JANUARY 1989

SAMPLING PLAN

REMEDIAL INVESTIGATION / FEASIBILITY STUDY
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

VOLUME I

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0727

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SAMPLING PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

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January 6, 1989

86-018-01

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Transmittal
Volume 1 Sampling Plan
Remedial Investigation/Feasibility Study
Naval Air Station Alameda
Alameda, California

Dear Ms. Dizon:

Enclosed are 20 copies of the Sampling Plan, Volume 1 of the Remedial Investigation/Feasibility Study Work Plan at the Naval Air Station-Alameda. This is the revised version which has incorporated the changes required by the DHS and NOAA comments.

Also enclosed are two copies of our letter report which presents responses to the DHS and NOAA comments on the Sampling Plan.

These reports complete a portion of the work authorized under contract N62474-85-D-5620 Delivery Orders 001 and 002.

If you have any questions, please call us.

Very truly yours,

James W. Babcock, Ph.D.
Project Supervisor

Richard J. Greenwood, P.E.
Project Manager

JWB/RJG/dt

Enclosures

SAMPLING PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
(RI/FS)
VOLUME 1 OF 8

DATED 01 JANUARY 1989

THIS RECORD CONTAINS MULTIPLE VOLUMES WHICH HAVE BEEN ENTERED SEPARATELY

VOLUME 1 OF 8 – FINAL DRAFT SAMPLING PLAN, RI/FS DATED 8/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000212**

VOLUME 1A OF 8 – DRAFT SAMPLING PLAN, SOLID WASTE ASSESSMENT TEST PROPOSAL ADDENDUM, RI/FS DATED 9/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000807**

VOLUME 1A OF 8 – FINAL DRAFT SAMPLING PLAN, SOLID WASTE ASSESSMENT TEST PROPOSAL ADDENDUM, RI/FS DATED 10/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000257**

VOLUME 1B OF 8 – FINAL DRAFT AIR SAMPLING PLAN, RI/FS DATED 8/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000787**

VOLUME 1B OF 8 – FINAL DRAFT AIR SAMPLING PLAN, RI/FS DATED 9/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000258**

VOLUME 2 OF 8 – FINAL DRAFT HEALTH AND SAFETY PLAN, RI/FS DATED 8/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000214**

VOLUME 3 OF 8 – FINAL DRAFT QUALITY ASSURANCE PROJECT PLAN – QUALITY ASSURANCE/QUALITY CONTROL PLAN, RI/FS DATED 8/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000213**

VOLUME 4 OF 8 – FINAL DRAFT COMMUNITY RELATIONS PLAN, RI/FS DATED 12/9/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000263**

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VOLUME 5 OF 8 – FINAL DRAFT PROJECT MANAGEMENT PLAN/SCHEDULE, RI/FS DATED 11/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000259**

VOLUME 6 OF 8 – FINAL DRAFT DATA MANAGEMENT PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000260**

VOLUME 7 OF 8 – FINAL DRAFT PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000261**

VOLUME 8 OF 8 – FINAL DRAFT FEASIBILITY STUDY PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000262**

TABLE OF CONTENTS

	PAGE
LIST OF TABLES	i
LIST OF FIGURES	~~ii~~ v
1.0 INTRODUCTION	1
1.1 Introduction	1
1.2 Work Plan Objectives	1
1.3 Past RI/FS Activities	3
1.4 Geographical Description	3
1.5 Geologic and Hydrologic Conditions	4
1.5.1 Geology	4
1.5.2 Hydrology	~~4~~ 5
2.0 FIELD INVESTIGATION APPROACH	6
2.1 Mobilization	6
2.2 Site Reconnaissance	8
2.3 Types of Samples	10
2.4 Drilling Procedures	10
2.5 Analytical Methods	11
2.6 Sampling Procedures	12
2.7 Chain-of-Custody and Document Control	14
2.8 Well Surveying	15
3.0 SITE SPECIFIC SAMPLING PLANS	16
3.1 1943-1956 Disposal Area Site Investigation Sampling Plan	17
3.2 West Beach Landfill Site Investigation Sampling Plan	17

TABLE OF CONTENTS
(Continued)

		PAGE
3.3	Area 97 Site Investigation Sampling Plan	17
	3.3.1 Site Specific Conditions	17
	3.3.1.1 General Description and Current Conditions	17
	3.3.1.2 Site History	18
	3.3.1.3 Summary of Previous Site Investigations	18
	3.3.2 Sampling Objectives	19
	3.3.3 Site Reconnaissance	19
	3.3.4 Soil Gas Monitoring Survey	20
	3.3.5 Soil Sampling	20
	3.3.6 Monitoring Well Installation	21
	3.3.7 Ground Water Sampling	21
3.4	Building 360 (Plating, Engine Cleaning, Paint, and Paint Stripping Shops) Site Investigation Work Plan	22
	3.4.1 Site Specific Conditions	22
	3.4.1.1 General Description and Current Conditions	22
	3.4.1.2 Site History	23
	3.4.1.3 Summary of Previous Site Investigations	23
	3.4.2 Sampling Objectives	23
	3.4.3 Site Reconnaissance	25
	3.4.4 Soil Sampling	25
	3.4.5 Monitoring Well Installation	26
	3.4.6 Ground Water Sampling	26

TABLE OF CONTENTS
(Continued)

		PAGE
3.5	Building 5 (Plating, Paint Stripping, Cleaning, and Paint Shops) Site Investigation Work Plan	27
	3.5.1 Site Specific Conditions	27
	3.5.1.1 General Description and Current Conditions	27
	3.5.1.2 Site History	28
	3.5.1.3 Summary of Previous Site Investigations	28
	3.5.2 Sampling Objectives	29
	3.5.3 Site Reconnaissance	30
	3.5.4 Soil Sampling	30
	3.5.5 Monitoring Well Installation	31
	3.5.6 Ground Water Sampling	31
3.6	Building 41 (Aircraft Intermediate Maintenance Department) Site Investigation Work Plan	32
	3.6.1 Site Specific Conditions	32
	3.6.1.1 General Description and Current Conditions	32
	3.6.1.2 Site History	32
	3.6.1.3 Summary of Previous Site Investigations	33
	3.6.2 Sampling Objectives	33
	3.6.4 Soil Sampling	34
	3.6.5 Monitoring Well Installation	35
	3.6.6 Ground Water Sampling	35
3.7	Building 459 (Service Station) Site Investigation Work Plan	36
	3.7.1 Site Specific Conditions	36

TABLE OF CONTENTS
(Continued)

		PAGE
3.7.1.1	General Descriptions and Current Conditions	36
3.7.1.2	Site History	36
3.7.1.3	Summary of Previous Site Investigations	37
3.7.2	Sampling Objectives	37
3.7.3	Site 459 Reconnaissance	37
3.7.4	Soil Gas Monitoring Survey	37
3.7.5	Soil Sampling	38
3.7.6	Monitoring Well Installation	39
3.7.7	Ground Water Sampling	39
3.8	Building 547 (Service Station) Site Investigation Work Plan	39
3.8.1	Site Specific Conditions	39
3.8.1.1	General Description and Current Conditions	40
3.8.1.2	Site History	40
3.8.1.3	Summary of Previous Site Investigations	40
3.8.2	Sampling Objectives	40
3.8.3	Site 547 Reconnaissance	41
3.8.4	Soil Gas Monitoring Survey	41
3.8.5	Soil Sampling	41
3.8.6	Monitoring Well Installation	42
3.8.7	Ground Water Sampling	42
3.9	Building 162 (Service Station) Site Investigation Work Plan	43
3.9.1	Site Specific Conditions	43

TABLE OF CONTENTS
(Continued)

	PAGE
3.9.1.1 General Description and Current Conditions	43
3.9.1.2 Site History	43
3.9.1.3 Summary of Previous Site Investigations	43
3.9.2 Sampling Objectives	44
3.9.3 Site Reconnaissance	44
3.9.4 Soil Sampling	44
3.9.5 Monitoring Well Installation	45
3.9.6 Ground Water Sampling	46
3.10 Building 114 (Pest Control Area and Separator Pit) Site Investigation Work Plan	46
3.10.1 Site Specific Conditions	46
3.10.1.1 General Description and Current Conditions	46
3.10.1.2 Site History	47
3.10.1.3 Summary of Previous Site Investigation	47
3.10.2 Sampling Objectives	47
3.10.3 Site Reconnaissance	48
3.10.4 Soil Sampling	48
3.10.5 Monitoring Well Installation	49
3.10.6 Ground Water Sampling	50
3.11 Building 410 Site Investigation Work Plan	50
3.11.1 Site Specific Conditions	50
3.11.1.1 General Description and Current Conditions	50
3.11.1.2 Site History	51
3.11.1.3 Summary of Previous Site Investigations	51

