Northern Indiana Public Service Company
General Offices / 5265 Hohman Avenue / Hammond, Indiana 46325 / Tel.: 853-5200 (219)

EUGENE M. SHORB
FIRST VICE PRESIDENT

August 14, 1979

Mr. Dominic B. Vassallo, Acting Director
Division of Project Management
Office of Nuclear Reactor Regulations
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Northern Indiana Public Service Company
Bailly Generating Station - Nuclear 1
Docket No. 50-367

Dear Mr. Vassallo:

Your letter to NIPSCO dated June 28, 1979, requested additional information in support of the Bailly piling proposal with regard to the following three areas: (1) an acceptable proposal for correcting the preconstruction areas; (2) selection of representative production piles for load testing; and (3) a sheeting and bracing plan to minimize pile disturbance adjacent to the deeper excavation planned for the reactor building.

Our letter to you dated June 29, 1979, delineated the reports and responses that have been previously submitted on this subject matter and also transmitted "Supplementary Information, Clarifications, and Alternatives to the Foundation Pile Design", which provided additional information relating to items (1) and (2) above.

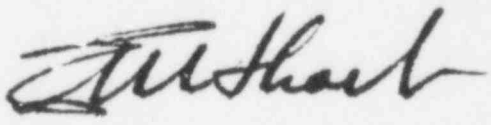
Our responses to your requests for information are completed in the attached brief report titled "Response to NRC Requests for Information of June 28, 1979." As you will note, items (1), (2) and (3) are covered under the portions titled "Program for Densification of Preconstruction Areas", "Production Pile Load Testing" and "Category I Building Excavation and Pile Driving Sequence" respectively. We believe that we have satisfactorily addressed each of your stated concerns.

In addition, as suggested in the last paragraph of your letter, we have given careful consideration to the thoughts expressed in your letter and can assure you that the Bailly safety-related piles will be designed, tested, and

installed in accordance with high construction industry standards. We remain confident that the three reports which we have submitted on the shorter piles proposal are well documented and thoroughly justified. Since the reports were submitted over some months while refinements were being made in response to NRC questions and suggestions, we are now reviewing the documents and will advise you promptly of any modifications needed to conform each of the reports fully to the current detailed pile proposal.

We have now provided all of the requested information and would appreciate early completion of your review so that we may resume installation of the piles.

Very truly yours,



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Attachment

RESPONSE TO NRC REQUESTS FOR INFORMATION OF JUNE 28, 1979

1.0 PROGRAM FOR DENSIFICATION OF PRECONSTRUCTION AREAS

1.1 Introduction

As describe in Chapter 2 of the report entitled "Supplementary Information on Driven H-Pile Foundations" Bailly Generating Station Nuclear -1, dated December 4, 1978, (Reference 1), there are five small areas, identified in Figure 1-1, within the limits of the Category I structures where the subsoils were disturbed by a variety of preconstruction activities. These activities consisted of pile jetting, preaugering and pile extraction. The primary effect of the preconstruction activities was the loosening of the soils in each of these areas. These activities were described in detail in the following two reports:

a) "Pile Testing Analyses - Bailly Generating Station - Nuclear 1", report SL-3109, dated September 6, 1974, submitted to the NRC on September 13, 1974.

b) "Analyses of Pile Driving Tests - Bailly Generating Station - Nuclear 1", report SL-3205, dated September 15, 1975, submitted to the NRC on July 14, 1978.

In addition, Chapter 2 of Reference 1 presented a brief summary of these preconstruction activities. In particular, Figures 2-2, 2-6, 2-9, 2-12 and 2-15 reproduced herein as Figures 1-2 to 1-6 identify the sources of disturbance within each area.

Northern Indiana Public Service Company (NIPSCO) developed a remedial program to densify the soils within these five small areas. The program was described in Reference 1. On the basis of the June 28, 1979 letter from the Nuclear Regulatory Commission (NRC) and the meetings with the Advisory Committee on Reactor Safeguards (ACRS), certain aspects of the densification program have been revised. The revised densification program is presented below in two parts. The first part describes the general concepts of the densification program while the second part presents the detailed densification program.

1.2 General Description of the Densification Program

Development of the densification program required identification of the primary source(s) of disturbance within each area of preconstruction activity and the depth and lateral extent of disturbance around the source(s). This has been accomplished by:

a) Review of all the available records of the preconstruction activities.

b) Review of the driving characteristics of the indicator piles driven within and adjacent to the preconstruction areas.

c) Review of the results of soil borings drilled within and adjacent to the preconstruction areas.

On the basis of these reviews, the following program for densification in the preconstruction areas has been developed:

a) Additional information will be obtained concerning the condition of the disturbed soils before installation of the densification piles is begun. A number of additional borings will be drilled at selected locations within the preconstruction areas. These supplementary borings will be drilled to the glacial till and backfilled with grout. The data obtained will be used to evaluate the effectiveness of the densification program by comparing the penetration resistances in the borings with those obtained in verification borings described in Item g below. If possible, the cone penetrometer will be utilized to provide supplementary information on soil conditions.*/

*/ The ACRS suggested that a cone penetrometer, commonly referred to as a Dutch cone, should be used as an additional exploration and verification device. The cone penetrometer has not previously been used at the Bailly site; its usefulness was considered doubtful because it may not be able to penetrate more than a few feet into the dense interbedded deposit in undisturbed areas. Explorations were conducted using the Standard Penetration Test (SPT), evaluating density on the (continued)...)

b) The densification and control piles will be closed-end pipes, 10-inch nominal diameter, approximately 7/8 inch wall thickness. They will be driven with a Vulcan 016, single-acting steam hammer with a rated energy of 48,750 ft-lbs., or equivalent.

c) One or two pipe piles will be driven outside the limits of each area of disturbance as control pipe piles. The objective of this is to obtain information on the driving characteristics of the pipe piles in undisturbed areas. The driving characteristics of these control piles will then be compared with the driving characteristics of the densification piles as explained in Item f below. The control piles will be driven five feet below the maximum depth of disturbance in each area, or to refusal, defined as 25 blows per inch (BPI) on the basis of wave equation analyses, whichever occurs first.

*/ (continuation of footnote from page 1-3)
basis of resistances obtained at vertical intervals of 2 1/2 feet. Use of the SPT has the advantage of yielding samples, which provide positive identification of soil types, as well as penetration resistance information. However, the cone penetrometer cannot produce samples. Therefore, when it is used, soil types can only be determined indirectly through correlations and empirical charts relating friction ratio and cone point resistance. Furthermore, these empirical correlations and charts are limited in application; use of the cone requires site-specific correlations before data can be interpreted correctly. As explained in paragraph 1.3.5 with reference to Area E, we will attempt to develop site-specific correlations at the beginning of the densification program. If that effort is successful, the cone penetrometer will then be used to supplement the SPT in evaluation of the densification program.

d) Once the control pipe piles have been driven, densification pipe piles will be driven at or adjacent to each identified source of disturbance, i.e., extracted piles, preaugered holes, unbackfilled boreholes, and jetted piles. These piles will be driven five feet below the identified depth of disturbance, or to bedrock, whichever occurs first.

e) Following this, four additional densification piles will be driven around the source of disturbance. These piles will be driven to the full depth of disturbance identified at the location, or until they reach refusal, defined as 25 BPI, whichever occurs first. This refusal value is based on wave equation analyses and is identified as the upper limit of efficient and effective driving with the hammer-pile system.

f) Upon completion of driving of the piles at and around the source of disturbance, the driving records will be examined and compared to the driving records of the control pipe piles. If, on the basis of this examination, the driving behavior of a given densification pile indicates that densification has been achieved, then further densification will be terminated around this pile. If the driving behavior of a given pile indicates

disturbance at that location, then additional densification piles will be driven around that particular pile in accordance with the example shown on Figure 1-7. These piles will be driven to penetrate the identified depth of disturbance or until they reach refusal, whichever occurs first. This procedure will be repeated until the driving records of densification piles indicate that densification has been achieved.

The above approach treats every densification pile as a penetration device. The driving record of the control piles serves as a means of calibration for this penetration device and will be used to interpret the driving behavior of each densification pile.

g) Upon completion of the driving of the densification piles within each area, a minimum of two verification borings will be drilled at selected locations within the limits of each preconstruction area. The locations of the verification borings will be within a few feet of the locations of borings drilled previously within the same area. These borings will be drilled to a depth of five feet below the identified depth of disturbance in the area or to bedrock, whichever occurs first, and will subsequently be backfilled with grout. If possible, the cone penetrometer will also be used as another means of independently evaluating the effectiveness of the densification program.

h) The pipe piles will be filled with concrete and cut-off a minimum of one foot below the elevation of the base of the mat.

i) Production piles will then be driven to satisfy the driving criteria.

It must be emphasized that these programs cannot be considered final or completely definitive for the following reasons:

1) There is no site specific experience relative to the drivability of pipe piles at Bailly.

2) The radial extent of the densification resulting from driving a single pipe pile is not known as yet for the specific soil conditions encountered at Bailly.

Therefore, it must be recognized that the program should have flexibility in terms of the spacing and the number of the densification piles. In addition, if it is not possible to drive the piles to the planned tip elevation with the Vulcan 016 hammer, a larger hammer will be utilized. Wave equation analyses confirm that a hammer with a rated energy of up to 90,000 ft.-lbs. can achieve penetration without damaging the piles.

If the planned pile tip elevation of the point source piles cannot be attained with the larger hammer, additional borings would be drilled to confirm the density of the soils underlying the piles. With these qualifications in mind, details of the densification plan are presented below.

1.3 Details of Densification Program

On the basis of the principles presented in the previous section, a detailed densification program has been developed for each of the five preconstruction areas (Figure 1-8 to 1-12).

The following sections provide details of some of the specific items of the densification programs which are unique to each area.

1.3.1 Preconstruction Area A (Figure 1-8)

a) One supplementary boring, SBA-1, will be drilled midway between the locations of two anchor piles (both of which were jetted to elevation -53).

b) Two control pipe piles will be driven. One is located close to boring PZA-1, which showed no disturbance, and the other is next to indicator pile RD-64, which met the driving criteria.

c) Two verification borings will be drilled close to borings PZA-2 and SBA-1 to evaluate the effectiveness of the densification program.

1.3.2 Preconstruction Area B (Figure 1-9)

a) Two supplementary borings will be drilled at the locations identifed as SBB-1 and SBB-2. They are close to two piles which were installed with the assistance of jetting and, therefore, soil disturbance is expected.

b) Two control pipe piles will be driven. One pile will be located close to boring PZB-1, which showed no disturbance. The other control pile will be located close to the indicator pile RB-510, which met the driving criteria.

c) Two verification borings will be drilled close to borings SBB-1 and SBB-2 to verify the effectiveness of the densification program.

1.3.3 Preconstruction Area C (Figure 1-10)

a) Two supplementary borings will be drilled at the locations identified as SBC-1 and SBC-2. They are located close to piles where jetting was most extensive.

b) One control pipe pile will be driven a few feet from boring PZC-2. This pile will be close enough to boring PZC-2 to develop a correlation with the undisturbed soils.

c) Two verification borings will be drilled close to borings SBC-1 and SBC-2 to verify the effectiveness of the densification program.

1.3.4 Preconstruction Area D (Figure 1-11)

As explained in detail in Reference 1, it is believed that disturbance in this area is minor if indeed, it exists at all and, therefore, no densification piles are presently planned within this area.

Although four piles were installed by jetting or jetting and preaugering, the results of borings PZD-1 and PZD-2A, drilled within 2 to 3 feet from the jetted piles, showed no signs of disturbance. According to the records of the preconstruction activities, three of the four piles were driven to penetrate 40 to 80 feet below the depth to which jetting or augering took place. It is believed that the vibrations caused by the driving of these piles redensified the sands which might have been loosened by jetting and/or augering. Two supplementary borings SBD-1 and SBD-2 will be drilled at the approximate locations shown in Figure 1-11 to verify the conclusion that

the soils in this area are very dense and, therefore, do not require further densification. If these borings indicate that densification is necessary, a densification program following the guidelines detailed in paragraph 1.2 will be initiated.

1.3.5 Preconstruction Area E (Figure 1-12)

a) No supplementary borings will be drilled in area E because a sufficient number of borings have already been drilled to define the disturbance in this area. However, as explained earlier, the cone penetrometer will be used in an effort to develop site-specific information as to the suitability of this device as an independent means of evaluating the effectiveness of the densification program.

The cone penetrometer will be used in this area primarily to calibrate the device for the soil conditions existing at the Bailly site. One sounding will be performed adjacent to each of the existing borings PZE-1 to PZE-4. As explained in Reference 1, borings PZE-1 to PZE-4 cover the range of soil conditions in the preconstruction areas from severe disturbance (PZE-4) to no disturbance (PZE-3). In addition, cone soundings will be taken within 2 feet of one or two of the jetted piles and in the area densified by the H-piles driven as part of the

densification effort presented in Chapter 2 of Reference 1. This experiment will determine the suitability of the cone penetrometer device and, in addition, will provide site-specific correlations for the soil conditions encountered at Bailly.

b) Two control pipe piles will be driven at the locations shown in Figure 1-12. The first pipe pile will be located near boring PZE-3, which showed no signs of disturbance. The second pipe pile will be driven next to pile SF-66, which met the driving criteria.

c) Additional densification piles will be driven north and west of the jetted piles, as shown in Figure 1-12, because of the disturbance identified in borings PZE-1 and PZE-2, and indicator pile SF-34.

d) Two verification borings will be drilled close to borings PZE-1 and PZE-2 to evaluate the effectiveness of the densification program.

REFERENCE 1

"Supplementary Information on Driven H-Pile Foundations" Bailly Generating Station Nuclear -1, Northern Indiana Public Service Company, dated December 4, 1978.

2. PRODUCTION PILE LOAD TESTING

During production pile driving operations, a minimum of ten additional compression pile load tests will be conducted in order to verify the load-carrying capacity and load-deformation characteristics of the piles. Four or five production piles will be tested in the preconstruction areas. The remainder of the production piles to be tested will be located within the more heavily loaded areas and will be selected based upon the following guidelines.

a. Three piles that penetrate more than 10 feet into the bearing stratum (Category B Piles).

b. One pile with a minimum total embedded length (for example, Southern Radwaste Building Production Piles).

c. One pile which exhibits driving behavior (penetration resistance) significantly different from that of adjacent piles.

The load test procedure will be in general accordance with ASTM D 1143-74, "Testing Piles Under Axial Compressive Load". The optional quick load test method will be used with the following exception: Upon reaching a test load of 400 tons, the load will be held on the pile for 24 hours and deflection readings taken. After 24 hours have elapsed, the test will continue and the load will be increased until pile failure or 600 tons, the jack capacity, is achieved.

