2 1/2	Auxiliary Building to Reactor Containment
26-1K 2 1/2-MU-1236-1502-1	2 1/2	Auxiliary Building to Reactor Containment

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification	Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
26-1L 1 1/2-MU-1223-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-1224-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-1225-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1L 1 1/2-MU-1226-1502-1	1 1/2	Auxiliary Building to Reactor Containment
26-1M 2-MU-1265-1502-2	2	Auxiliary Building to Reactor Containment
27-1A 1-CF-21-602-2A	1	Auxiliary Building to Reactor Containment
27-1B 1-CF-22-602-2B	1	Auxiliary Building to Reactor Containment
27-1B 1-CF-33-602-2X	1	Auxiliary Building to Reactor Containment
27-1A 1-CF-1021-602-2	1	Auxiliary Building to Reactor Containment
27-1B 1-CF-1022-602-2	1	Auxiliary Building to Reactor Containment
27-1B 1-CF-1033-602-2	1	Auxiliary Building to Reactor Containment
28-1A 12-DH-17-602-2	12	Auxiliary Building to Reactor Containment
28-1C 10-DH-50-1502-2A	10	Auxiliary Building to Reactor Containment
28-1C 10-DH-51-1502-2B	10	Auxiliary Building to Reactor Containment
28-1C 2-DH-32-1502-2X	2	Auxiliary Building to Reactor Containment
28-1A 12-DH-1017-602-2	12	Auxiliary Building to Reactor Containment
28-1C 10-DH-1050-1502	10	Auxiliary Building to Reactor Containment
28-1C 10-DH-1052-1502	10	Auxiliary Building to Reactor Containment
28-1C 2-DH-1032-1502-2	2	Auxiliary Building to Reactor Containment
31-1A 12-RS-1-153-2	12	Auxiliary Building to Reactor Containment
31-1A 12-RS-2-153-2	12	Auxiliary Building to Reactor Containment
31-1B 12-RS-3-153-2	12	Auxiliary Building to Reactor Containment
31-1B 12-RS-4-153-2	12	Auxiliary Building to Reactor Containment
31-1C 10-RS-9-153-2A	10	Auxiliary Building to Reactor Containment
31-1C 10-RS-10-153-2A	10	Auxiliary Building to Reactor Containment
31-1C 10-RS-11-153-2A	10	Auxiliary Building to Reactor Containment
31-1C 10-RS-12-153-2A	10	Auxiliary Building to Reactor Containment
31-1C 8-QS-3-153-2B	8	Auxiliary Building to Reactor Containment
31-1C 8-QS-4-153-2B	8	Auxiliary Building to Reactor Containment
31-31D 10-QA-20-153-2	10	Auxiliary Building to Reactor Containment
31-31D 10-QA-1-153-2	10	Auxiliary Building to Reactor Containment
31-31D 10-QS-2-153-2	10	Auxiliary Building to Reactor Containment
31-31D 18-QS-19-153-2	18	Auxiliary Building to Reactor Containment
31-31-1A 12-RS-1001-153-2	12	Auxiliary Building to Reactor Containment
31-31-1A 12-RS-1002-153-2	12	Auxiliary Building to Reactor Containment
31-31-1B 12-RS-1003-153-2	12	Auxiliary Building to Reactor Containment
31-31-1B 12-RS-1004-153-2	12	Auxiliary Building to Reactor Containment
31-31-1C 10-RS-1009-153-2	10	Auxiliary Building to Reactor Containment
31-31-1C 10-RS-1010-153-2	10	Auxiliary Building to Reactor Containment
31-31-1C 10-RS-1011-153-2	10	Auxiliary Building to Reactor Containment
31-31-1C 10-RS-1012-153-2	10	Auxiliary Building to Reactor Containment
31-31-1C 8-QS-1003-153-2	8	Auxiliary Building to Reactor Containment
31-31-1C 8-QS-1004-153-2	8	Auxiliary Building to Reactor Containment
31-31C 10-QS-1020-153-2	10	Auxiliary Building to Reactor Containment
31-31C 10-QS-1001-153-2	10	Auxiliary Building to Reactor Containment
31-31C 10-QS-1002-153-2	10	Auxiliary Building to Reactor Containment
31-31C 18-QS-1019-153-2	18	Auxiliary Building to Reactor Containment
25-1B 2 VA-21-153-2	2	Auxiliary Building to Reactor Containment
35-1D 1 1/2-DA-18-153-2	1 1/2	Auxiliary Building to Reactor Containment
35-1A 2-VA-1021-153-2	2	Auxiliary Building to Reactor Containment