TABLE OF CONTENTS
(Continued)

	PAGE
3.11.2 Sampling Objectives	51
3.11.3 Site Reconnaissance	52
3.11.4 Soil Sampling	52
3.11.5 Monitoring Well Installation	53
3.11.6 Ground Water Sampling	54
3.12 Building 530 (Missile Rework Operations)	54
3.12.1 Site Specific Conditions	54
3.12.1.1 General Description and Current Conditions	54
3.12.1.2 Site History	54
3.12.1.3 Summary of Previous Site Investigations	55
3.12.2 Sampling Objectives	55
3.12.3 Site Reconnaissance	56
3.12.4 Soil Sampling	56
3.12.5 Monitoring Well Installation	57
3.12.6 Ground Water Sampling	57
3.13 Building 400 (Missile Rework Operations) Site Investigation Work Plan	58
3.13.1 Site Specific Conditions	58
3.13.1.1 General Description and Current Conditions	58
3.13.1.2 Site History	58
3.13.1.3 Summary of Previous Site Investigations	58
3.13.2 Sampling Objectives	59
3.13.3 Soil Reconnaissance	59
3.13.4 Soil Sampling	60

TABLE OF CONTENTS
(Continued)

	PAGE
3.13.5 Monitoring Well Installation	60
3.13.6 Ground Water Sampling	61
3.14 Building 14 (Test Shop) Site Investigation Work Plan	61
3.14.1 Site Specific Conditions	61
3.14.1.1 General Description and Current Conditions	61
3.14.1.2 Site History	62
3.14.1.3 Summary of Previous Site Investigations	62
3.14.2 Sampling Objectives	62
3.14.3 Site Reconnaissance	63
3.14.4 Soil Sampling	63
3.14.5 Monitoring Well Installation	64
3.14.6 Ground Water Sampling	64
3.15 Building 10 (Power Plant) Site Investigation Work Plan	65
3.15.1 Site Specific Conditions	65
3.15.1.1 General Description and Current Conditions	65
3.15.1.2 Site History	65
3.15.1.3 Summary of Previous Site Investigations	65
3.15.2 Sampling Objectives	66
3.15.3 Site Reconnaissance	67
3.15.4 Soil Sampling	67
3.15.5 Monitoring Well Installation	68
3.15.6 Ground Water Sampling	68

TABLE OF CONTENTS
(Continued)

	PAGE
3.16 Oil Refinery Site Investigation Work Plan	69
3.16.1 Site Specific Conditions	69
3.16.1.1 General Description and Current Conditions	69
3.16.1.2 Site History	69
3.16.2 Sampling Objectives	69
3.16.3 Site Reconnaissance	70
3.16.4 Soil Sampling	70
3.16.5 Monitoring Well Installation	70
3.16.6 Ground Water Sampling	70
3.17 Fire Training Area Site Investigation Work Plan	71
3.17.1 Site Specific Conditions	71
3.17.1.1 General Description and Current Conditions	71
3.17.1.3 Summary of Previous Site Investigations	71
3.17.2 Sampling Objectives	71
3.17.3 Site Reconnaissance	72
3.17.4 Soil Sampling	72
3.17.5 Monitoring Well Installation	73
3.17.6 Ground Water Sampling	73
3.18 Buildings 301 and 389 Site Investigation Work Plan	74
3.18.1 Site Specific Conditions	74
3.18.1.1 General Description and Current Conditions	74
3.18.1.2 Site History	74
3.18.1.3 Summary of Previous Investigations	74

TABLE OF CONTENTS
(Continued)

	PAGE
3.18.2 Sampling Objectives	75
3.18.3 Site Reconnaissance	75
3.18.4 Soil Sampling	75
3.18.5 Monitoring Well Installation	76
3.18.6 Ground Water Sampling	76
3.19 Cans C-2 Area Site Investigation Work Plan	77
3.19.1 Site Specific Conditions	77
3.19.1.1 General Description and Current Conditions	77
3.19.1.2 Site History	77
3.19.1.3 Summary of Previous Site Investigations	78
3.19.2 Sampling Objectives	78
3.19.3 Site Reconnaissance	78
3.19.4 Soil Sampling	78
3.19.5 Monitoring Well Installation	79
3.19.6 Ground Water Sampling	80
3.20 Seaplane Lagoon Site Investigation Work Plan	80
3.20.1 Site Specific Conditions	80
3.20.1.1 General Description and Current Conditions	80
3.20.1.2 Site History	81
3.20.1.3 Summary of Previous Site Investigations	81
3.20.2 Sampling Objectives	82
3.20.3 Site Reconnaissance	82
3.20.4 Sediment and Water Sampling	83

TABLE OF CONTENTS
(Continued)

	PAGE
3.21 Station Sewer System Site Investigation Work Plan	84
3.21.1 Site Specific Conditions	84
3.21.1.1 General Description and Current Conditions	84
3.21.1.2 Site History	84
3.21.1.3 Summary of Previous Site Investigations	85
3.21.2 Sampling Objective	85
3.21.3 Site Reconnaissance	85
3.22 Yard D-13 Site Investigation Work Plan	86
3.22.1 Site Specific Conditions	86
3.22.1.1 General Description and Current Conditions	86
3.22.1.2 Site History	86
3.22.1.3 Summary of Previous Site Investigations	86
3.22.2 Sampling Objectives	87
3.22.3 Site Reconnaissance	87
3.22.4 Soil Sampling	87
3.22.5 Monitoring Well Installation	88
3.22.6 Ground Water Sampling	89
3.23 Estuary (Oakland Inner Harbor) Site Investigation Work Plan	89
3.23.1 Site Specific Conditions	89
3.23.1.1 General Description and Current Conditions	89

TABLE OF CONTENTS
(Continued)

		PAGE
3.23.1.2	Site History	90
3.23.1.3	Summary of Previous Site Investigations	90
3.23.2	Sampling Objectives	90
3.23.4	Sediment Sampling	91

REFERENCES

TABLES

FIGURES

LIST OF TABLES

TABLE NUMBER	TITLE
2.5.1	Parameters to be Analyzed for
2.5.2	Analytical Methods
2.5.3	Sample Analyses for NAS-Alameda Sites
3.1.1	Sample Types and Analyses/Rationale for 1943-56 Disposal Area
3.1.2	Number and Type of Samples to be Collected at 1943-1953 Disposal Site
3.2.2	Number and Type of Samples to be Collected at West Beach Landfill Site
3.3.1	Sample Types and Analyses/Rationale for Area 97
3.3.2	Number and Type of Samples to be Collected at Area 97
3.4.1	Sample Types and Analyses/Rationale for Building 360
3.4.2	Number and Type of Samples to be Collected at Site 360
3.5.1	Sample Types and Analyses/Rationale for Building 5
3.5.2	Number and Type of Samples to be Collected at Site 5
3.6.1	Sample Types and Anlyses/Rationale for Building 41
3.6.2	Number and Type of Samples to be Collected at Site 41
3.7.1	Sample Type and Analyses/Rationale for Building 459
3.7.2	Number and Type of Samples to be Collected at Site 459

LIST OF TABLES
(Continued)

TABLE NUMBER	TITLE
3.8.1	Sample Types and Analyses/Rationale for Building 547
3.8.2	Number and Type of Samples to be Collected at Site 547
3.9.1	Sample Types and Analyses/Rationale for Building 162
3.9.2	Number and Type of Samples to be Collected at Site 162
3.10.1	Sample Types and Analyses/Rationale for Building 114
3.10.2	Number and Type of Samples to be Collected at Site 114
3.11.1	Sample Types and Analyses/Rationale for Building 410
3.11.2	Number and Type of Samples to be Collected at Site 410
3.12.1	Sample Types and Analyses/Rationale for Building 530
3.12.2	Number and Type of Samples to be Collected at Site 530
3.13.1	Sample Types and Analyses/Rationale for Building 400
3.13.2	Number and Type of Samples to be Collected at Site 400
3.14.1	Sample Types and Analyses/Rationale for Building 14
3.14.2	Number and Type of Samples to be Collected at Site 14

LIST OF TABLES
(Continued)