3. CATEGORY I BUILDING EXCAVATION AND PILE DRIVING SEQUENCE

The final excavation levels for Category I structures will be as follows:

a. Reactor Building - Excavation El. - 6 ± 6 inches.

b. Radwaste Building - Excavation El. 0 ± 6 inches.

c. Auxiliary and Service Buildings - Excavation El. + 8 ± 6 inches.

These excavation levels are all within the lacustrine (beach) sand deposit. The transition from one level to another will consist of slopes cut in the sand at approximately 1.5 horizontal to 1 vertical. Slopes may be adjusted so that piles will be driven from a level surface.

Because of the excavation slopes, no sheeting and bracing from one building elevation to another is necessary or planned. Within each building, locally depressed areas, e.g., sumps and elevator pits, are present. Where vertical cuts are required, sheet piling will be used.

Because differing excavation levels occur within the main building complex, the potential exists for lateral movement of driven piles if, 1) adjacent slopes are excavated after these piles have been driven or, 2) piles adjacent to the top of the slope are driven first, followed by driving of piles away from the slope.

Concerns about lateral movements of production piles at the Bailly site are eliminated because of the following:

1) the excavation will be completed prior to driving production piles located adjacent to slopes and

2) the pile driving sequence is planned so that the pile driving operations will always progress towards the slope.

To demonstrate these procedures, the excavation and pile driving sequence for two areas has been detailed. (See attached plan view, Figure 3-1.) Brief descriptions of the sequence for each section follow.

SECTION A-A

Figure 3-2 presents a cross section in the east-west direction showing the slope configuration between the Service Building (final excavation level at elevation +8) and the Reactor Building (final excavation level at elevation -6). The sequence of excavation and pile driving operations is described below.

1. Excavate Reactor Building area to elevation -6. Leave temporary bench ("C") at elevation -1 to allow access for redrive of easternmost Service Building heaved piles (if any) and to drive piles identified as group "B".

2. Drive Service Building piles from El. +8 starting from the easternmost rows and moving west. The westernmost pile groups, labeled "B", will be driven last from bench "C" at elevation -1.

3. After the Service Building piles are driven and checked for heave (and all necessary redrive completed), remove bench "C" down to El. -6 ("D").

SECTION B-B

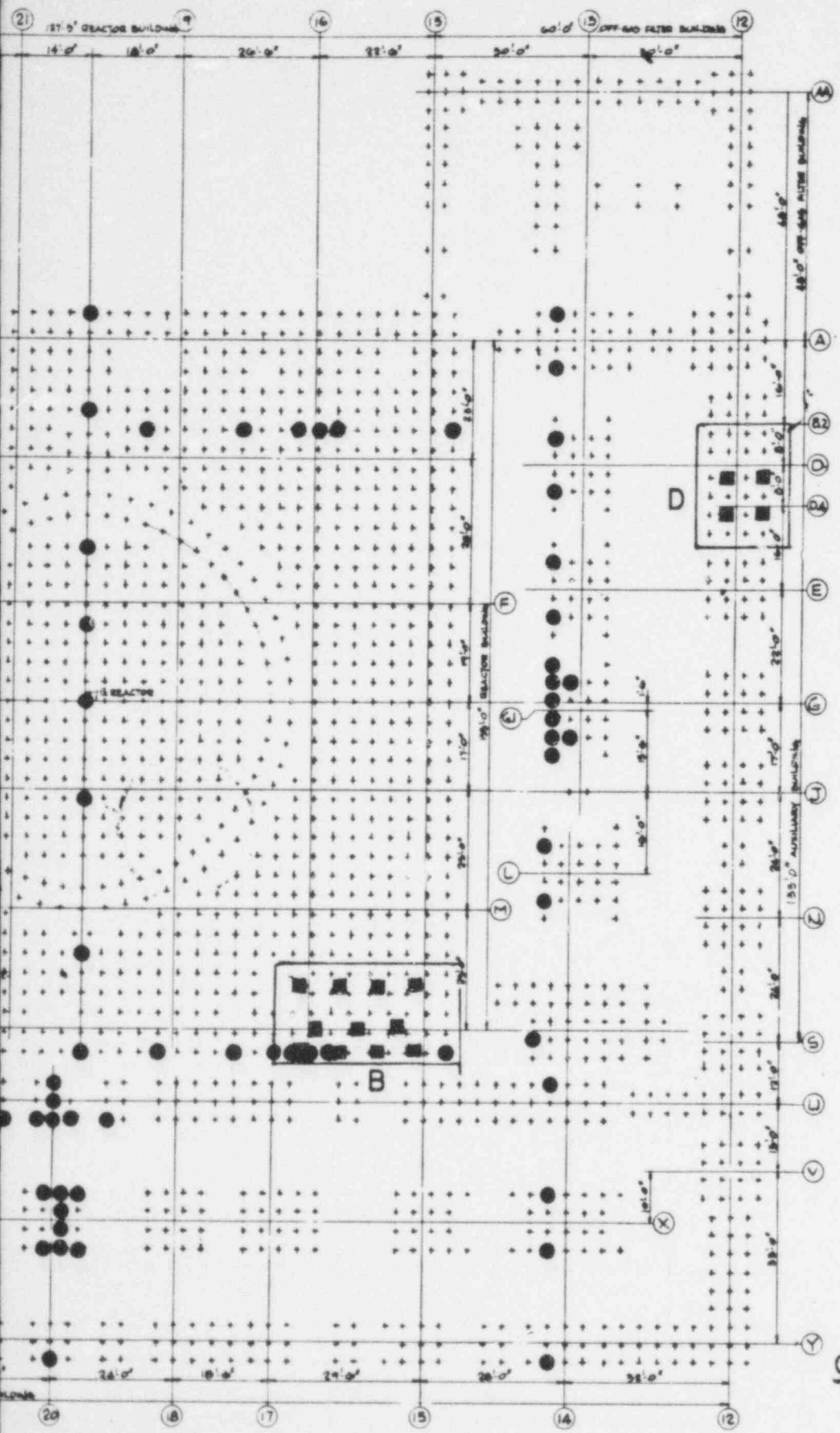
Figure 3-3 presents a cross section in the north-south direction showing the slope configuration between the Auxiliary Building (final excavation level at elevation +8) and the Reactor Building (final excavation level at elevation -6). The sequence of excavation and pile driving operations in this area is described below.

1. Excavate the Reactor Building area to elevation -6 ("B").

2. Drive Auxiliary Building H-piles starting from the east end of the building and working west as indicated by the arrows in Figure 3-1. It should be noted that the pile groups labeled "A", adjacent to the slope, will be driven last.

3. Drive Reactor Building H-piles ("C").

The differences in excavation levels between the Service-Radwaste and the Radwaste-Reactor Buildings are only 6 to 8 feet. Furthermore, there are no piles on these slopes. Nevertheless, excavation and pile driving sequences in these areas will be similar to those for the interfaces between Reactor-Service and Reactor-Auxiliary Buildings described above.



HAS BEEN REVISED TO
REFLECT SURVEYED
LOCATIONS OF IN-PLACE
PILES

POOR ORIGINAL

FIGURE 1-1

FIGURE 2-1
LOCATION PLAN
OF PRECONSTRUCTION AREAS

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

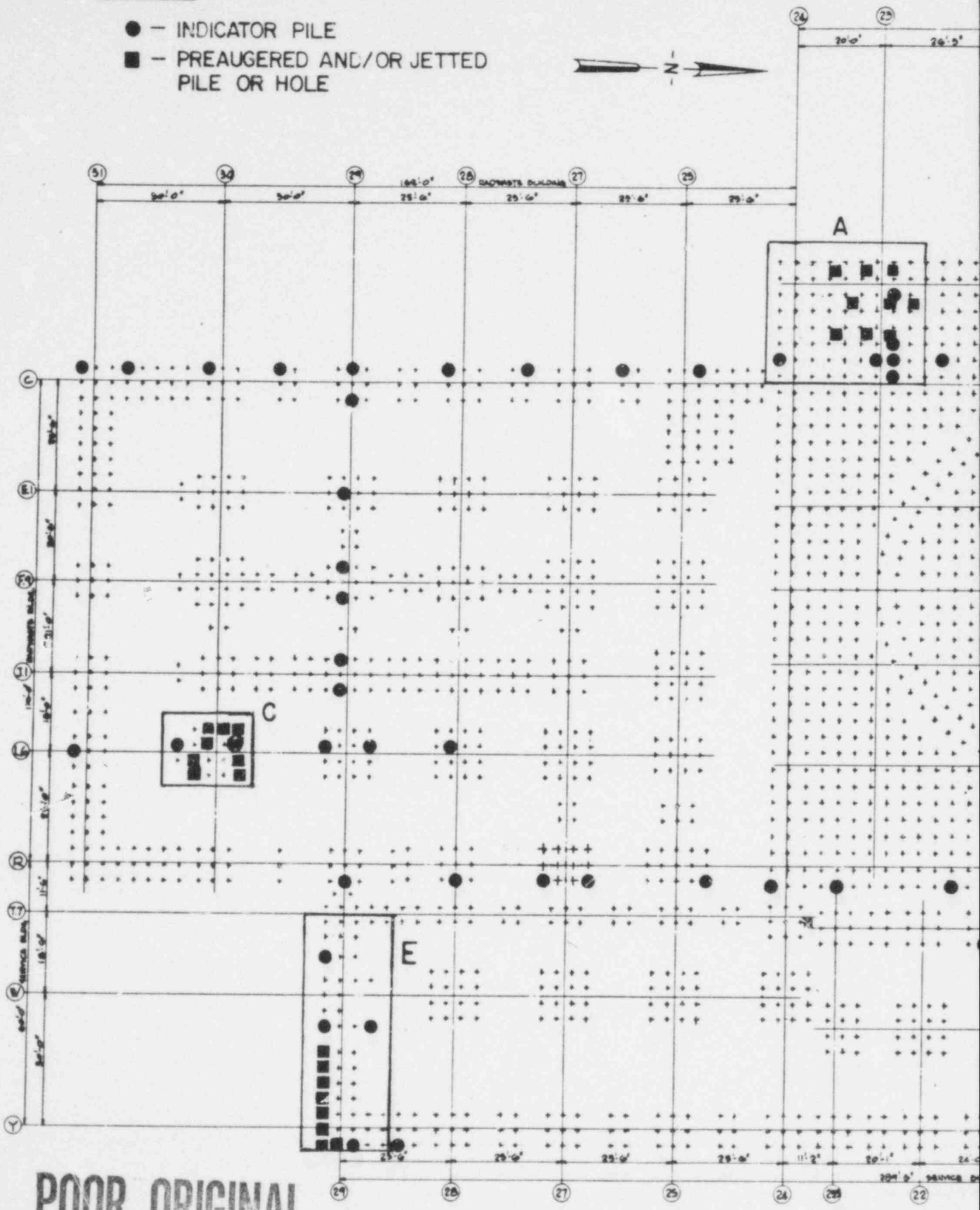
SARGENT & LUNDY
ENGINEERS

MENTARY INFORMATION ON DRIVEN
FOUNDATIONS," BAILLY GENERATING
NUCLEAR-1 NI SCO, DEC. 4, 1978

LEGEND:

● – INDICATOR PILE

■ – PREAUGERED AND/OR JETTED PILE OR HOLE



REF.