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification	Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
35-1C 1 1/2-DA-1018-153-2	1 1/2	Auxiliary Building to Reactor Containment
35-2D 4-DG-15-153-2	4	Auxiliary Building to Reactor Containment
35-2D 4-DG-1015-153-2	4	Auxiliary Building to Reactor Containment
36-3 2-HC-3-151-2	2	Auxiliary Building to Reactor Containment
36-3 2-HC-4-151-2	2	Auxiliary Building to Reactor Containment
12181-36-3-2HC-1003-151-2	2	Auxiliary Building to Reactor Containment
12181-36-3-2HC-1004-151-2	2	Auxiliary Building to Reactor Containment
37-1B 8-RP-42-153-2	8	Auxiliary Building to Reactor Containment
37-1B 8-RP-43-153-2	8	Auxiliary Building to Reactor Containment
37-3 Fuel XFR-Tube	Later	Auxiliary Building to Reactor Containment
38-1D 2-PF-320-153-2	2	Auxiliary Building to Reactor Containment
38-1D 2-PG-420-153-2	2	Auxiliary Building to Reactor Containment
39-1C 6-CC-187-151-2	6	Auxiliary Building to Reactor Containment
39-1C 6-CC-157-151-2	6	Auxiliary Building to Reactor Containment
39-1D 6-CC-217-151-2	6	Auxiliary Building to Reactor Containment
39-1D 6-CC-161-151-2	6	Auxiliary Building to Reactor Containment
39-1E 6-CC-259-151-2	6	Auxiliary Building to Reactor Containment
39-1E 6-CC-258-151-2	6	Auxiliary Building to Reactor Containment
39-1E 3-CC-387-151-2	6	Auxiliary Building to Reactor Containment
39-1E 3-CC-388-151-2	6	Auxiliary Building to Reactor Containment
39-1J 6-CC-307-151-2	6	Auxiliary Building to Reactor Containment
39-1J 6-CC-277-151-2	6	Auxiliary Building to Reactor Containment
39-1K 6-CC-339-151-2	6	Auxiliary Building to Reactor Containment
39-1K 6-CC-281-151-2	6	Auxiliary Building to Reactor Containment
39-1L 6-CC-351-151-2	6	Auxiliary Building to Reactor Containment
39-1L 6-CC-342-151-2	6	Auxiliary Building to Reactor Containment
39-1L 3-CC-390-151-2	3	Auxiliary Building to Reactor Containment
39-1L 3-C-391-151-2	3	Auxiliary Building to Reactor Containment
39-3 3RD-27-153-2	3	Auxiliary Building to Reactor Containment
39-3 3-RD-22-153-2	3	Auxiliary Building to Reactor Containment
12181-39-3 3-RD-1027-153-2	3	Auxiliary Building to Reactor Containment
12181-39-3 3-RD-1022-153-2	3	Auxiliary Building to Reactor Containment
41-1B 3/8-SS-16-N9-1	3/8	Auxiliary Building to Reactor Containment
41-1B 3/8-SS-20-N9-1	3/8	Auxiliary Building to Reactor Containment
41-1B 3/8-SS-1016-N9-1	3/8	Auxiliary Building to Reactor Containment
41-1B 3/8-SS-1021-N9-1	3/8	Auxiliary Building to Reactor Containment
41-2 1-CM-3-153-2	1	Auxiliary Building to Reactor Containment
41-2 1-CM-7-153-2	1	Auxiliary Building to Reactor Containment
41-2 1-CM-1003-153-2	1	Auxiliary Building to Reactor Containment
41-2 1-CM-1007-153-2	1	Auxiliary Building to Reactor Containment
42-1T 10-SW-6-151-3	0	Auxiliary Building to Reactor Containment
42-1V 6-SW-31-151-3	6	Auxiliary Building to Reactor Containment
42-1V 6-SW-32-151-3	6	Auxiliary Building to Reactor Containment
42-1V 6-SW-33-151-3	6	Auxiliary Building to Reactor Containment
42-1V 6-SW-34-151-3	6	Auxiliary Building to Reactor Containment
42-1V 2A-SW-1-151-3A	24	Auxiliary Building to Reactor Containment
42-1V 2A-SW-2-151-3A	24	Auxiliary Building to Reactor Containment
43-1B 3/4-GN-26-153-2	3/4	Auxiliary Building to Reactor Containment
43-1B 3/4-GN-40-153-2	3/4	Auxiliary Building to Reactor Containment