TABLE NUMBER	TITLE
3.15.1	Sample Types and Analyses/Rationale for Building 10
3.15.2	Number and Type of Samples to be Collected at Site 10
3.16.1	Sample Types and Analyses/Rationale for Oil Refinery
3.16.2	Number and Type of Samples to be Collected at Oil Refinery Site
3.17.1	Sample Types and Analyses/Rationale for Fire Training Area
3.17.2	Number and Type of Samples to be Collected at Fire Training Area Site
3.18.1	Sample Types and Analyses/Rationale for Buildings 301 and 389
3.18.2	Number and Type of Samples to be Collected at Site of Buildings 301 and 389
3.19.1	Sample Types and Analyses/Rationale for Cans C-2 Area
3.19.2	Number and Type of Samples to be Collected at Site Cans C-2 Area
3.20.1	Sample Types and Analyses/Rationale for Seaplane Lagoon
3.20.2	Number and Type of Samples to be Collected from the Seaplane Lagoon
3.21.1	Sample Types and Analyses/Rationale for Station Sewer System

LIST OF TABLES
(Continued)

TABLE NUMBER	TITLE
3.22.1	Sample Types and Analyses/Rationale for Yard D-13
3.22.2	Number and Type of Samples to be Collected at Yard D-13
3.23.1	Sample Types and Analyses/Rationale for the Estuary
3.23.2	Number and Type of Samples to be Collected from the Estuary

LIST OF FIGURES

FIGURE NUMBER	TITLE
1.1	General Location Map
1.2	Remedial Investigation/Feasibility Study Sites
2.1	Proposed Area for Mobile Field Command Center and Decontamination Center
2.2	Field Command Center and Decontamination Pad
2.3	Decontamination Pit
2.4	Generalized Monitoring Well Construction Diagram
3.1	See Volume 1A for Figures on the 1943-1956 Disposal Area
3.2	See Volume 1A for Figures on the West Beach Landfill
3.3.1	Area 97 Sampling Locations
3.4.1	Building 360 Buried Utility Schematic
3.4.2	Building 360 Sampling Locations
3.5.1	Building 5 Buried Utility Schematic
3.5.2	Building 5 Sampling Locations
3.6.1	Building 41 Buried Utility Schematic
3.6.2	Building 41 Sampling Locations
3.7.1	Building 459 Buried Utility Schematic
3.7.2	Building 459 Soil Gas Survey Locations
3.7.3	Building 459 Sampling Locations
3.8.1	Building 547 Buried Utility Schematic
3.8.2	Building 547 Soil Gas Survey Locations
3.8.3	Building 547 Sampling Locations

LIST OF FIGURES
(Continued)

FIGURE NUMBER	TITLE
3.9.1	Building 162 Buried Utility Schematic
3.9.2	Building 162 Sampling Locations
3.10.1	Building 114 Buried Utility Schematic
3.10.2	Building 114 Sampling Locations
3.11.1	Building 410 Buried Utility Schematic
3.11.2	Building 410 Sampling Locations
3.12.1	Building 530 Buried Utility Schematic
3.12.2	Building 530 Sampling Locations
3.13.1	Building 400 Buried Utility Schematic
3.13.2	Building 400 Sampling Locations
3.14.1	Building 14 Buried Utility Schematic
3.14.2	Building 14 Sampling Locations
3.15.1	Building 10 Buried Utility Schematic
3.15.2	Building 10 Sampling Locations
3.16.1	Oil Refinery Site
3.17.1	Fire Training Area Sampling Locations
3.18.1	Building 301 and 389 Sampling Locations
3.19.1	Cans C-2 Area Sampling Locations
3.20.1	Seaplane Lagoon Sampling Locations
3.22.1	Yard D13 Sampling Locations
3.23.1	Estuary Sampling Locations

1.0 INTRODUCTION

1.1 Introduction

The Work Plan for the Remedial Investigation/Feasibility Study (RI/FS) at NAS Alameda consists of the following planning documents:

Volume 1	Sampling Plan
Volume 1A	Sampling Plan - SWAT Proposal Addendum
Volume 1B	Air Sampling Plan
Volume 2	Health and Safety Plan
Volume 3	Quality Assurance Project Plan - Quality Assurance/Quality Control Plan
Volume 4	Community Relations Plan
Volume 5	Project Management Plan/Schedule
Volume 6	Data Management Plan
Volume 7	Public Health and Environmental Evaluation Plan
Volume 8	Feasibility Plan

1.2 Work Plan Objectives

The objectives of the NAS Alameda site investigation work plan are to determine if contamination of soil and ground water has occurred in areas which have been identified as potential waste release sites. These objectives will:

1. Determine the nature and full extent of hazardous substance of contamination of air, soil, surface water and ground water at the site and contamination from the site, including off-site areas affected by the site;

2. Identify all existing and potential migration pathways, including the direction, rate and dispersion of contaminant migration, within and beyond the site;

3. Determine the magnitude and probability of actual or potential harm to public health or welfare or to the environment posed by the threatened or actual release of hazardous substances or hazardous wastes at the site;

4. Identify and evaluate appropriate remedial action to prevent future releases and mitigate any releases which have already occurred;

5. Collect and evaluate the information necessary to prepare a Remedial Action Plan in accordance with Section 25356.1 of the California Health and Safety Code.

This Remedial Investigation Work Plan, while initiated under the Naval Assessment and Control of Installation Pollutants (NACIP) program purview, has been written to satisfy the Comprehensive Environmental Response, Compensation, and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA/SARA) remedial investigation program developed by the U.S. Environmental Protection Agency (EPA). It is consistent with EPA guidance on CERCLA/SARA Remedial Investigation (RI) Work Plan development.

The sampling program will proceed in several stages, with elements of the FS to be conducted concurrently with the RI. Sampling during the initial stage will be limited to that necessary for development of a general understanding and characterization of the sites. This program uses the following documents as a primary guidance for its implementation:

1. The California Site Mitigation Decision Tree Manual, California Department of Health Services, 1986.

2. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, U.S. Environmental Protection Agency, 1988.

Data from the initial stage will be used as a part of the FS to evaluate potential remedial alternatives.

Identification of the alternatives will allow the subsequent sampling stages to focus an specific data requirements. Any data gaps pertaining to the feasibility analysis of the alternatives will be addressed in the subsequent sampling stages.

This staged method will enable this sampling program to be directed toward accumulating data relevant to remedial action selection. By targeting the sampling and analysis data, quality can be maximized and collecting of unnecessary data will be minimized.

1.3 Past RI/FS Activities

The U.S. Navy started RI/FS studies of chemical concentrations in the soil and water at NAS Alameda under the Naval Assessment and Control of Installation Pollutants (NACIP) program. An Initial Assessment Study (IAS) was conducted by Ecology and Environment Inc. (E&E, 1983). The next investigation was a Confirmation Study (CS) of the sites identified for further investigation in the IAS. Wahler (1985) conducted work on the CS.

Canonie Environmental Services Corp. (Canonie) was retained by the Navy in February 1988 to review the EPA and DHS' comments concerning the IAS and CS reports; and develop a sampling plan to satisfy RI/FS guidance.

1.4 Geographical Description

The Alameda Naval Air Station (NAS) occupies the western tip of the Island of Alameda and is located in Alameda and San Francisco Counties, California. Alameda Island is found along the eastern side of San

Francisco Bay as shown on the location map (Figure 1-1). NAS Alameda occupies approximately 2,634 acres (Figure 1.2). Roughly 2,479 acres of the base are owned by the government, and 155 acres are leased from others. Approximately 1,526 acres of the air station is above water, and 1,108 acres is below water. The station also holds an aviation airspace easement for approximately 120 acres (Wahler, 1985).

The station is rectangular in shape, approximately 2 miles in length, and 1 mile in width. The station is essentially flat, with typical elevations of 10 to 15 feet above sea level. Much of the dry land portion of the station, including all of the western portion, occupies reclaimed marsh and open water which has been filled. A substantial proportion of the fill used in this reclamation is dredge spoils from San Francisco Bay and the so-called Oakland Estuary, which separates the island from the mainland just to the north (Wahler, 1985).

1.5 Geologic and Hydrologic Conditions

1.5.1 Geology

Most of the soil beneath the station area is moderately to poorly compacted silty sand and sand fill. The thickness of this unit ranges from 6 to 8 feet. Beneath the fill, soft silt clay (bay mud) extends to depths of 25 to 120 feet below the existing ground surface. The soil below the bay mud consists of loose to dense silty and clay sands, and stiff to very stiff sandy clays. The soils on the station are predominantly coarse textured, have a low water-holding capacity and, except for a small area on the west side next to the San Francisco Bay, the soils are well-drained. Soil depth ranges from 20 to 60 inches [Ecology and Environment (E&E), 1983].