"SUPPLE
H-PILE
STATION

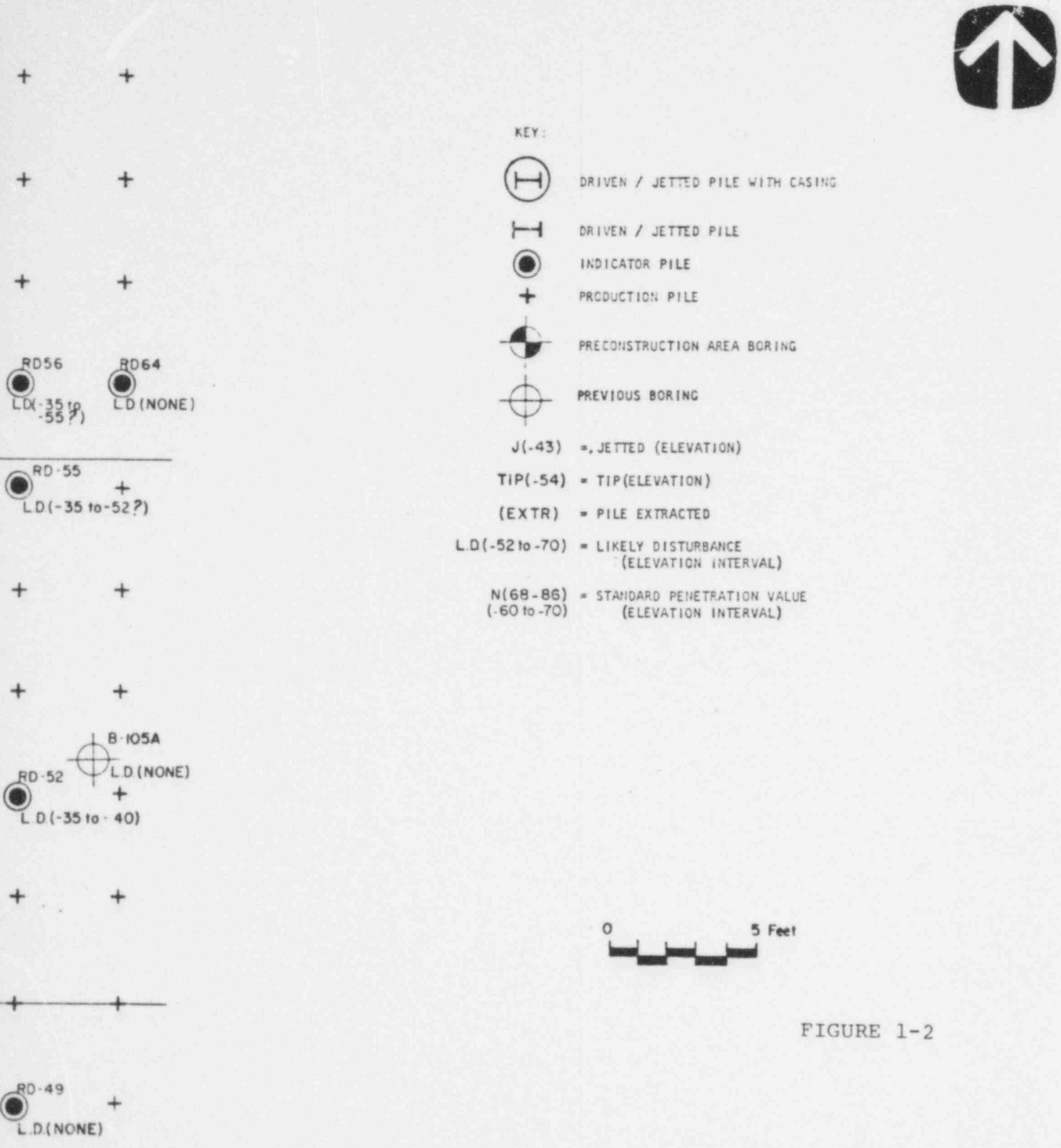


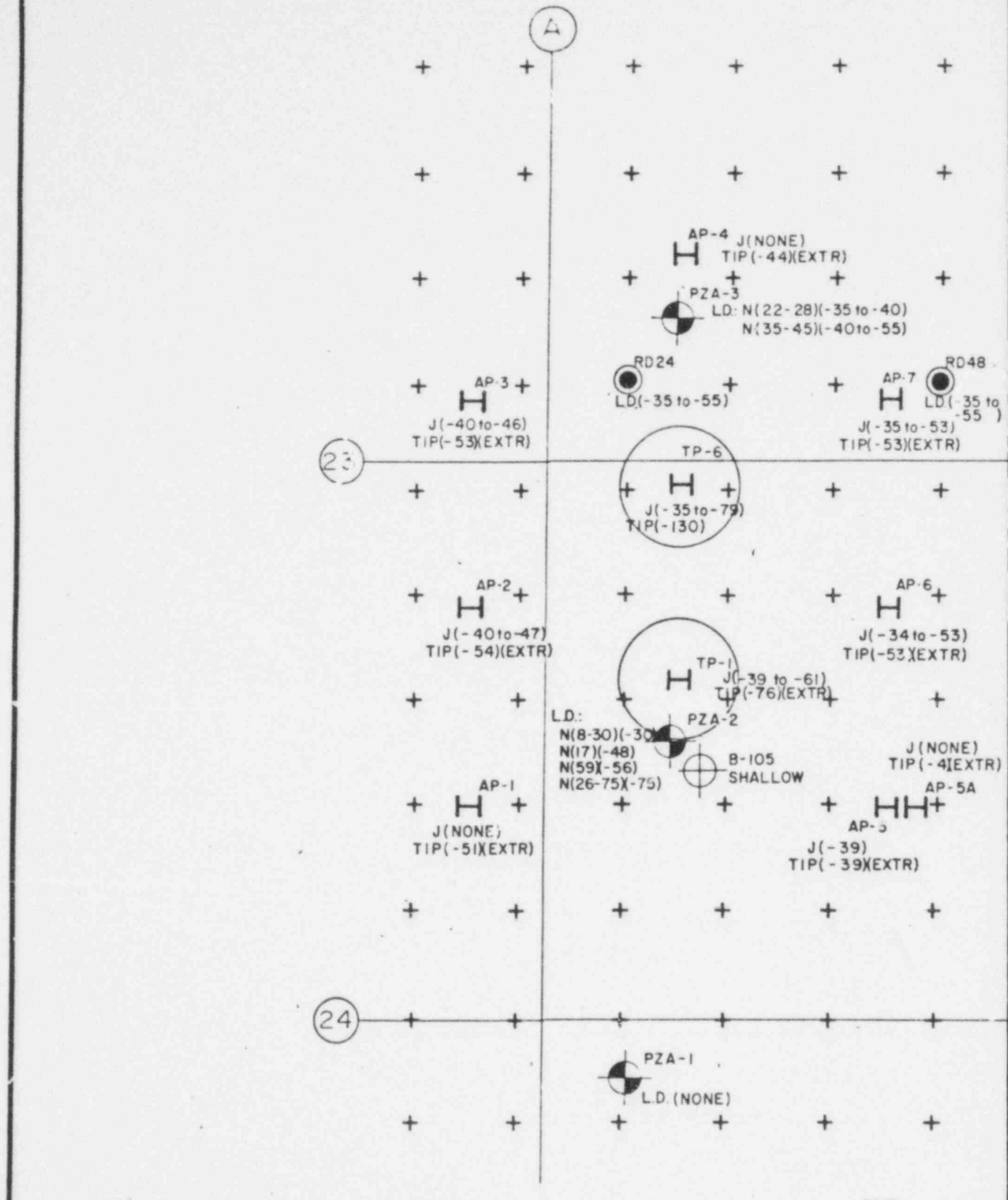
FIGURE 1-2

ARY INFORMATION ON DRIVEN
DATIONS," BAILLY GENERATING
LEAK-1 NIPSCO, DEC. 4, 1978

FIGURE 2-2
LOCATION PLAN
PRECONSTRUCTION AREA A

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE



REF.

"SUPPLEMENT
H-PILE FOUN
STATION NUC

KEY:

DRIVEN / JETTED PILE WITH CASING

DRIVEN / JETTED PILE

INDICATOR PILE

PRODUCTION PILE

PRECONSTRUCTION AREA BORING

PREVIOUS BORING

J(-43) = JETTED (ELEVATION)

TIP(-54) = TIP(ELEVATION)

(EXTR) = PILE EXTRACTED

L.D(-52 to -70) = LIKELY DISTURBANCE (ELEVATION INTERVAL)

N(68-86) (-60 to -70) = STANDARD PENETRATION VALUE (ELEVATION INTERVAL)

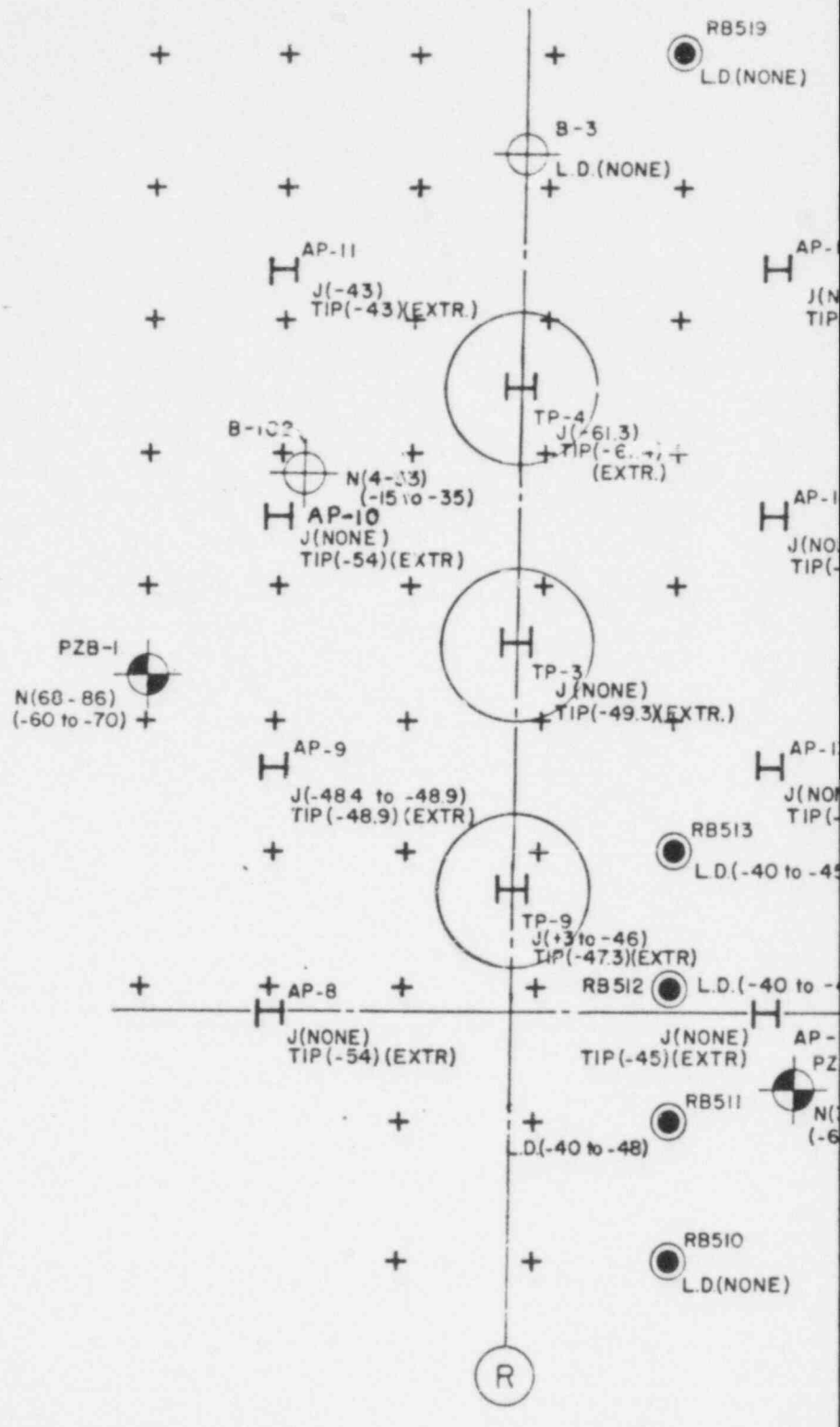
0 5 Feet

FIGURE 1-3

FIGURE 2-6
LOCATION PLAN
PRECONSTRUCTION AREA B

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

PPLEMENTARY INFORMATION ON DRIVEN
ILE FOUNDATIONS," BAILLY GENERATING
TION NUCLEAR-1 NIPSCO, DEC. 4, 1978


RB519
L.D (NONE)
B-3
L.D.(NONE)
AP-11
J(-43)
TIP(-43)(EXTR.)
TP-4
J(-61.3)
TIP(-6..)
(EXTR.)
B-102
N(4-..3)
(-15 to -35)
AP-10
J(NONE)
TIP(-54)(EXTR)
PZB-1
N(68-86)
(-60 to -70)
TP-3
J(NONE)
TIP(-49.3)(EXTR.)
AP-9
J(-48.4 to -48.9)
TIP(-48.9)(EXTR)
RB513
L.D.(-40 to -4
TP-9
J(+3 to -46)
TIP(-47.3)(EXTR)
AP-8
RB512
L.D.(-40 to -
J(NONE)
TIP(-54)(EXTR)
J(NONE)
TIP(-45)(EXTR)
RB511
L.D.(-40 to -48)
RB510
L.D(NONE)
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H-P
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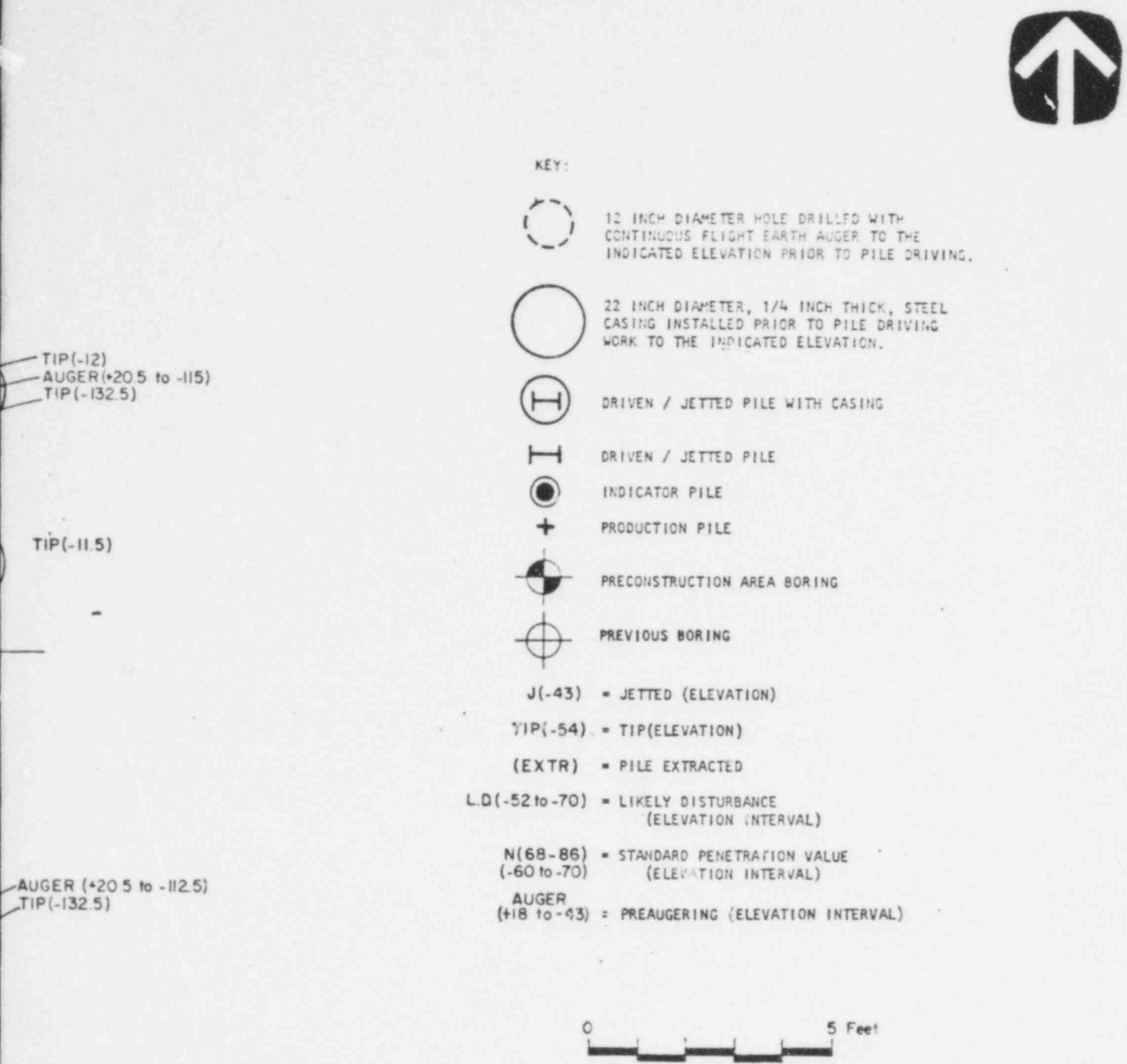
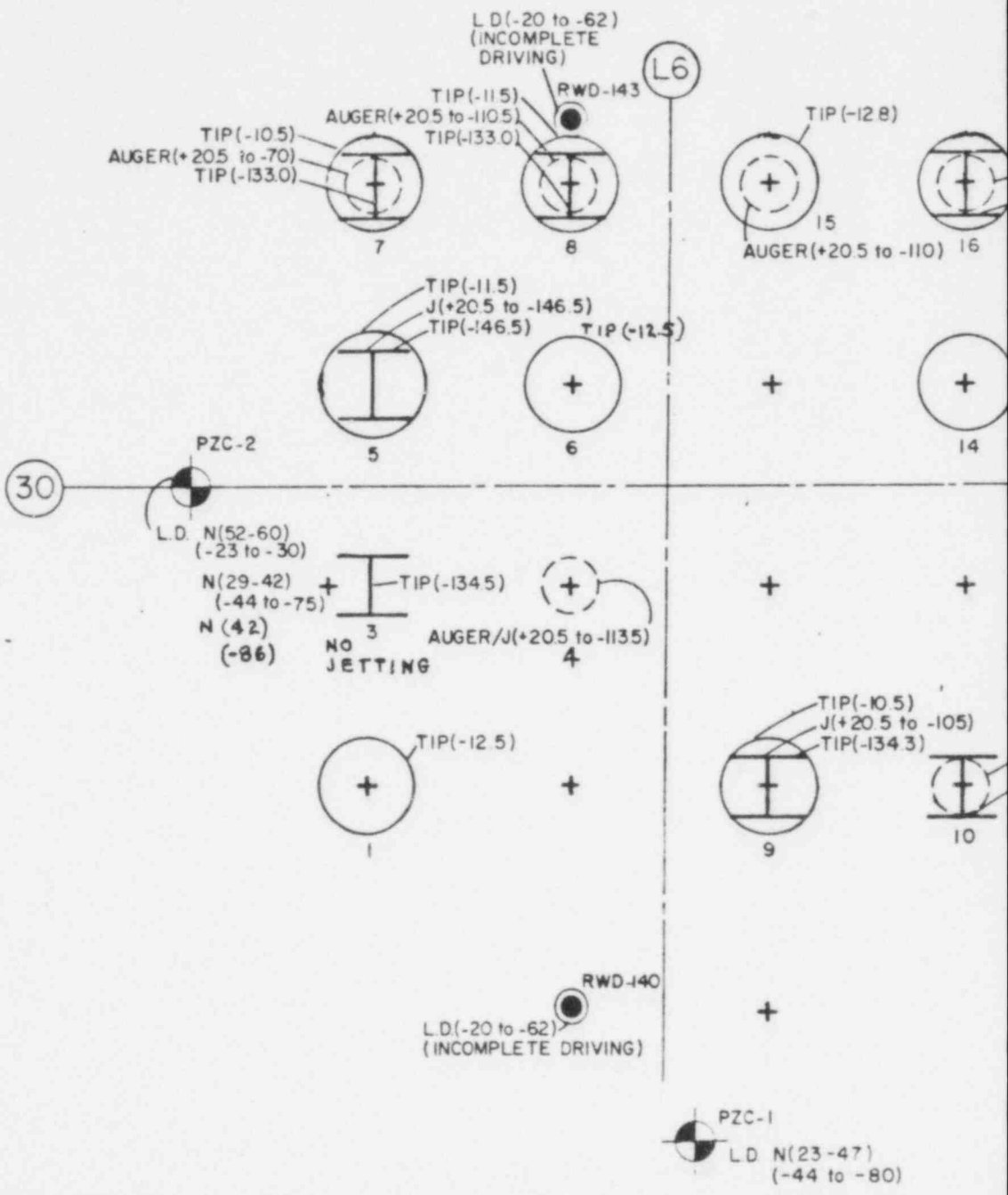