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification	Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
F. Fuel Oil Piping		
3-EG-1-151-3	3	Oil Pump Room to Tank 1A
3-EG-2-151-3	3	Oil Pump Room to Tank 1B
3-EG-57-151-3	3	Oil Pump Room to Tank 1A
3-EG-58-151-3	3	Buried Tank to Tank 1B
3-EG-4-151-3	3	Foundation Wall Penetration to Oil Pump Room
3-EG-5-151-3	3	Foundation Wall Penetration to Oil Pump Room
1 1/2-EG-9-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-12-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-15-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-18-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-24-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-27-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-31-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-34-151-3	1 1/2	Oil Pump Room to Buried Line Below Grade
1 1/2-EG-9-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-12-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-15-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-18-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-24-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-27-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-31-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
1 1/2-EG-34-151-3	1 1/2	Buried Line Below Grade to Diesel Generator Building
2-EG-92-151-3	2	Diesel Generator Building to Connections Determined Later
2-EG-94-151-3	2	Diesel Generator Building to Connections Determined Later
2-EG-96-151-3	2	Diesel Generator Building to Connections Determined Later
2-EG-96-151-3	2	Diesel Generator Building to Connections Determined Later
2-EG-98-151-3	2	Diesel Generator Building to Connections Determined Later
G. Electrical Ducts		
Ducts through E line wall	Later	Service Building to Fuel Oil Pump House, to Service Water Pump House, to Diesel Generator Building
Ducts in service building floor slab	Later	Service Building to Fuel Oil Pump House, to Service Water Pump House, to Diesel Generator Building
Ducts through E line wall	Later	Service Building to Vacuum Priming Pump House
Ducts through service building floor slab	Later	Service Building to Intake Structure Through Turbine Area

TABLE III: PRELIMINARY PIPELINE AND DUCT LINE IDENTIFICATION

System Identification	Cross-Sectional Dimensions (In)	Structure-to-Structure Connections
Ducts through C line wall	Later	Service Building to Turbine Area to Intake Structure
Ducts in floor slab	Later	Service Building to Turbine Area to Turbine Building
Ducts through intake structure wall	Later	Service Building to Intake Structure
Ducts through water treatment wall	Later	Service Building to Water Treatment Building
Ducts through vacuum priming pump house wall	Later	Service Building to Vacuum Priming Pump House
Duct through fuel oil pump house wall	Later	Service Building to Fuel Oil Pump House
Duct through service building wall	Later	Service Building to Water Treatment Building
Ducts through B line wall	Later	Turbine Building to Transformer
Ducts through B line wall	Later	Turbine Building to Intake Structure
Ducts through B line wall	Later	Turbine Building to Switchyard
Ducts through B line wall	Later	Turbine Building to Water Treatment Building
Diesel generator building mat extension	Later	Diesel Generator Building to Service Building
H. Electrical Conduit		
N.I.R.P.S	Later	Service Building to Auxiliary Building
N.I.R.P.S.		Auxiliary Building to Reactor Containment
Later	Later	Service Building to Auxiliary Building
Later		Auxiliary Building to Main Steam Valve House
Later		Main Steam Valve House to Safeguards Area