Depth to bedrock at the site is not known. A map published by the Geological Survey (Radbruch, 1957) indicates that exploration borings made in the vicinity penetrated to depths up to 354 feet without encountering bedrock. A boring about 1-mile northwest of NAS Alameda encountered bedrock at an elevation of 433 feet (mean lower low water datum). Bedrock

at this location was described as yellow shale. In borings that did not reach bedrock, the soils consisted primarily of clays with interbedded sandy and gravelly layers.

There is no evidence of any fault traversing the site. However, the site is located approximately 6 miles west of the Hayward Fault and approximately 12.5 miles east of the San Andreas Fault. These faults are known to be active and have been the cause of major earthquakes in the past. Destructive earthquakes have occurred in the San Francisco Bay area in 1836, 1838, 1861, 1865, 1868, and 1906. Other less severe, but damaging earthquakes, have also occurred in the area (E&E, 1983).

1.5.2 Hydrology

There are no significant natural surface water drainages within the station. Precipitation is removed through infiltration, sheet-runoff, and artificial storm drainage. It is believed that essentially all surface and ground water leaving the station is discharged into the surrounding bay and estuary (Wahler, 1985). The average ground water underflow rate to the bay and estuary is believed to be 15 gal/day/foot of shoreline. However, for any significant segment of shoreline, this rate may vary significantly depending on a variety of factors including precipitation, drainage, grading, and soil permeability (E&E, 1983).

Significant quantities of ground water are first encountered at a depth of only a few feet, and recur in permeable sand zones throughout the underlying formations. Two wells completed in these lower zones were removed from service due to water quality problems (high background levels of naturally occurring mercury). Presently, one of these wells, the Army Well, was reactivated and is currently being used for irrigational purposes. However, in general, the ground water beneath Alameda Island is not considered a public drinking water supply, nor is it likely to be in the future (E&E, 1983).

2.0 FIELD INVESTIGATION APPROACH

The following subsections describe the procedures to be included as part of the field investigation program at NAS Alameda.

2.1 Mobilization

Organization is critical to the successful implementation of a field sampling plan. An integrated approach has been developed which allows maximum utilization of personnel and material in achieving the objectives of this sampling plan.

A mobile trailer will be used to serve as a command post and supply depot for the site investigation. The trailer will serve as a supply depot for all health and safety equipment, portable sampling equipment, sample jars and bottles, and sample shipping containers. The trailer will also contain copies of all maps and written information and instructions pertaining to the field investigation. All sample document and chain-of-custody forms needed to record and ship samples will be kept in the trailer.

The field trailer will also serve as a communication base for the coordination of field activities. If necessary, the field teams will be supplied with portable 2-way radios which will allow instant communication between the field teams and the command center. Field personnel will be made aware that unauthorized radio communication could interfere with the normal base operations and will broadcast using only radio frequencies and power levels which have been pre-approved by the Navy.

A fenced storage area with a lockable gate large enough to contain two drill trucks, two pick-up trucks, a steam generator, and material supplies such as hollow stem augers, casing PVC pipe, sand and cement. If an appropriate area cannot be allocated by the Navy for use during this field effort, such an area will be constructed.

The trailer should be situated next to the secured storage area to facilitate safety meetings to reduce the mobilization time each morning to a minimum. The ideal location would be isolated from normal base activities to minimize disruption of ongoing naval operations. It should also be a paved area to reduce any complications created by inclement weather and have restricted access to protect naval personnel during equipment decontamination. The site should also be easily accessible by equipment and personnel. The paved parking area west of Building 608 meets these criteria (see Figure 2-1). This proposed location is subject to review by and consent of the Navy.

A portable bathroom will be set up next to the field trailer for use by field personnel. The field trailer will require a telephone line feed and an electrical power line to conduct field operations. The consent and assistance of the Navy will be required to meet these requirements.

The decontamination of equipment is necessary to safeguard worker health, minimize the possibility of spreading of contamination, and ensure the accuracy of analytical results of samples collected with the equipment. All personnel and hand-held monitoring and sampling equipment will be decontaminated at each site (refer to the Health and Safety Plan for decontamination procedures).

The wash waters used for decontamination will be collected and stored in Department of Transportation (DOT) approved 55-gallon drums for later disposal. These drums will be stored either in the controlled equipment storage area or at a hazardous waste storage generator accumulation point designated by the Navy Project Coordinator. The choice of the appropriate storage area is subject to approval by the Navy Project Coordinator. Samples of wash water will be analyzed to determine whether the liquids can be disposed of onsite or whether they will require offsite disposal.

Any downhole equipment used in a boring must be decontaminated before reuse. Because many of the borings specified in this plan are shallow

(less than 15 feet), enough hollow stem auger equipment will be supplied to complete four 15 feet borings without reusing any downhole equipment. This will minimize the down-time associated with cleaning equipment between borings.

Where possible the recommended decontamination procedure is to clean all equipment at the site where it is used. Many of the sites to be investigated, however, are in high-traffic work areas. Most of these areas are paved and the areas of soil disrupted are extremely small. It is, therefore, believed that the danger posed by introducing contaminants into the air during soil investigation activities is minimal. In addition, the construction of a decontamination station at each site large enough to clean the heavy equipment would prove to be costly and time consuming, and cause major disruptions to ongoing work. While personnel decontamination and portable monitoring and sampling equipment decontamination can be conducted at each site, the decontamination of the truck and associated downhole equipment can be done at centralized decontamination stations. One such station (Figure 2-2) can be constructed near the mobile command center in a restricted area of the parking lot. Another decontamination station (Figure 2-3) should be constructed on the western side of the base to allow the decontamination of equipment used during the 1943-1956 Landfill and West Beach Landfill studies.

When all downhole equipment has been used at a site, all equipment used can be removed (by pick-up) to a decontamination area to be cleaned for reuse. If the work at a site is completed before all downhole equipment is used, then the drill truck will be loaded with the downhole equipment and driven to the decontamination area where it and all downhole equipment will be cleaned before use at another site.

2.2 Site Reconnaissance

The site reconnaissance phase will be conducted at each site before any field sampling activities occur. The purpose of the site reconnaissance is to: familiarize field personnel with the site; identify all potential work

hazards and obstructions; locate and designate specific sampling locations; define site specific health and safety procedures; and to develop work procedures that will create a minimum of disruption to ongoing work activities of base personnel in the area.

A site walkover will be conducted by field personnel to familiarize themselves with the site area. All potential work hazards such as overhead powerlines and areas of heavy equipment use will be noted.

Review of Navy station schematics has revealed a large number of subsurface utilities in the developed areas of the base. The approximate locations of these utilities have been displayed on the site figures. Many of the proposed soil boring locations needed for site characterization have been chosen to evaluate the soil conditions near certain types of utilities such as the industrial, storm, and sanitary sewer lines. All soil boring locations have been chosen to avoid dangerous utilities such as natural gas, steam, and electrical lines. It is absolutely necessary that the exact locations of these utilities be determined in the areas of investigation in order to: afford maximum protection to workers; minimize disruption to ongoing base activities; and optimize placement of sampling points in order to achieve the objectives of the sampling program. It will therefore be required that all subsurface utility lines be located by personnel from each of the corresponding utilities at each site and that these locations be marked on the surface of the site areas.

Field personnel will coordinate with the Navy Project Coordinator to confirm the presence and location of all subsurface utilities, underground tanks and other subsurface structures in the area to be investigated. The exact location of surface points where subsurface sampling will occur will be determined using this Navy information. All sampling points will be approved by the Navy Project Coordinator or designee before drilling work will begin. The locations of all subsurface utilities/surface obstructions and sampling points will be marked on the surface of paved areas with orange paint. Any sampling point located in unpaved areas will be flagged with a wooden stake.

A hollow stem auger cannot penetrate through concrete or metal plates. If a sampling point is located in an area with concrete paving, the concrete at that point will be removed by a crew using a jack hammer or concrete coring equipment. If a sampling point is covered with metal grating, this grating will be removed at that point by a crew using a cutting torch. In areas where soil gas monitoring is prescribed, sampling grids will be established to facilitate sampling during the data collection phase.

The site reconnaissance activities will also include the determination of the boundaries of exclusion zones, contaminant reduction zones and clean zones that will be observed during the data collection phase. Personnel decontamination areas will also be identified at this time.