FIGURE 1-4

FIGURE 2-9
LOCATION PLAN
PRECONSTRUCTION AREA C

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

NFORMATION ON DRIVEN
NS," BAILLY GENERATING
1 NIPSCO, DEC. 4, 1978



REF.

"SUPPLEMENTARY I
H-PILE FOUNDATIO
STATION NUCLEAR-

KEY:

12 INCH DIAMETER HOLE DRILLED WITH CONTINUOUS FLIGHT EARTH AUGER TO THE INDICATED ELEVATION PRIOR TO PILE DRIVING.

DRIVEN / JETTED PILE WITH CASING

DRIVEN / JETTED PILE

INDICATOR PILE

PRODUCTION PILE

PRECONSTRUCTION AREA BORING

PREVIOUS BORING

J(-43) = JETTED (ELEVATION)

TIP(-54) = TIP ELEVATION

(EXTR) = PILE EXTRACTED

L.D.(-52 to -70) = LIKELY DISTURBANCE (ELEVATION INTERVAL)

N(68-86) (-60 to -70) = STANDARD PENETRATION VALUE (ELEVATION INTERVAL)

AUGER (+18 to -117) = PREAUGERING (ELEVATION INTERVAL)

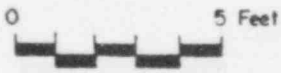


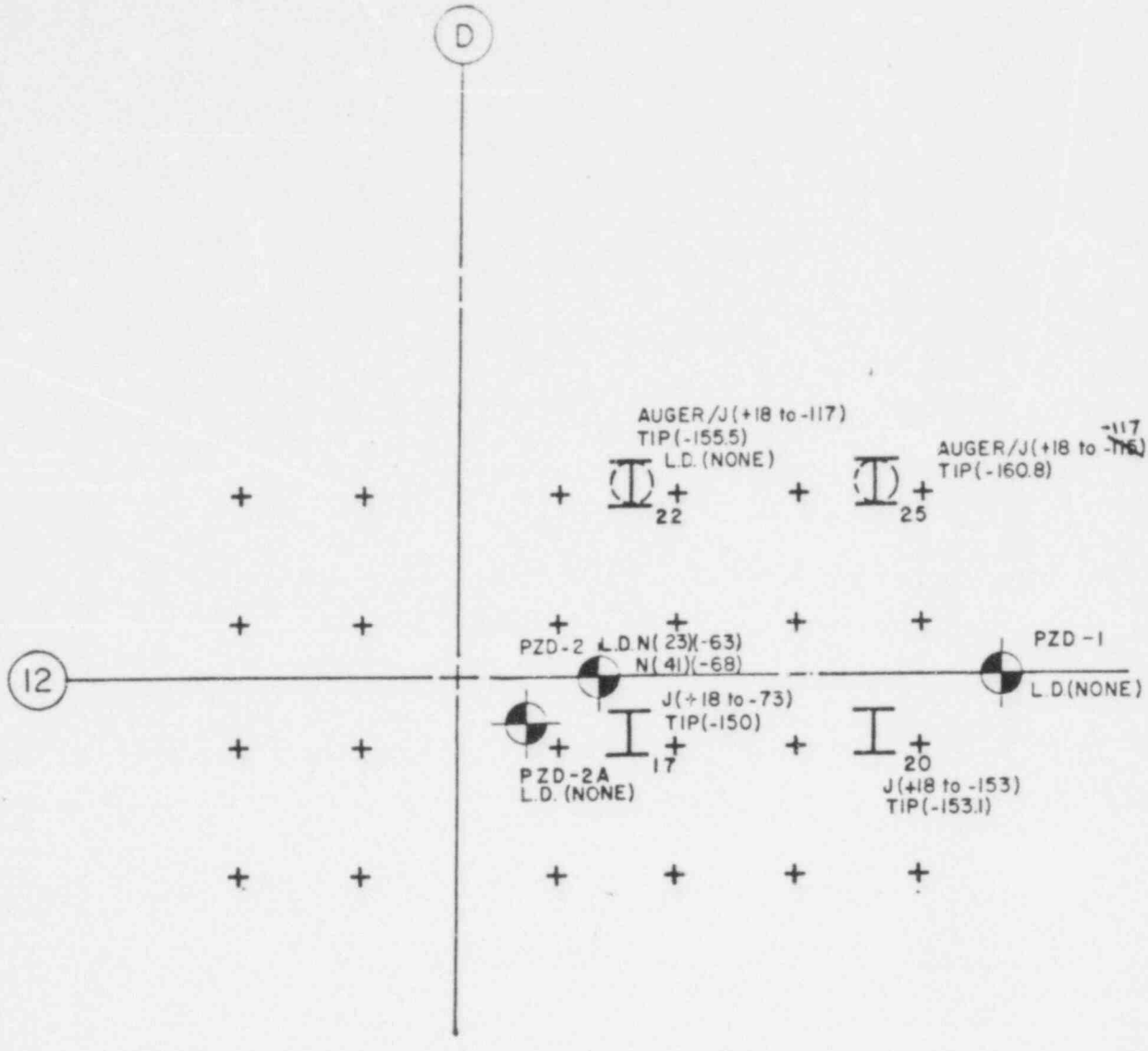
FIGURE 1-5

RY INFORMATION ON DRIVEN
ATIONS," BAILLY GENERATING
CAR-1 NIPSCO, DEC. 4, 1978

FIGURE 2-12
LOCATION PLAN
PRECONSTRUCTION AREA D

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE



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"SUPPLEMENTAR
H-PILE FOUNDA
STATION NUCLE

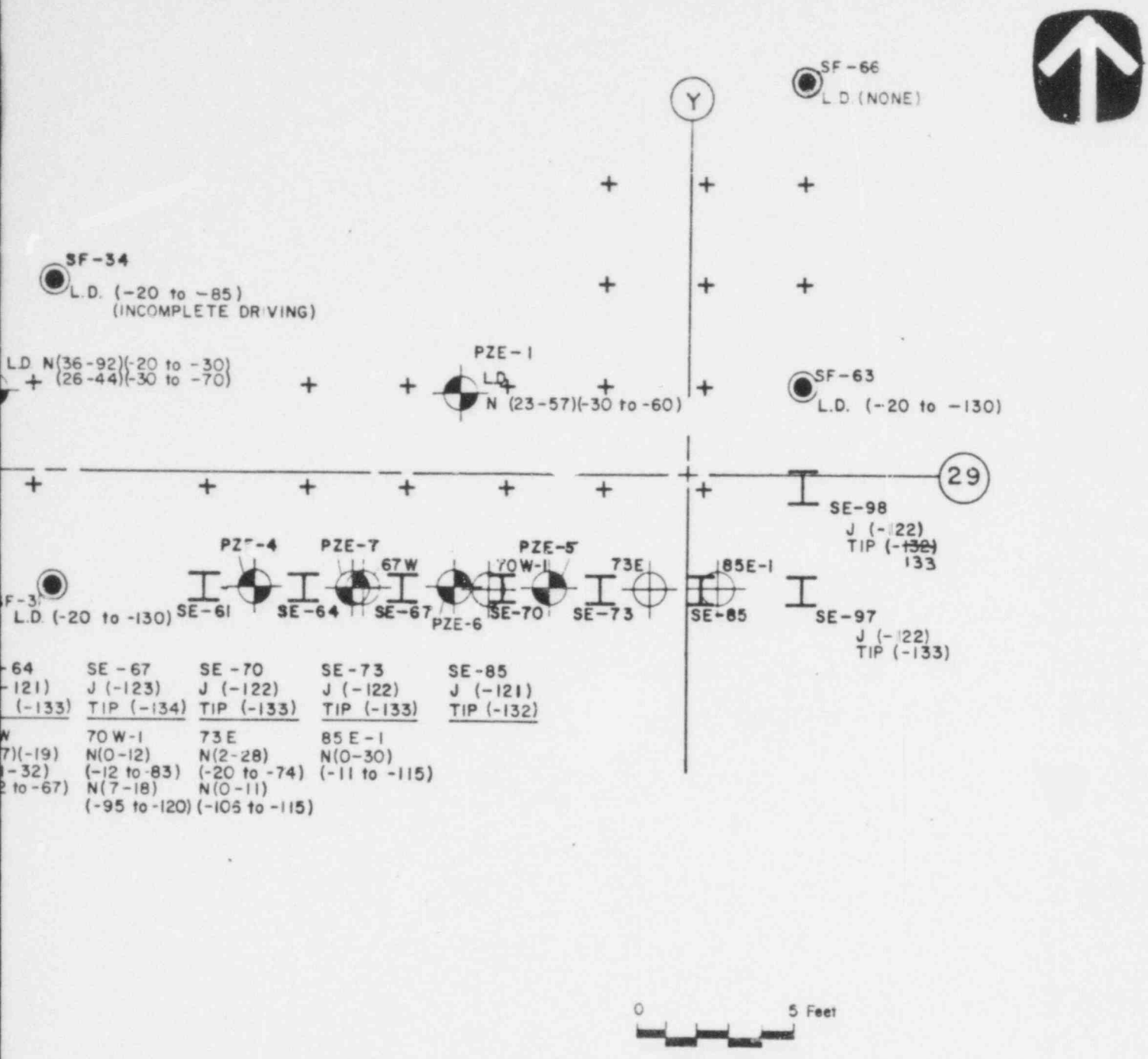


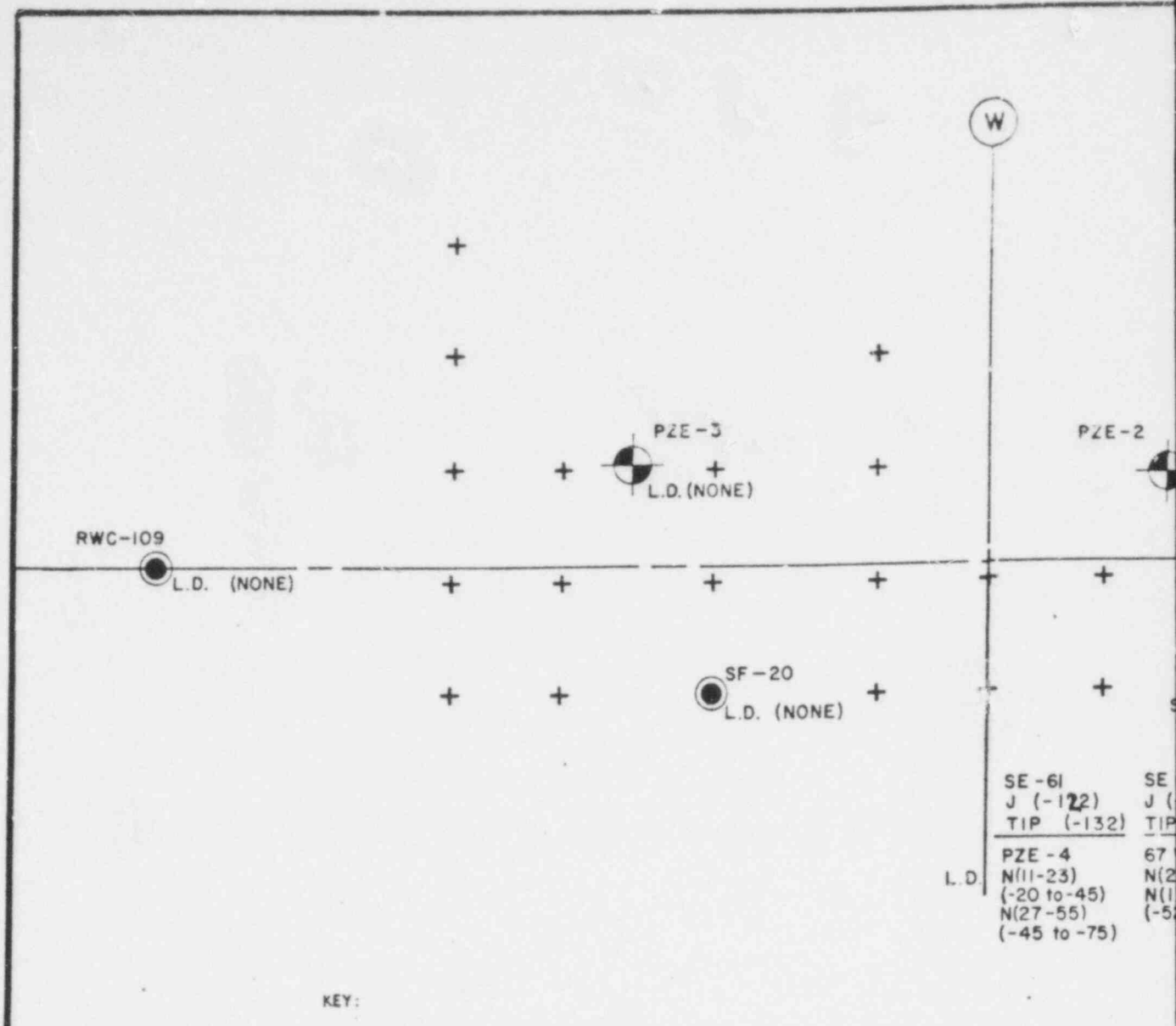
FIGURE 1-6

LEMENTARY INFORMATION ON DRIVEN
E FOUNDATIONS," BAILLY GENERATING
ON NUCLEAR-1 NIPSCO, DEC. 4, 1978

FIGURE 2-15
LOCATION PLAN
PRECONSTRUCTION AREA E

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE



KEY:

- DRIVEN / JETTED PILE
- INDICATOR PILE
- PRODUCTION PILE
- PRECONSTRUCTION AREA BORING
- PREVIOUS BORING
- BORING DRILLED AFTER DRIVING DENSIFICATION PILES

(LOWEST

J(-43) = JETTED ELEVATION)

TIP(-54) = TIP(ELEVATION)

(EXTR) = PILE EXTRACTED

L.D.(-52 to -70) = LIKELY DISTURBANCE (ELEVATION INTERVAL)

N = STANDARD PENETRATION VALUE (ELEVATION INTERVAL)

REF.

"SUPP
H-PIL
STATI

NOTES

I. DRIVE DENSIFICATION PILES AT THE LOCATIONS IDENTIFIED BY FULL (SOLID)CIRCLES.

II. DRIVE DENSIFICATION PILES AT THE LOCATIONS IDENTIFIED BY OPEN CIRCLES.

III. EXAMINE THE NEED FOR ADDITIONAL DENSIFICATION PILES:

i. ALL POTENTIAL ADDITIONAL DENSIFICATION PILES ARE SHOWN BY THE OPEN DASHED CIRCLES.

ii. THE NEED TO DRIVE AN ADDITIONAL DENSIFICATION PILE AT THE LOCATION DESIGNATED "a" WILL BE DETERMINED BY EXAMINING THE DRIVING RECORDS OF PILES NO. 4, 5, 7 AND 10 AND COMPARING THE RECORDS WITH THE DRIVING RECORD FOR THE NEAREST CONTROL PILE. THE EVALUATION WEIGHS THE IMPORTANCE OF EACH OF THESE PILES TO TAKE INTO ACCOUNT THEIR LOCATION RELATIVE TO THE POTENTIAL PILE LOCATION.

iii. ALL OTHER POTENTIAL LOCATIONS ARE EVALUATED BY EXAMINING THE PILE DRIVING RECORDS OF THE ADJACENT PILES, AS INDICATED BY THE ARROWS STARTING FROM THE ALREADY DRIVEN PILES. IN THIS MANNER, ANY OF THE PILES IDENTIFIED AS a TO e MAY BE DRIVEN, DEPENDING ON THE RESULTS OF THE DRIVING RECORDS OF THE PILES IN THE VICINITY.

iv. THE PROCESS IS REPEATED SEQUENTIALLY UNTIL THE LAST DRIVEN PILES SHOW NO SIGNS OF DISTURBANCE.

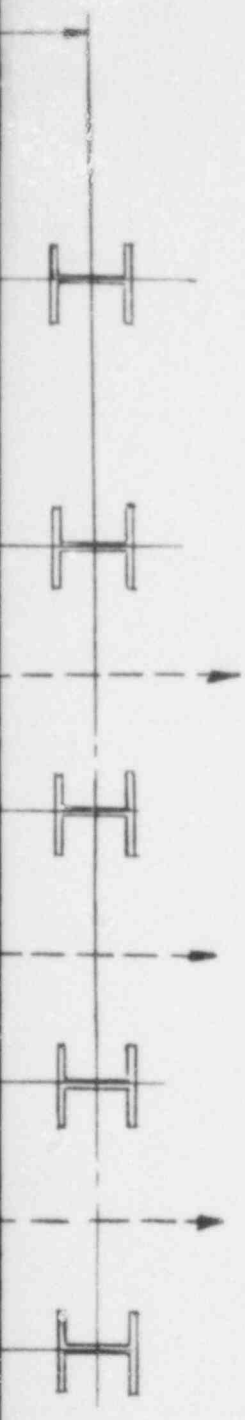
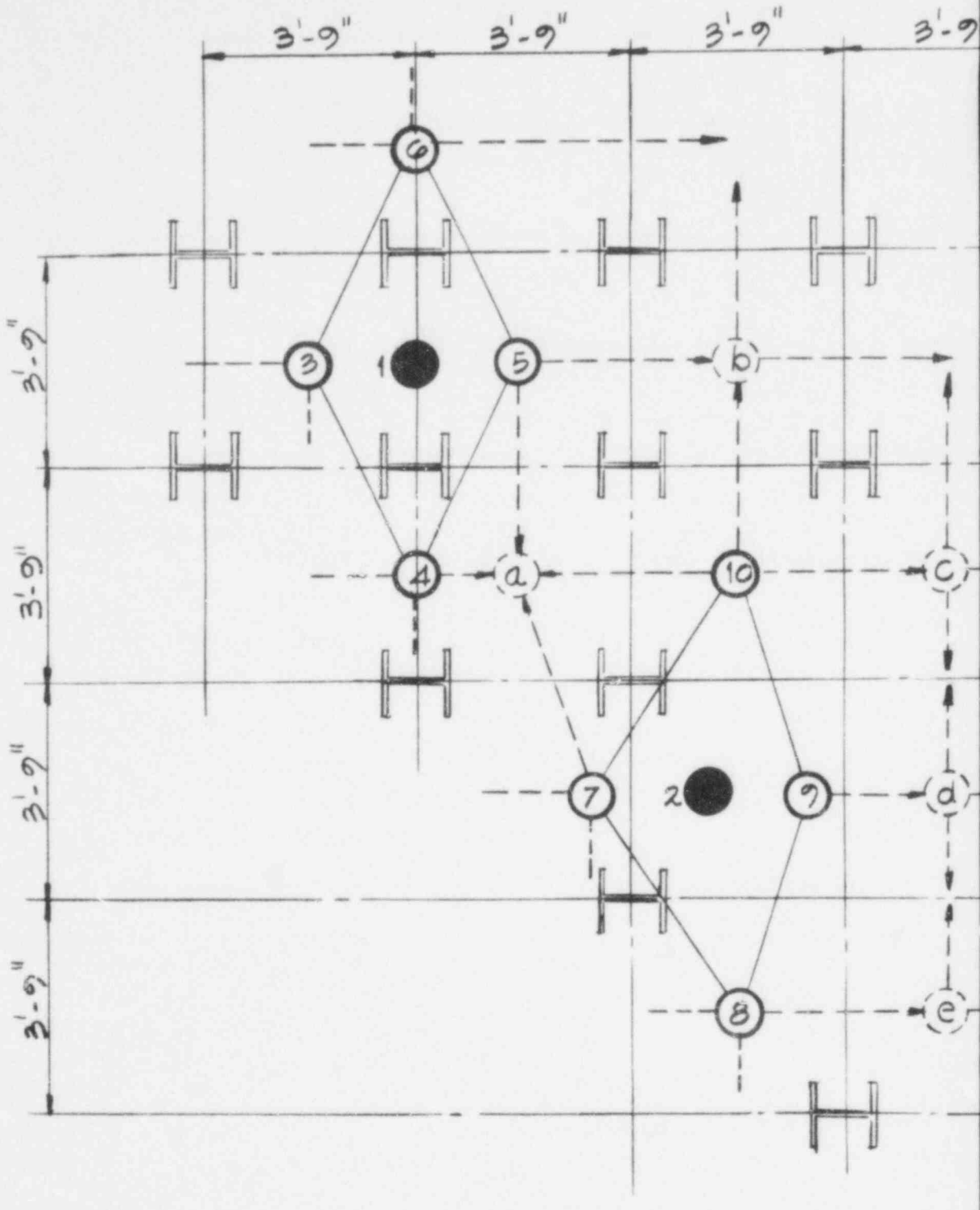
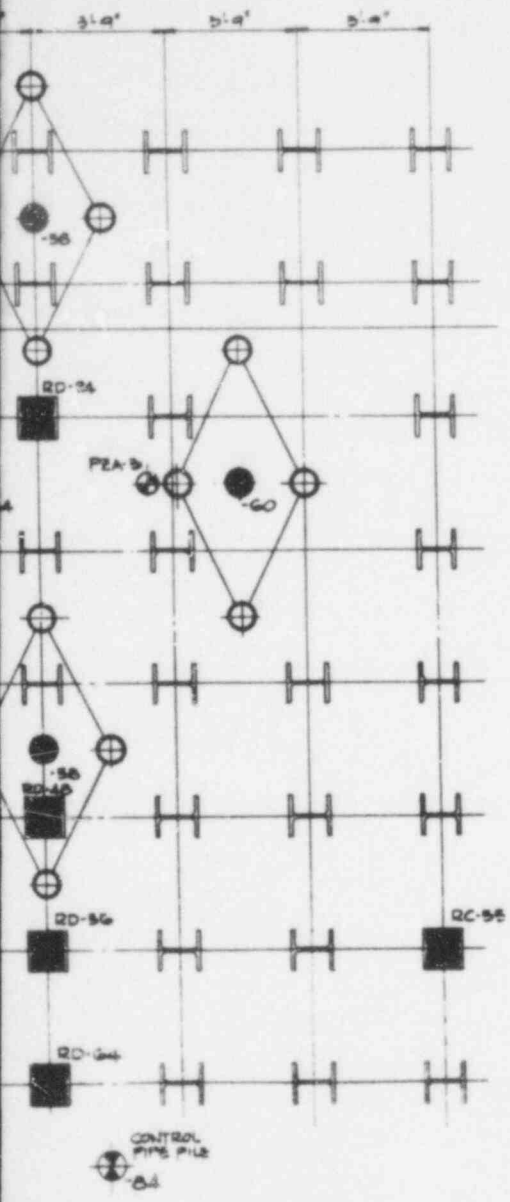


FIGURE 1-7

SARGENT & LUNDY ENGINEERS



TYPICAL PLAN
FOR DENSIFICATION PILES



LEGEND:

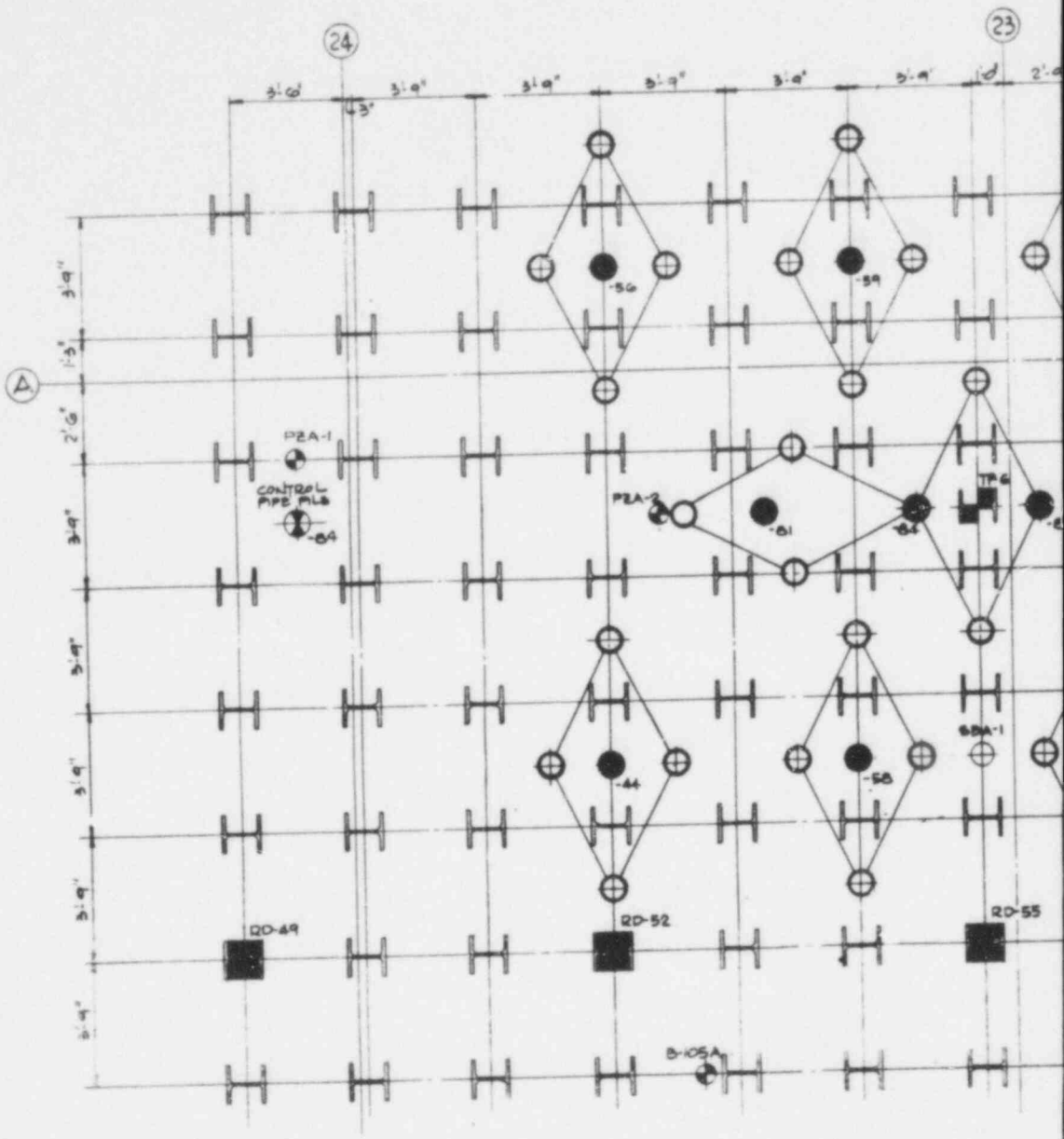
- PRODUCTION PILE
- DENSIFICATION H-PILE
- INDICATOR PILE, IN PLACE (RD-34 MARK NO.)
- DRIVEN/JETTED PILE, IN PLACE
- 10"ϕ DENSIFICATION PIPE PILE AT OR ADJACENT TO THE POINT SOURCE OF DISTURBANCE DRIVEN TO THE DEPTH INDICATED
- 10"ϕ DENSIFICATION PIPE PILE DRIVEN TO THE SAME DEPTH AS THE ADJACENT POINT SOURCE PILE OR TO 25 B.P.I.
- 10"ϕ CONTROL PIPE PILE (DRIVEN TO ELEVATION INDICATED OR TO 25 B.P.I.)
- EXISTING BORING
- SUPPLEMENTARY BORING