2.3 Types of Samples

A multi-media sampling approach will be employed to characterize the nature and extent of contamination at the base and in the waters surrounding the base. Samples will be collected from the following media as part of this investigation:

- Soil;
- Water;
- Sediment.

At specific areas of the base, radiation surveys will be also conducted. Air monitoring and soil gas monitoring will be employed where applicable.

2.4 Drilling Procedures

All onsite drilling will be conducted using a mobile drilling truck capable of augering, mud rotary, air rotary, angle boring, and driving and retrieving split spoons. A 3-1/4 inch ID (inside diameter) continuous

flight, hollow stem auger will be used to advance all borings onsite. If this method does not prove feasible, then either the mud rotary or air rotary method shall be used.

The drilling truck, augers, drilling rods, bits, pumps, tubs, circulation hoses, and any other equipment which will be used during subsurface investigations will be steam-cleaned prior to its use at the site. All equipment used during the drilling of a borehole will be steam-cleaned prior to its reuse at any other boring location.

2.5 Analytical Methods

The types of chemical analyses to be performed on samples collected at the base are based upon the information gathered during the IAS, the Verification Study and the site visit. The specific chemicals to be analyzed for are shown in Table 2.5.1. These chemicals were grouped into the appropriate chemical class, each of which has a corresponding analytical method. The methods to be utilized in analyzing the chemicals as appropriate to the specific media to be sampled (water and soils/sediments) are shown in Table 2.5.2. The sample analyses and matrices to be sampled are shown on a site-specific basis in Table 2.5.3.

As described earlier in this RI work plan, site characterization sampling and analysis activities have been planned to generate data useful during formulation of remedial measures for confirmed sites. This sector of the RI work plan specifies the soils and ground water tests necessary to support formulation of remedies within the general response actions previously identified for each site. These data are supplemental to chemical/physical data already specified, and are directly related to engineered solutions such as cap installation, excavation (removal, excavation/treatment, and in situ treatment of contaminated soils), and treatment of contaminated ground waters. Data needs have been identified consistent with the EPA guidance "Data Needs For Selecting Remedial Action Technologies" (U.S EPA, 1987).

Site specific data needs are specified in Table 2.5.4.

2.6 Sampling Procedures

Soil sampling will be executed using either of the following methods. Soil samples from unpaved sites which require only shallow sampling (less than 3 foot depth) will be collected using a hand-held auger and an 18-inch or 12-inch split spoon samplers. Samples will be collected using the procedures described in section 5.3.2 of the Quality Assurance Project Plan (QAPP) and based on the EPA document entitled "Characterization of Hazardous Waste Sites - A Methods Manual", Vol II (EPA-600/4-84/075).

Soil samples from areas which require a deeper investigation will be collected using a split spoon sampler with a 24-inch length and a 2-inch outside diameter (OD). A soil sample is collected by driving the split spoon sampler into the ground with a 140 lb weight which is repeatedly raised 30 inches and dropped onto the top of the sampler. The spoon is advanced to a predetermined depth into the ground and then withdrawn and opened to retrieve a soil sample. The sampling intervals will be determined on a site by site basis. The split spoon sampler can be advanced ahead of the hollow stem augers by lowering the spoon down through the hollow center of the augers and then driving it into undisturbed soil below the mouth of the augers. A soil sample can be taken from the desired depth interval using this method.

After a split spoon is retrieved and opened, the sample recovery will be measured. The physical characteristics of the soils will be described using the Unified Soils Classification System and logged in the field log. In the event a change in strata is observed, a sample will be collected from each stratum (providing sufficient sample is available). Once collected, the samples will be given a unique sample number, logged onto a chain-of-custody form, placed on ice in a cooler and sent to a State of California approved laboratory for analysis. Chain-of-custody procedures are identified in section 6.1.2 of the QAPP.

After the collection of each sample, the split spoons will be decontaminated prior to reuse. The primary decontamination process will be steam cleaning. An alternative decontamination process consists of placing the split spoon into a wash tub containing Alconox detergent and tap water, and cleaning the spoon with a brush. Next, the spoon will be rinsed with tap water to remove all soap, and rinsed with hexane to remove any residual contaminants. The waste hexane will be collected and containerized for proper disposal. The spoon will be thoroughly rinsed with deionized water and allowed to air dry. Thin-walled tube samplers, if feasible, will be used to collect undisturbed soil samples for engineering parameter analysis. An undisturbed soil sample will be collected by hydraulically advancing a 24-inch long, 3-inch outside diameter thin-walled sampler ahead of the augers. After the sample has been retrieved the ends of the sampler will be sealed with aluminum foil and taped to retain the soil sample and to preserve the water content in the soil. The outside of the tube is indelibly marked with the site name, boring number and depth collected. The samples will be recorded using chain-of-custody procedures and sent to the appropriate soils laboratory for analyses.

Surface water samples will be collected using either Method III-1: Sampling Surface Waters Using a Dipper or Other Transfer Device or Method III-2: Use of Pond Sampler For the Collection Of Surface Water Samples. Method III-1 employs the use of a stainless steel or teflon container which can be used to transfer liquid samples from their source to a sample bottle. Using this method prevents unnecessary contamination of the outer surface of the sample bottle that occurs when the bottle is placed directly into the liquid medium. This method also allows a sample to be taken by a technician without the technician physically contacting the sampling medium.

Method III-2 is a modification of Method III-1. This method utilizes the same type of container as Method III-1 and adds an extension handle which allows retrieval of samples from areas beyond the normal reach of a technician. This method can be useful when water samples are collected from piers or the deck of a floating sampling platform.

Ground water samples will be collected from wells using Method III-9: Sampling Monitoring Wells With a Bucket-Type Bailer after they have been purged using the methods described in section 5.3.3.2 of the QAPP. Method III-9 employs a bucket-type bailer equipped with a check valve on the bottom to collect liquid samples. A stainless steel or teflon bailer will be used to collect samples.

Sediment samples will be collected from the Oakland Estuary and the Seaplane Lagoon using either Method II-5: Sampling Bottom Sludges or Sediments With a Gravity Cover or Method II-6: Sampling Bottom Sludges or Sediments With a Ponar Grab. The gravity corer is a metal tube with a removable nose piece on the bottom and a check valve on the top which is dropped into the sediment to retrieve a sample. The check valve allows water to flow through the cover as it drops to the bottom. The removable nose piece can be fitted with a core-catching device to help retain core samples. The coring device can be fitted with additional weights to increase penetration depth. The Ponar grab sampler is a clamshell-type scoop which is lowered through the water to the sediment below. The scoop can be closed from the surface to retrieve a sample. The Ponar sampler and the enclosed sample are then raised to the surface.

All sampling equipment will be decontaminated before use and prior to reuse. The decontamination procedure to be used employs the steps described in the decontamination of split spoons.

2.7 Chain-of-Custody and Document Control

All of the chain-of-custody and document control procedures described in Volume 3, The Quality Assurance Project Plan (QAPP), of the RI/FS Work Plan, will be followed.

A document and sample accounting and control mechanism will be established and employed during the execution of the field investigation program at the NAS Alameda. This accounting and control system will facilitate rapid and efficient access to all data collected during the field investigation. This system will also ensure that all laboratory results of samples collected during the field investigation are scientifically and legally defensible.

A chain-of-custody and document control system based on EPA guidelines will be employed during this field investigation. All sample custody and document control procedures and requirements outlined in the Quality Assurance Project Plan (QAPP) in Volume 3 of this workplan will be followed during the RI/FS. The EPA control and accounting system can be found in the EPA document entitled "Characterization of Hazardous Waste Sites - A Methods Manual," Vol II (EPA/600/4-84/075).

2.8 Well Surveying

All wells installed at the NAS Alameda facility will be surveyed and tied into existing benchmarks to ensure proper elevation control. This will allow an evaluation of the ground water flow patterns and tidal influences at the base.

Figure 2.4 is a generalized well construction design. Survey control points will be established to marks at the top of casings.

3.0 SITE SPECIFIC SAMPLING PLANS

The following section contains site specific sampling plans for the NAS Alameda field investigations. The following sites have been identified for investigation:

1) 1943-1956 Disposal Area;
2) West Beach Landfill;
3) Area 97;
4) Building 360 (Plating Shop, Engine Cleaning Shop, Paint Stripping Shop and Paint Shop);
5) Building 5 (Plating Shop, Paint Stripping Shop, Cleaning Shop, and Paint Shop).
6) Building 41;
7) Building 459, Building 547, and Building 162;
8) Building 114,
9) Building 410;
10) Building 400 and Building 530;
11) Building 14;
12) Building 10;
13) Oil Refinery;
14) Fire Training Area;
15) Buildings 301 and 389;
16) Cans C-2 Area;
17) Seaplane Lagoon;
18) Station Sewer System;
19) Yard D-13; and
20) Estuary (Oakland Inner Harbor).

The subsections of Section Three are individual site-specific sampling plans. The sites are addressed in the above order. Because some sites have multiple components, the subsection numbers do not correspond to the site numbers.

3.1 1943-1956 Disposal Area Site Investigation Sampling Plan

The sampling plan for the 1943-1956 Disposal Area, that satisfies the requirements of the Solid Waste Assessment Test (SWAT) proposal, is presented in Addendum A. Addendum A of this sampling plan is submitted as a separate document.

3.2 West Beach Landfill Site Investigation Sampling Plan

The sampling plan for the West Beach Landfill area is also presented in Addendum A, which is submitted as a separate document. The sampling plan for the West Beach Landfill satisfies the requirements of the SWAT proposal.

3.3 Area 97 Site Investigation Sampling Plan

3.3.1 Site Specific Conditions

3.3.1.1 General Description and Current Conditions

Area 97 is located immediately west of the East Gate (Figure 3.3.1). The focal point of the area is a 2-acre parcel, which previously contained five partially buried 100,000-gallon aviation gasoline (AVGAS) tanks. The zone potentially effected by leakage from the tanks is approximately 30 to 40 acres in size.

Since removal of the tanks, the central section has remained an area of exposed soil. Currently, the site is being landscaped; as of March, 1988, an aircraft had been mounted centrally in the area as an exhibit, and lawn sprinkler ditches were being installed prior to seeding and planting.

3.3.1.2 Site History

In 1975, it was discovered that three of the five AVGAS tanks were leaking. They were subsequently drained, cleaned, and filled with water. In 1978, one of the remaining two tanks was also discovered to be leaking, and consequently both tanks were drained and filled with water. Based on tank inventories, approximately 365,000 gallons of 115/145 AVGAS were estimated to have leaked from Area 97 during the late 1960s and early 1970s. These leakages have caused gasoline vapor problems in both sewer and electrical manholes, with reported incidences of explosion and fire. As of 1987, none of the five tanks remained standing in Area 97. The concrete tanks were destroyed and buried in place.

3.3.1.3 Summary of Previous Site Investigations

In response to the identification of significant leakages and hazardous conditions resulting from gasoline vapors, Kennedy Engineers was contracted in July, 1979 to investigate the extent of subsurface fuel contamination in the vicinity of Area 97. The report, dated January 17,1980 (Kennedy,1980), concluded that an area of approximately 5-1/2 acres of subsoil was affected by fuel contamination. No pooled fuel was found to be floating on the water table, suggesting that the fuel had drained through the soil and infiltrated subsurface utility lines. Fuel vapor concentrations in the explosive range Figure 3.3.1. were detected in sanitary sewer lines and high concentrations were also detected in electrical ducts and storm drains. During the course of the Kennedy investigation, a total of 18 observation wells were installed and sampled. A subsequent investigation was conducted by Wahler Associates, as part of the verification step of the NACIP confirmation study (Wahler, 1985). Wahler resampled 12 of the wells installed by Kennedy Engineers and installed and sampled three new wells.

AVGAS was detected at significant levels in ground water, and lead was also detected at elevated levels during the Wahler study. Some of the installed monitoring wells were destroyed prior to or during the recent landscaping.

3.3.2 Sampling Objectives

The sampling objectives for Area 97 are to define the full extent of the migration and subsequent contamination of the site. Further sampling of ground water, subsurface soil, utility ducts and sewage lines is necessary to adequately evaluate the extent of a AVGAS contamination and the severity of fuel vapor build-up.

Because of the large area of suspected contamination, sample coverage from Buildings 14, 162, and 360 will be used in conjunction with the three additional sampling locations for Area 97.

The objective of the soil gas survey for Area 97 is to provide data for areas where there is inadequate ground water and/or soil samples to define the extent of contamination migration.

The types of samples to be collected and analyses to be performed have been developed using information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS. The sample types and analyses for Area 97 can be seen in Table 3.3.1.

3.3.3 Site Reconnaissance

The specific objective of the Area 97 site reconnaissance is to define the optimum placement of the 100-foot soil gas grid. The actual sampling locations will be contingent on such factors as local traffic, subsurface hazards, surface conditions, and available power supply.

3.3.4 Soil Gas Monitoring Survey

Soil gas monitoring will be used to define the petroleum hydrocarbon contaminant plume and to determine the optimal placement of proposed monitoring wells and/or soil borings (Figure 3.3.1) in Area 97. A 100-foot sampling grid will be established during the site reconnaissance phase of the investigation (Figure 3.3.1). The soil gas survey will be performed using a truck-mounted system equipped with a gas chromatograph.

3.3.5 Soil Sampling

Figure 3.3.1 shows all subsurface utilities and obstructions identified on the Area 97 site during review of Navy maps and documents. Figure 3.3.1 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.3.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.3.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil

samples is presented in Table 3.3.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch.

Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.3.6 Monitoring Well Installation

Table 3.3.2 and Figure 3.3.1 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.3.7 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.3.2. These samples will be analyzed for the parameters listed in Table 3.3.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells in Area 97 after the wells have been installed, developed, and allowed a sufficient recovery time. Samples will also be collected from the active wells installed during the 1979 and 1985 investigations. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.3.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and

the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.4 Building 360 (Plating, Engine Cleaning, Paint, and Paint Stripping Shops) Site Investigation Work Plan

3.4.1 Site Specific Conditions

3.4.1.1 General Description and Current Conditions

Building 360 occupies an area of approximately 5-1/2 acres near the eastern perimeter of the base (Figure 3.4.1). The building, in operation since 1954, houses a number of specialized process shops for the repair and testing of aircraft engines. Building 360 contains machine shops, a paint and cleaning shop, and a plating shop similar to those located in Building 5.

Processes in the plating shop include paint stripping by blasting; chrome, silver, and nickel stripping; etching; and chrome, silver, nickel, and copper plating. Cyanide and chromium processes are separated into two areas and have separate sumps. Untreated rinse water from cyanide processes enters the industrial waste collection system at approximately 5,400 gal/day. Chromium-bearing wastewaters are discharged to the industrial waste treatment facility prior to discharge to the industrial waste collection system (E&E, 1983).

Processes in the cleaning and blasting shop use baths of phenolic-base cleaners, alkaline-type cleaners, rust removers, descaling compounds, and caustics. Wastewaters are discharged to the industrial waste collection system at approximately 13,000 gal/day (E&E, 1983). At present, baths are dumped into tanks and disposed of off-base by contractors. Spent solvents are recovered to the extent possible.

In the plating shop, relatively small machine parts are painted in four paint spray booths, using similar techniques as in Building 5. Water used to control spray and solvent vapors is collected in a tank beneath the booths and reused until contaminant levels become excessive. Water is then discharged to 55 gallon drums and disposed of off-base. The paint shop also uses two degreasing tanks containing 1,1,1-trichloroethane.

3.4.1.2 Site History

As is the case at Building 5, the majority of processes that have occurred in Building 360 in the past are still in operation, although waste disposal practices have been modified. Prior to 1975, wastes from the plating shop were directly discharged to the Seaplane Lagoon. In addition, paint sludges and spent degreasing agents were routinely disposed of in the West Beach Landfill. Both trichloroethene and carbon tetrachloride were used in the degreasing process from 1950 to 1970. These agents were known to have entered the sewer system through spillage and parts rinsing.

3.4.1.3 Summary of Previous Site Investigations

As part of the NARF Industrial Waste Survey conducted in 1981, rinse composite samples from Building 360 were analyzed. Results showed the presence of low levels of metals and some organics (E&E, 1983). No ground water or soil sampling has been performed in the vicinity of Building 360. Soil samples taken from beneath the plating shop showed a high alkalinity and high levels of cyanide.

3.4.2 Sampling Objectives

The objectives of the Building 360 sampling plan is to determine if contamination has been introduced to the subsurface from surface spills or leaks in the subsurface sewer system in areas other than the plating shop. The site will be visually inspected for evidence of surface spills and

releases. Any surface areas exhibiting evidence of gross surface contamination will be investigated. Further sampling will be undertaken beneath the plating shop to provide a better representation of the nature and extent of the contamination.