NOTE:
TWO VERIFICATION BORINGS WILL BE DRILLED IN EACH AREA ADJACENT TO EXISTING BORINGS

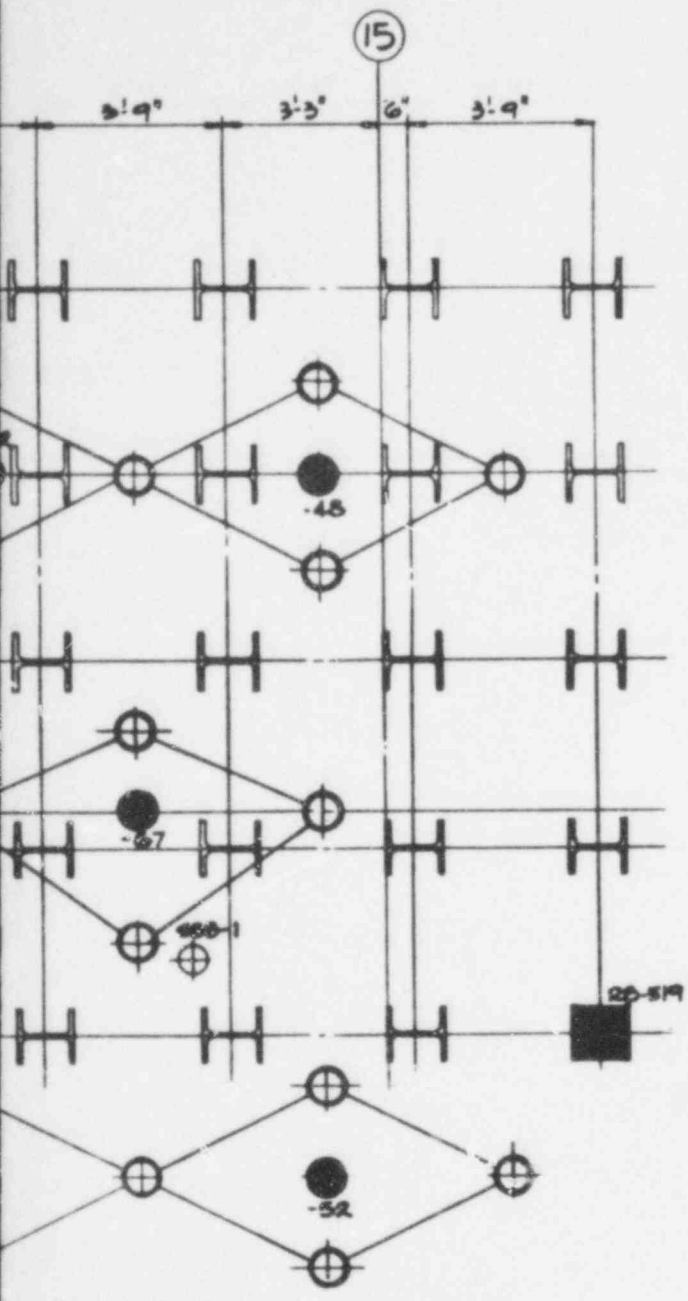
N

FIGURE 1-8

SARGENT & LUNDY ENGINEERS



PRECONSTRUCTION AREA A



LEGEND:

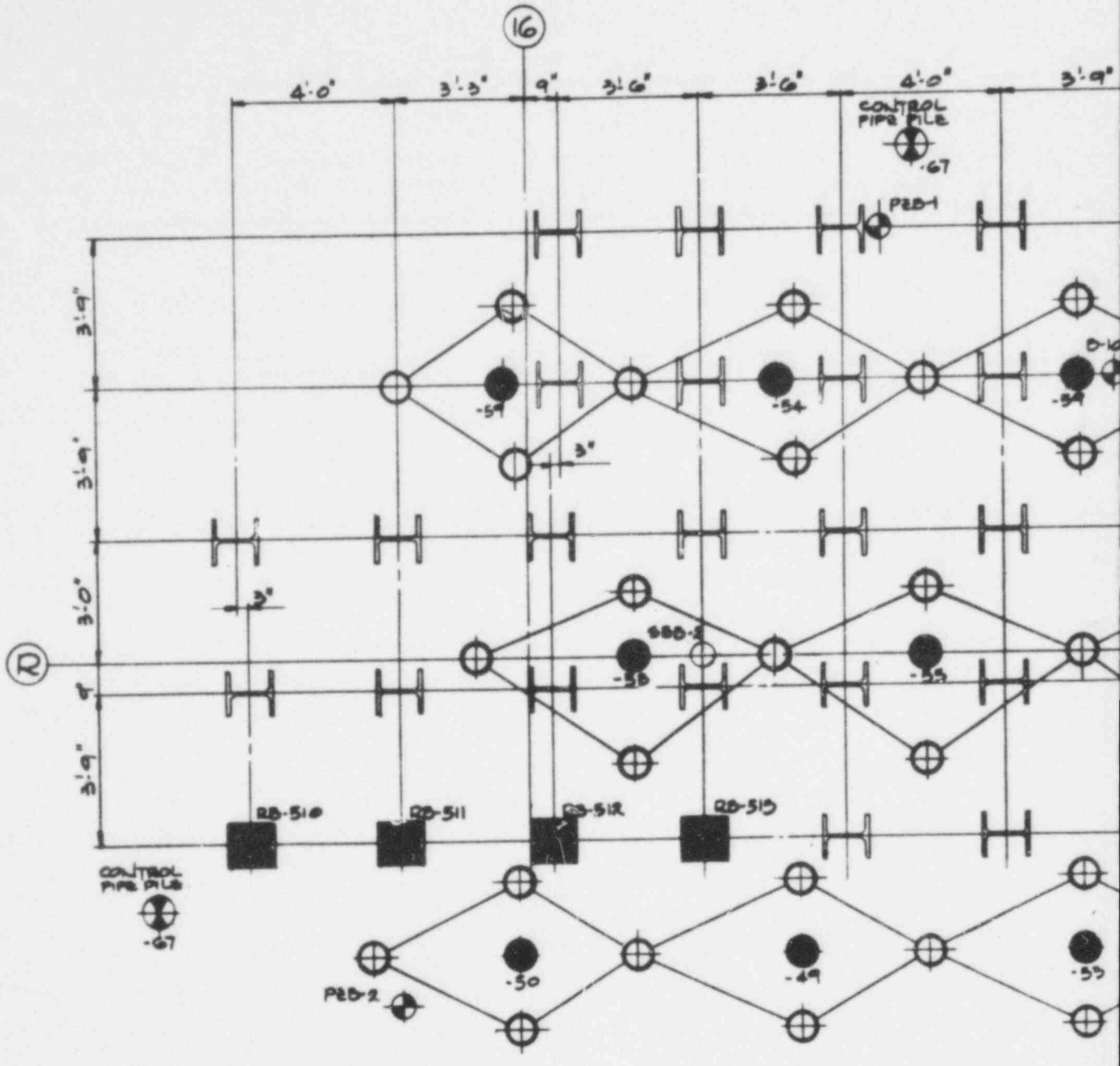
- PRODUCTION PILE
- DENSIFICATION H-PILE
- INDICATOR PILE, IN PLACE (MARK NO.)
- DRIVEN/JETTED PILE, IN PLACE
- 10"ϕ DENSIFICATION PIPE PILE AT OR ADJACENT TO THE POINT SOURCE OF DISTURBANCE DRIVEN TO THE DEPTH INDICATED
- 10"ϕ DENSIFICATION PIPE PILE DRIVEN TO THE SAME DEPTH AS THE ADJACENT POINT SOURCE PILE OR TO 25 B.P.I.
- 10"ϕ CONTROL PIPE PILE (DRIVEN TO ELEVATION INDICATED OR TO 25 B.P.I.)
- EXISTING BORING
- SUPPLEMENTARY BORING

NOTE:
TWO VERIFICATION BORINGS WILL BE DRILLED IN EACH AREA ADJACENT TO EXISTING BORINGS

FIGURE 1-9

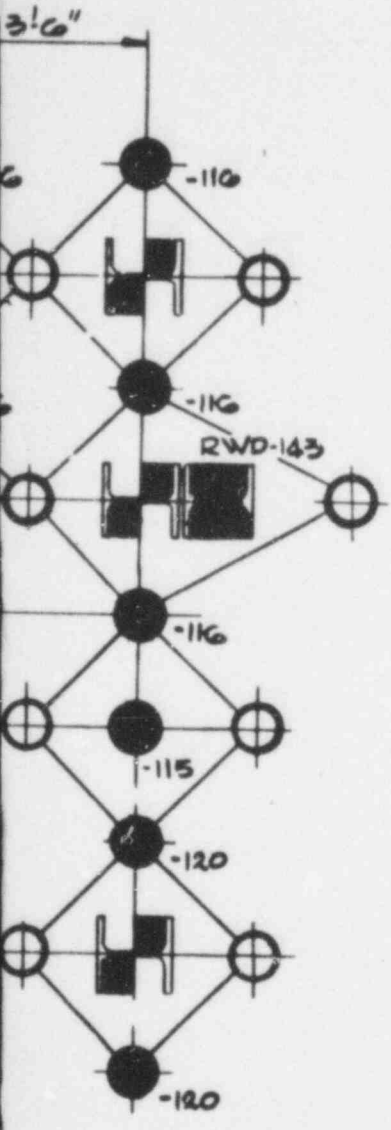
→ N

SARGENT & LUNDY ENGINEERS



PRECONSTRUCTION AREA B

0 3FT



LEGEND:

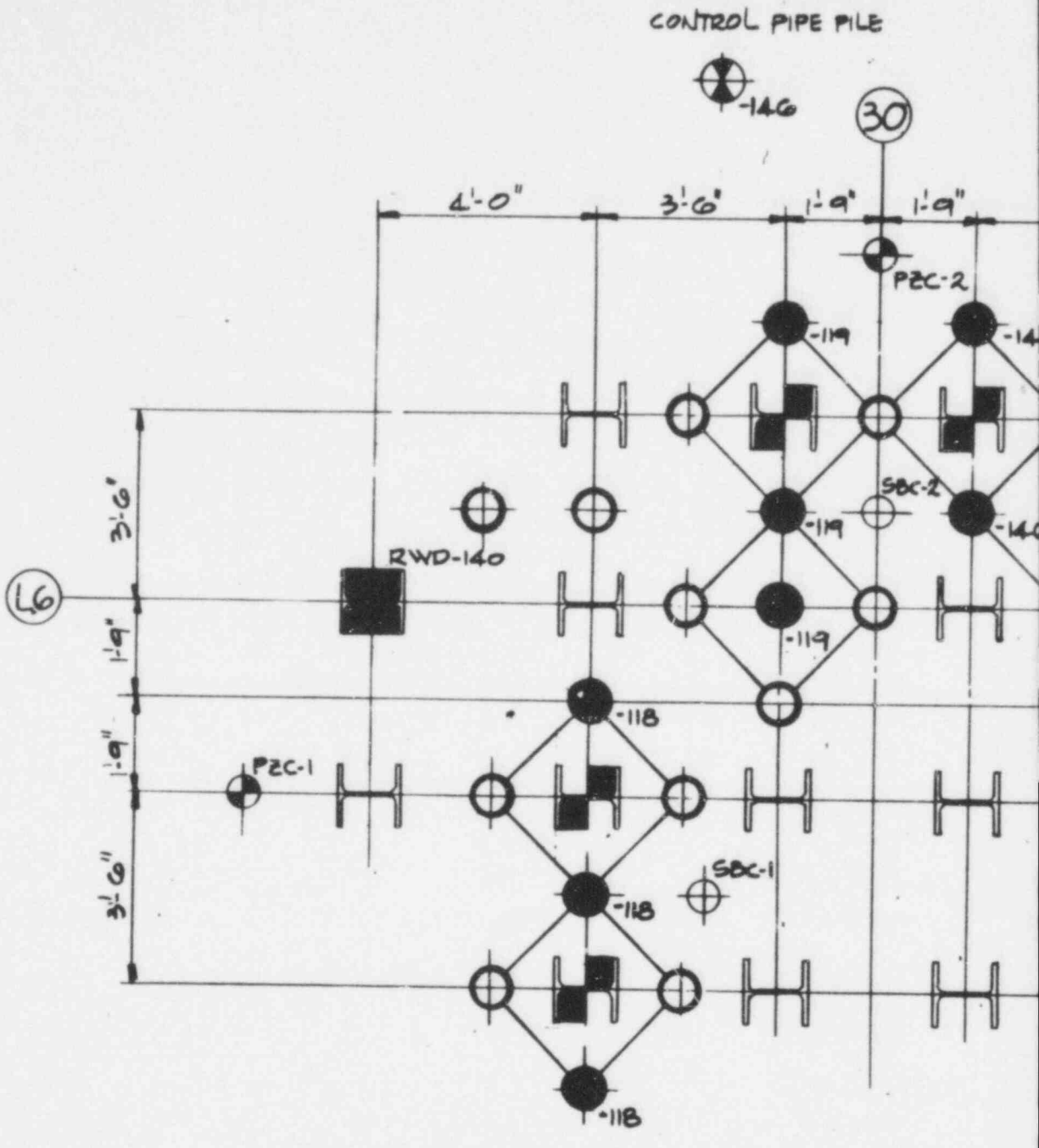
- PRODUCTION PILE
- DENSIFICATION H-PILE
- INDICATOR PILE, IN PLACE
  MARK 1/8
- DRIVEN/JETTED PILE, IN PLACE
- 10¾ DENSIFICATION PIPE PILE AT OR ADJACENT TO THE POINT SOURCE OF DISTURBANCE DRIVEN TO THE DEPTH INDICATED
- 10¾ DENSIFICATION PIPE PILE DRIVEN TO THE SAME DEPTH AS THE ADJACENT POINT SOURCE PILE OR TO 25 B.P.I.
- 10¾ CONTROL PIPE PILE (DRIVEN TO ELEVATION INDICATED OR TO 25 B.P.I.)
- EXISTING BORING
- SUPPLEMENTARY BORING