Soil borings will be advanced around the perimeter of the building near junction points of sewers which received effluent from these areas (Figure 3.4.2) on the basis that these junctions would be more likely to leak, and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

In addition to the building perimeter sampling, it is proposed that a sample grid be placed beneath the area of the plating shop on the western side of Building 360. Therefore, samples will be taken every 10 feet beneath the plating shop to accurately assess the extent of contamination in this area. The samples will be taken by hand.

Monitoring wells will be installed (Figure 3.4.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

A site-specific and analytical sampling plan has been developed for the Building 360 area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the March, 1988 site visit, review of existing reports, and the comments and concerns of the EPA and DHS.

The proposed sample types and analyses for Building 360 can be seen in Table 3.4.1.

3.4.3 Site Reconnaissance

See Section 2.2.

3.4.4 Soil Sampling

Figure 3.4.1 shows all subsurface utilities and obstructions identified at site 360 during review of Navy maps and documents. Figure 3.4.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.4.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.4.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.4.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.4.5 Monitoring Well Installation

Table 3.4.2 and Figure 3.4.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.4.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.4.2. These samples will be analyzed for the parameters listed in Table 3.4.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.4.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.5 Building 5 (Plating, Paint Stripping, Cleaning, and Paint Shops) Site Investigation Work Plan

3.5.1 Site Specific Conditions

3.5.1.1 General Description and Current Conditions

Building 5 occupies an area of approximately 18-1/2 acres between First and Second Streets (Figure 3.5.1). The building was constructed in 1942, and houses a variety of activities including cleaning, reworking and manufacturing of metal parts; tool maintenance; plating; painting, paint stripping, and conversion coating.

Operations in the plating shop include degreasing, caustic and acid etching, metal stripping and cleaning; and chrome, nickel, silver, cadmium, and copper plating. Wastes include rinse tank wastewater, concentrated bath dumps, plating tank sludges, caustic cleaners, and cyanide stripper bath dumps. Cyanide and chromium processes are in separate areas. Since 1975, chromium process wastewaters have been discharged to the industrial waste treatment at 19,200 gal/day. Cyanide process wastewaters are discharged directly to the industrial sewer system at 14,400 gal/day. Depending upon production rates, some baths are dumped 0 to 4 times/year. Since 1970, baths have been pumped and waste stored for offsite disposal (E&E, 1983).

Operations in the paint shops include two paint bays and several spray paint booths. Small amounts of water leak to the industrial waste collection system. The paint bay recirculation sump is pumped quarterly and disposed of offsite. Wastewater contains high levels of chromium, zinc, iron, COD, and phenol and is now being treated. Average daily flow is approximately 5,000 gal/day (E&E, 1983).

Paint stripping operations include paint stripping and conversion coating of airframe parts which use phenolic stripping compounds (spray-on/rinse-off) producing large volumes of rinse water. Wastewaters contain high levels of phenol (4,000 ppm at times), methylene chloride, chromium, oil and grease. Conversion operations use primer with chromate, activators, and dissolved aluminum and iron. Wastewaters have a high pH, aluminum, chromium and iron, and are discharged to the industrial waste treatment facility (E&E, 1083).

All operations in Building 5 generate miscellaneous nonsewerable wastes including oil, grease, spent solvents, old paints and sludges, detergents, and discarded stripping and cleaning agents.

3.5.1.2 Site History

The majority of processes and activities that have occurred in Building 5 in the past are still in operation and are described above. Some of the waste disposal practices have changed during the course of operations at Building 5. The historical disposal practices are summarized below.

Prior to 1970, the contents of the plating baths were directly discharged to the industrial waste collection system or to the West Beach Landfill. Similarly, many of the rinse waters and wastewaters from paint stripping operations were discharged through floor drains to the industrial waste collection system. While no major spills or releases are documented at Building 5, tanks have reportedly overflowed on several occasions, releasing untreated waste to the storm drains (E&E, 1983).

3.5.1.3 Summary of Previous Site Investigations

One study conducted in 1981 by Post, Buckley, Schuh & Jernigan, Inc., analyzed the content of wastewater from the various processes housed in Building 5. Summary tables presented in the Initial Assessment Study (E&E, 1983), indicate elevated levels of metals, phenols, and some volatile

organics. No sampling of ground water or soils has been performed in the vicinity of Building 5.

3.5.2 Sampling Objectives

The objective of the Building 5 sampling plan is to determine if contamination has been introduced into the subsurface from surface spills or from leaks in the subsurface sewer system. The types of samples to be collected and the analyses to be performed have been developed on the basis of information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS.

Soil borings will be advanced around the perimeter of the building near the junction points of sewers which receive effluent from these areas. These junctions would be more likely to leak and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

The potential for subsurface contamination exists from several work areas located inside Building 5. These areas are: the hangar and open bay areas used for paint stripping in the south central portion of the building; the painting area in the northeast corner of the building; the engine testing area in the northwest corner of the building; the plating shop located in the center of the building; and the painting shop in the south central area of the building.

Monitoring wells will be installed in selected borings (Figure 3.5.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

The proposed sample types and analyses for Building 5 along with the rationale for the analyses can be seen in Table 3.5.1.

3.5.3 Site Reconnaissance

See Section 2.2.

3.5.4 Soil Sampling

Figure 3.5.1 shows all subsurface utilities and obstructions identified at Building 5 during review of Navy maps and documents. Figure 3.5.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.5.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samples will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.5.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.5.1.

All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.5.5 Monitoring Well Installation

Table 3.5.2 and Figure 3.5.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.5.6 Ground Water Sampling

A ground water sample will be collected from the wells listed in Table 3.5.2. These samples will be analyzed for the parameters listed in Table 3.5.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the well has been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analysis of the ground water parameters listed on Table 3.5.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.6 Building 41 (Aircraft Intermediate Maintenance Department) Site Investigation Work Plan

3.6.1 Site Specific Conditions

3.6.1.1 General Description and Current Conditions

Building 41, formerly used as a hanger for seaplanes, is currently occupied by the Aircraft Intermediate Maintenance Department (AIMD). The building is one of several hangers located along the northern boundary of the seaplane lagoon. Building 41 is located the farthest east of the group (Figure 3.6.1). Activities in this building primarily involve the intermediate repair of aircraft components for transient and tenant aircraft. Items repaired include: hydraulics; brakes; avionics; engines; electrical wiring; and instrumentation.

Current conditions, described below, are based on observations made during a site visit in March, 1988. A tank containing paint stripper is located outside Building 41, on the west side of the building. Approximately 30 55-gallon drums containing a variety of wastes are also located immediately west of the building. No obvious visible signs of contamination are apparent although a storm drain is located immediately adjacent to the paint stripping tank and appears to have received some contamination from the stripping operations. A new concrete pad is present on the west apron to the hanger.

3.6.1.2 Site History

Building 41 formerly housed 55-gallon drums which were used to store wastes from ongoing repair and maintenance activities. Chemicals stored in the building included: PD680 dry cleaner; trichlorofluoroethane; 6083 oil; trichloroethane; paint wastes and strippers; and used hydraulic fluids. AIMD personnel have previously stated that more than 100 55-gallon drums

containing various wastes were stored on the paved area west of the building (E&E,1983).

No known spills have been documented at Building 41, although rinse waters from the paint-stripping tank located on the outer west side of the building flowed into a sewer manhole which discharged to the East Bay Municipal Utility District (EBMUD) system.

3.6.1.3 Summary of Previous Site Investigations

No sampling of media in the immediate vicinity of Building 41 has been performed to determine whether contamination exists. Historical information describing site activities were collected during the Initial Assessment Study conducted by Ecology and Environment, Inc. (E&E,1983); however, no further investigation was conducted in the verification step on the basis of this information.

3.6.2 Sampling Objectives

The objectives of the Building 41 sampling plan is to determine if contamination has been introduced to the subsurface from surface spills or leaks in the subsurface sewer system. The site will be visually inspected for evidence of surface spills and releases. Any surface areas exhibiting evidence of gross surface contamination will be investigated.

A soil boring will be advanced in the paint stripping area on the southwestern end of the building. Rinse waters from paint stripping activities flow down into the storm sewer system in this area.

Soil borings will be advanced around the perimeter of the building near the junction points of sewers which received effluent from these areas (Figure 3.6.2) since these functions would be more likely to leak, and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

Monitoring wells will be installed (Figure 3.6.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

The types of samples to be collected and analyses to be performed have been developed using information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS.

The proposed sample types and analyses for Building 41 can be seen in Table 3.6.1.

3.6.4 Soil Sampling

Figure 3.6.1 shows all subsurface utilities and obstructions identified at Building 41 during review of Navy maps and documents. Figure 3.6.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.6.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samples will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.6.2. The order in which these samples are

collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.6.1.