NOTE:
TWO VERIFICATION BORINGS WILL BE DRILLED IN EACH AREA ADJACENT TO EXISTING BORINGS

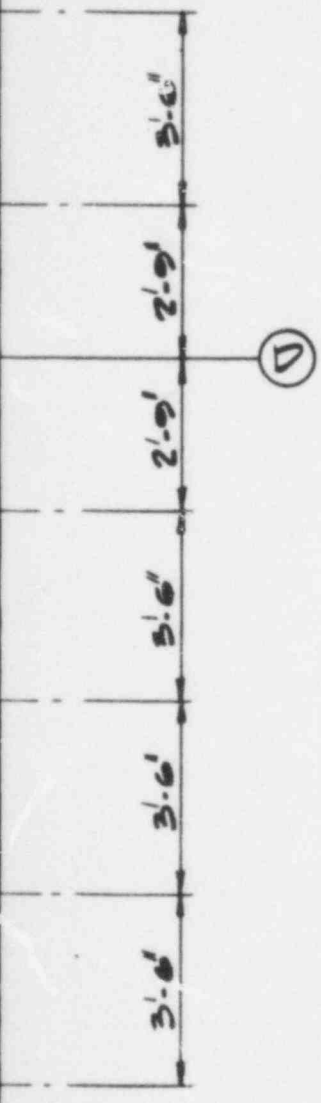
N

FIGURE 1-10

SARGENT & LUNDY ENGINEERS



PRECONSTRUCTION AREA



LEGEND:

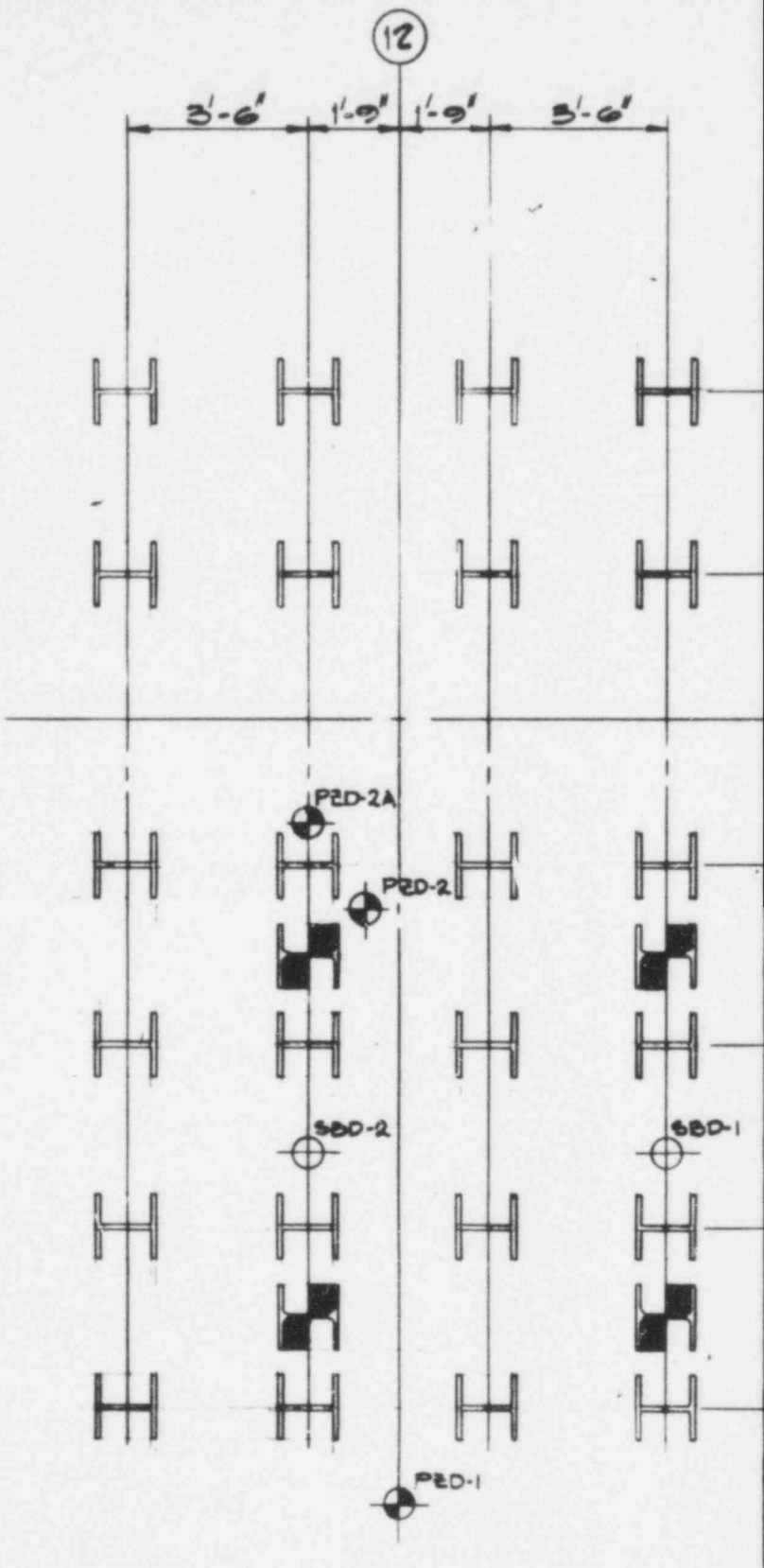
- PRODUCTION PILE
- DENSIFICATION H-PILE
- INDICATOR PILE, IN PLACE (MARK NO.)
- DRIVEN/JETTED PILE, IN PLACE
- 10"ϕ DENSIFICATION PIPE PILE AT OR ADJACENT TO THE POINT SOURCE OF DISTURBANCE DRIVEN TO THE DEPTH INDICATED
- 10"ϕ DENSIFICATION PIPE PILE DRIVEN TO THE SAME DEPTH AS THE ADJACENT POINT SOURCE PILE OR TO 25 B.P.I.
- 10"ϕ CONTROL PIPE PILE (DRIVEN TO ELEVATION INDICATED OR TO 25 B.P.I.)
- EXISTING BORING
- SUPPLEMENTARY BORING

NOTE:
TWO VERIFICATION BORINGS WILL BE DRILLED IN EACH AREA ADJACENT TO EXISTING BORINGS

FIGURE 1-11

→ N

SARGENT & LUNDY ENGINEERS



PRECONSTRUCTION AREA D

0 3FT

LEGEND:

- PRODUCTION PILE
- DENSIFICATION H-PILE
- INDICATOR PILE, IN PLACE (SP/34 MARK NO.)
- DRIVEN/JETTED PILE, IN PLACE
- 10'ϕ DENSIFICATION PIPE PILE AT OR ADJACENT TO THE POINT SOURCE OF DISTURBANCE DRIVEN TO THE DEPTH INDICATED
- 10'ϕ DENSIFICATION PIPE PILE DRIVEN TO THE SAME DEPTH AS THE ADJACENT POINT SOURCE PILE OR TO 25 B.P.I.
- 10'ϕ CONTROL PIPE PILE (DRIVEN TO ELEVATION INDICATED OR TO 25 B.P.I.)
- EXISTING BORING
- SUPPLEMENTARY BORING

NOTE:
TWO VERIFICATION BORINGS WILL BE DRILLED IN EACH AREA ADJACENT TO EXISTING BORINGS

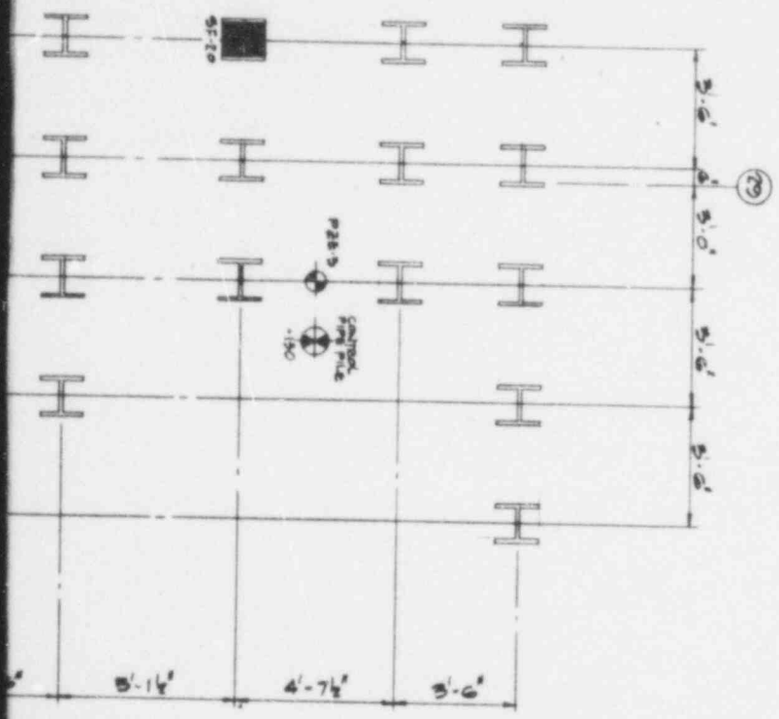


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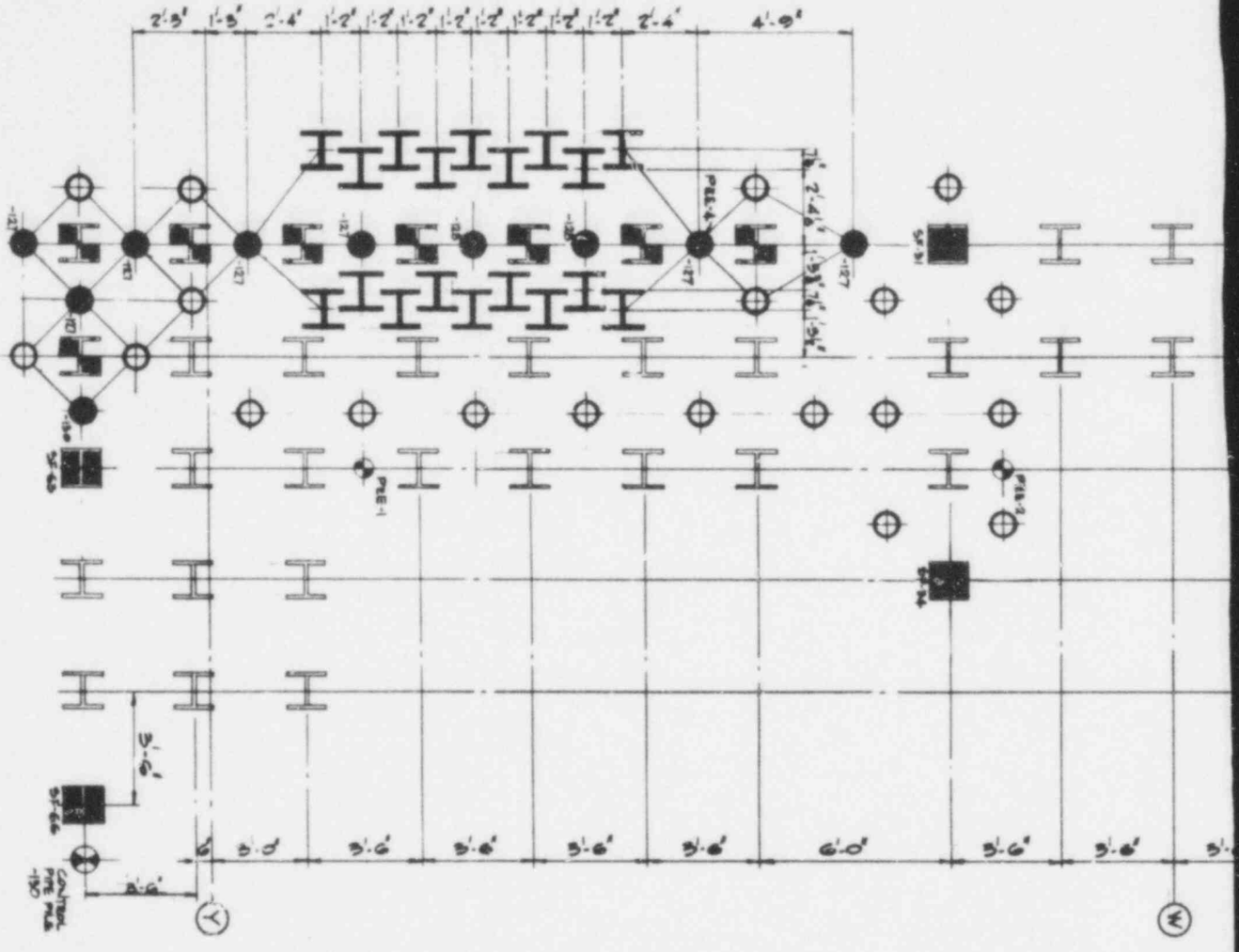
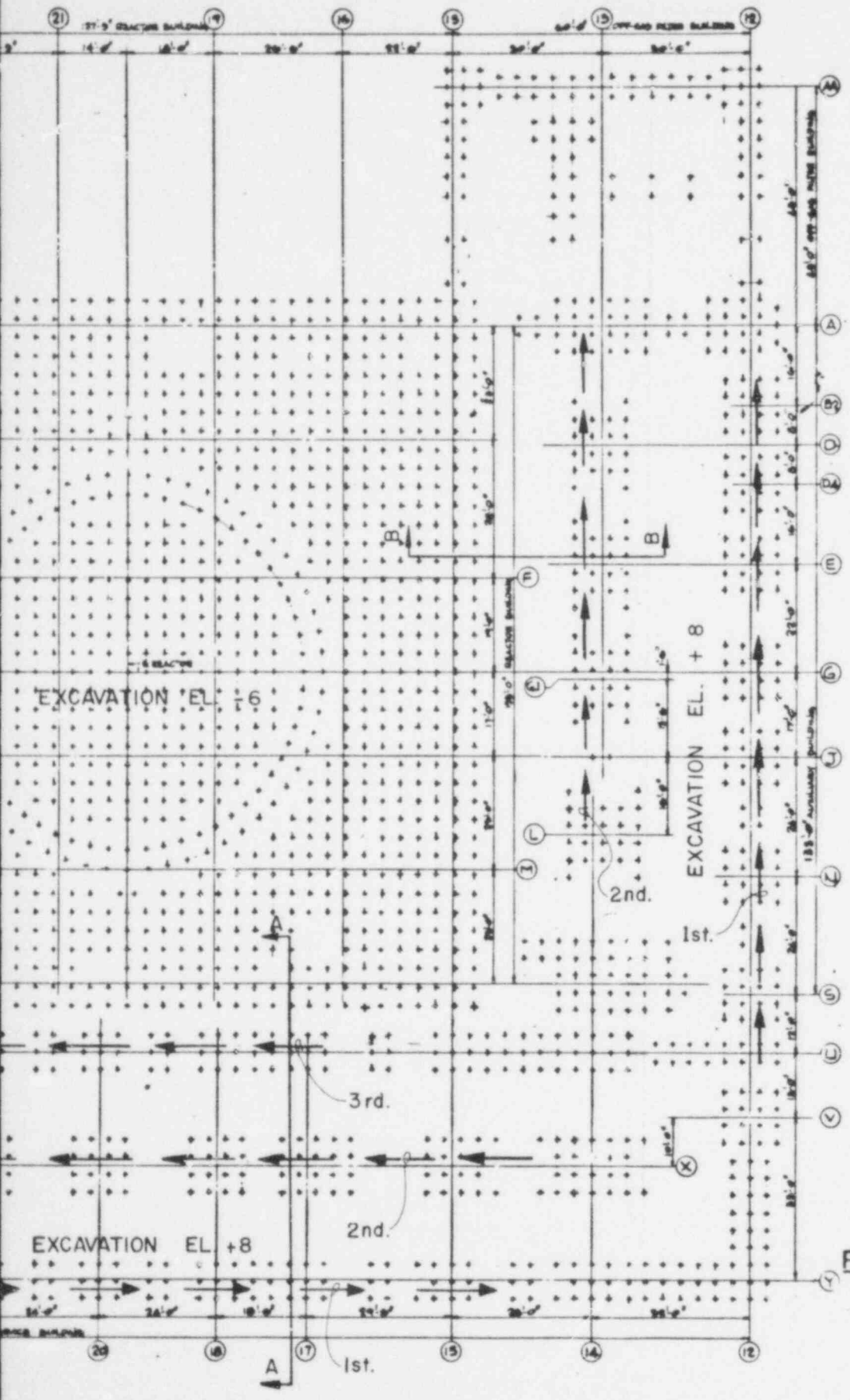
FIGURE 1 - 12

SARGENT & LUNDY ENGINEERS



PRECONSTRUCTION AREA E

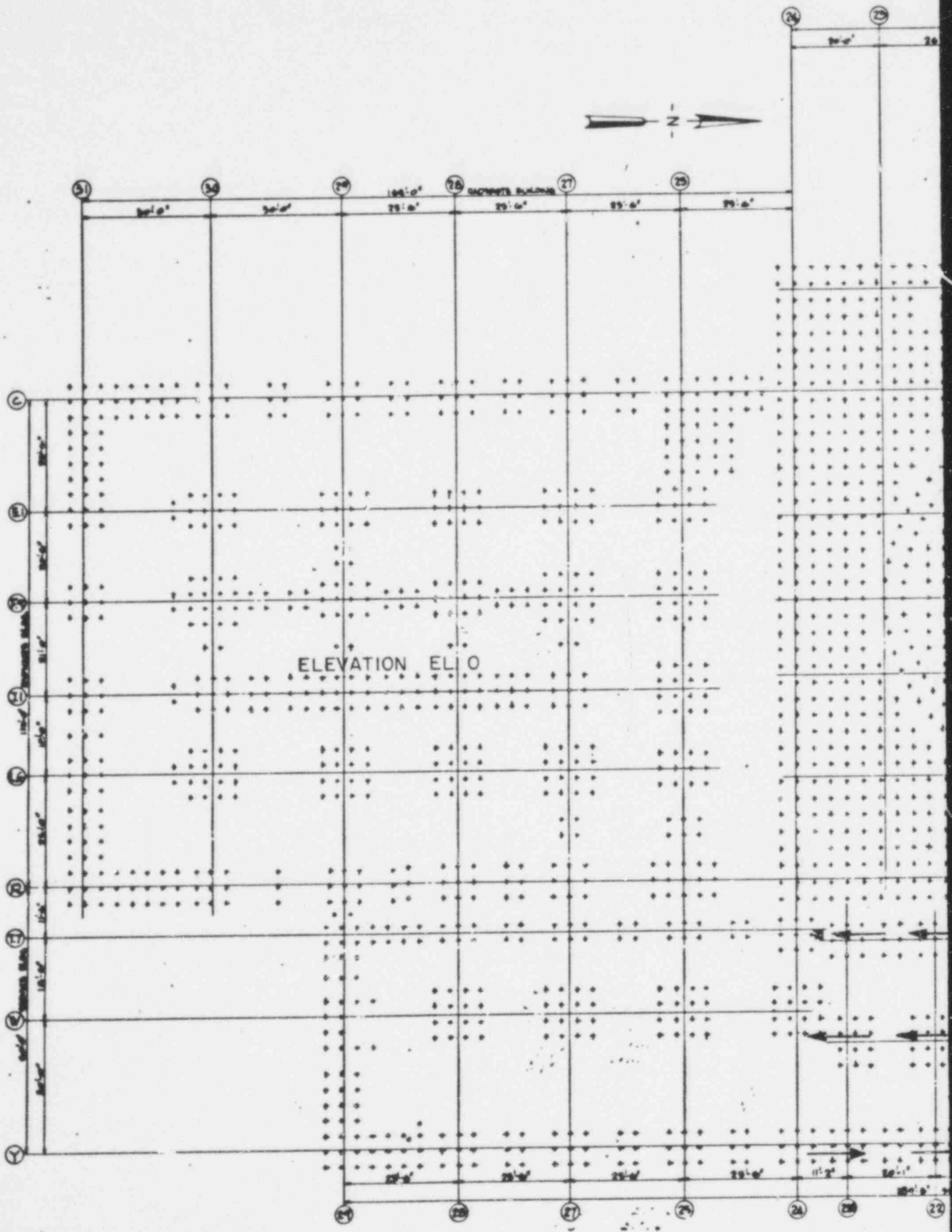


NOTE

1. Dotted line indicates pile driving sequence. → → → →

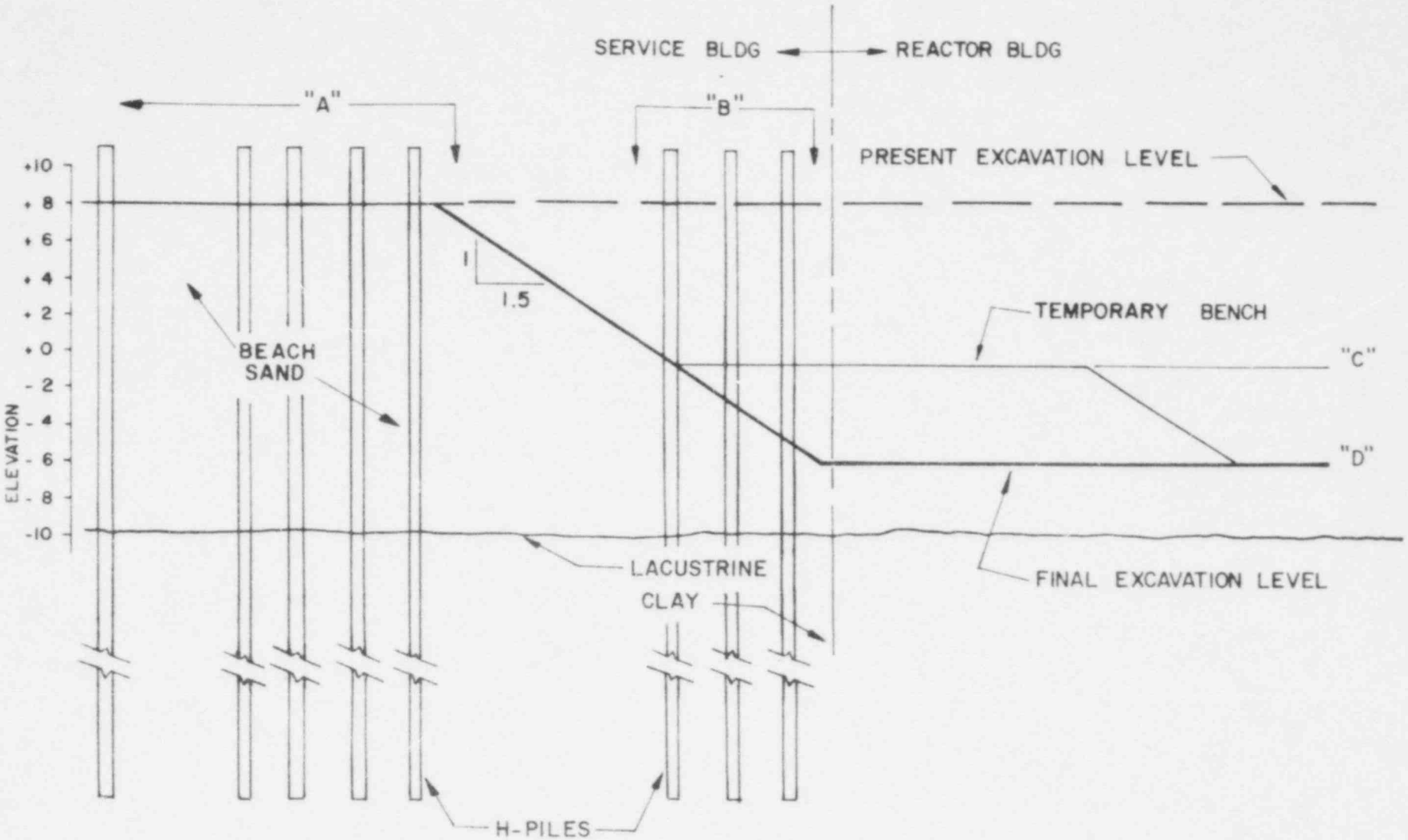
PLAN VIEW OF CATEGORY I PILES

FIGURE 3 - 1



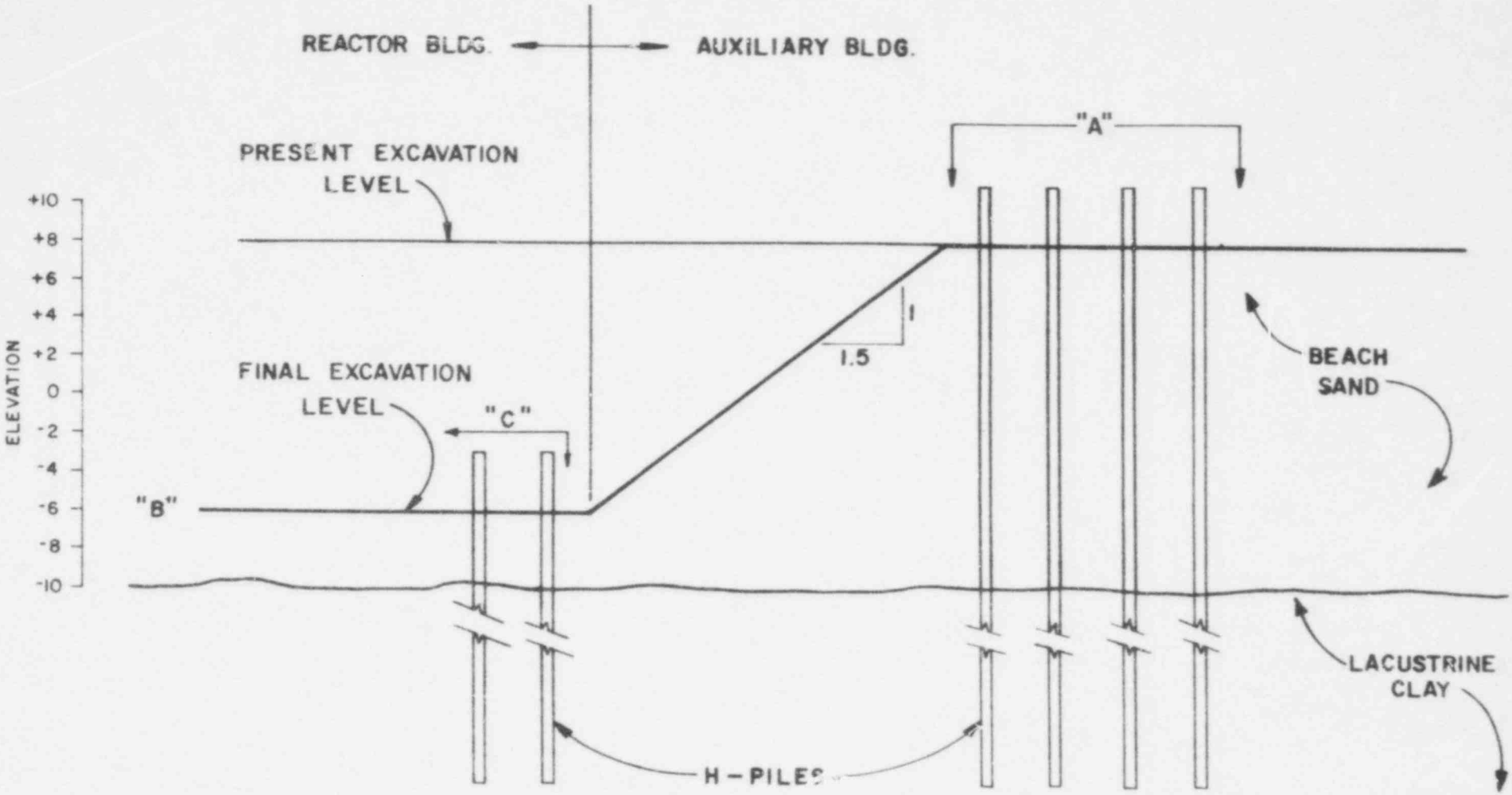
POOR ORIGINAL

801 210



SECTION A-A

FIGURE 3 - 2



SECTION B-B

FIGURE 3 - 3