All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.6.5 Monitoring Well Installation

Table 3.6.2 and Figure 3.6.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.6.6 Ground Water Sampling

A ground water sample will be collected from the wells listed in Table 3.6.2. These samples will be analyzed for the parameters listed in Table 3.6.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the well has been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analysis of the ground water parameters listed on Table 3.6.1. Refer to section 5.3.2 of the QAPP for information

regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.7 Building 459 (Service Station) Site Investigation Work Plan

3.7.1 Site Specific Conditions

3.7.1.1 General Descriptions and Current Conditions

Building 459 is an active gasoline station located approximately 1/2-mile north of the east gate, on the perimeter of the station (Figure 3.7.1). The gas station is operated by the Navy Exchange, and has been functional for 24 years.

There are currently four subsurface stainless steel tanks located on the northern boundary of the gas station, each of which have an approximate capacity of 10,000 gallons. Three of the four tanks are used at present and contain gasoline. The fourth tank has been taken out of service due to suspected leakage. There is also one subsurface steel tank located adjacent to an auto shop on the western side of site 459, which reportedly contains waste oils from auto maintenance activities. The tank is periodically emptied, but has been known to overflow on occasions.

3.7.1.2 Site History

In addition to the four gasoline tanks currently located on site 459, there were two tanks that were installed at an earlier date. These have been removed as a result of leakage. During this removal action, a visible oil sheen was reported in the pipeline trenches. This area has since been backfilled and paved.

3.7.1.3 Summary of Previous Site Investigations

No sampling and analysis of soil or ground water has been performed at site 459. However, a tank testing study on NAS Alameda, which included site 459, was recently completed by Environmental Resources Management (ERM-West, 1987). Results of this study showed that three of the four tanks at 459 had plumbing leaks. The fourth tank, as previously discussed, had been removed from service at an earlier date.

3.7.2 Sampling Objectives

The objective of the sampling at the Building 459 site is to define the full extent of contaminant migration in the subsurface media from past operations. The types of samples to be collected and analyses to be performed have been developed using information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS. The proposed sampling and analyses for Building 459 can be seen in Table 3.7.1.

3.7.3 Site 459 Reconnaissance

The objectives of the site 459 reconnaissance are to locate the boundaries of the underground storage tanks and the fuel lines leading from the tanks to the gas pumps. At this time, the 50-foot soil gas grid should be laid out to maximize sampling and minimize the disruption of normal traffic.

For a general overview of site reconnaissance procedures and further objectives, refer to Section 2.2.

3.7.4 Soil Gas Monitoring Survey

Soil gas monitoring will be used to define the petroleum hydrocarbon contaminant plume and to determine the optimal placement of proposed monitoring wells and/or soil borings (Figures 3.7.2 and 3.7.3) in the

Building 459 area. A 50-foot sampling grid will be established during the site reconnaissance phase of the investigation (Figure 3.7.2).

3.7.5 Soil Sampling

Figure 3.7.1 shows all subsurface utilities and obstructions identified at the Building 459 site during review of Navy maps and documents. Figure 3.7.3 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.7.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.7.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.7.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.7.6 Monitoring Well Installation

Table 3.7.2 and Figure 3.7.3 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.7.7 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.7.2. These samples will be analyzed for the parameters listed in Table 3.7.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells shown in Figure 3.7.3 after the wells have been installed, developed, and allowed a sufficient recovery time. Sampling will also include the existing wells at the site. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.7.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.8 Building 547 (Service Station) Site Investigation Work Plan

3.8.1 Site Specific Conditions

3.8.1.1 General Description and Current Conditions

Building 547 is an on-base annex service station, also accessible from outside the base. It is located midway between the east and south gates, on the perimeter of the base, and was constructed in 1971 (Figure 3.8.1). Currently, the annex station is not in operation, as a result of a possible tank rupture. Tanks were tested and found to be sound. Feed lines were leaking and were dug up and replaced. There are three 12,000-gallon subsurface fiberglass tanks on the site, which were installed in 1971. In addition, there are two stainless steel waste oil tanks located on the northwestern corner of site 547. One has a 5,000 gallon capacity, the other a 10,000 gallon capacity.

3.8.1.2 Site History

As previously mentioned, one of the 12,000-gallon fiberglass tanks at site 547 was ruptured in 1980 when a measuring dipstick was dropped into the bottom of the tank. It was assured that water infiltrated the tanks, rather than gasoline escaping, since all of the tanks were below the water table. However, this tank is no longer used for gasoline storage. No other problems have been reported at the 547 annex station.

3.8.1.3 Summary of Previous Site Investigations

Site 547 was included in the NAS Alameda tank testing survey, conducted by Environmental Resources Management in 1987. Two of the tanks were discovered to have plumbing leaks (ERM-West, 1987).

3.8.2 Sampling Objectives

The objective of the sampling at the Building 547 sampling plan is to define if contamination has been introduced into the subsurface from surface spills or from leaks in the subsurface sewer system. The types of samples to be collected and analyses to be performed have been developed on the basis of information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS. The proposed sampling and analyses for Building 547 along with the rationale for the analyses can be seen in Table 3.8.1.

3.8.3 Site 547 Reconnaissance

The objectives of the site 547 reconnaissance are to locate the boundaries of the underground storage tanks and the fuel lines leading from the tanks to the gas pumps. The boring and monitoring well position shown in Figure 3.8.3 are examples of location selections that should be used for the site 547 tank and fuel line location. Final locations will be based on the exact tank and line locations. The 50-foot soil gas grid will be laid out at this time to maximize sampling and minimize disruption of daily traffic.

For a general overview of site reconnaissance procedures and further objectives, refer to Section 2.2.

3.8.4 Soil Gas Monitoring Survey

Soil gas monitoring will be used to define the petroleum hydrocarbon contaminant plume and to determine the optimal placement of proposed monitoring wells and/or soil borings (Figures 3.8.2 and 3.8.3) in the Building 459 area. A 50-foot sampling grid will be established during the site reconnaissance phase of the investigation (Figure 3.8.2).

3.8.5 Soil Sampling

Figure 3.8.1 shows all subsurface utilities and obstructions identified at the Building 547 site during review of Navy maps and documents. Figure 3.8.3 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.8.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.8.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.8.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.8.6 Monitoring Well Installation

Table 3.8.2 and Figure 3.8.3 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.8.7 Ground Water Sampling

Ground water samples will be collected from the monitoring wells listed in Table 3.8.2. These samples will be analyzed for the parameters listed in Table 3.8.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells shown in Figure 3.8.3 after the wells have been installed, developed, and allowed a sufficient recovery time. Sampling will also include the existing wells at the site. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.8.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.9 Building 162 (Service Station) Site Investigation Work Plan

3.9.1 Site Specific Conditions

3.9.1.1 General Description and Current Conditions

Building 162 occupies an area formerly used by the Navy Exchange as a service station (Figure 3.9.1). No information could be located as to the presence of subsurface tanks, and no evidence could be located during a site visit in March, 1988 to suggest the presence of any tanks.

3.9.1.2 Site History

Despite numerous discussions with NAS Alameda personnel and record reviews, no information has been located describing the presence of underground storage tanks at site 162 (former location of a Navy Exchange Service Station). Possibly only administrative activities by the Naval Exchange occurred at this site.

3.9.1.3 Summary of Previous Site Investigations

Historical information relating to site 162 is virtually nonexistent. As stated in the IAS, any leakage that might have occurred at this site in the past, would in all likelihood be obscured by the more recent and sizeable

loss of AVGAS from Area 97. Contamination of this area will, therefore, be characterized as part of the Area 97 investigation.

3.9.2 Sampling Objectives

The objective of the Building 162 sampling plan is to determine if contamination has been introduced into the subsurface from surface spills or from leaks in the subsurface sewer system. The types of samples to be collected and the analyses to be performed have been developed on the basis of information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS.

Sampling locations to be used for the characterization of contamination from the service station previously located at the Building 162 site are Building 14-2 (MW 14-2), Buildings 14-3 and 97-3 (MW 97-3), OW-21, OW-2, and OW-8 (Figure 3.9.2).

The proposed sample types and analyses for Building 162 along with the rational for the analyses can be seen in Table 3.9.1.

3.9.3 Site Reconnaissance

Refer to the Building 14 and Area 97 site reconnaissance sections, as well as Section 2.2.

3.9.4 Soil Sampling

Figure 3.9.1 shows all subsurface utilities and obstructions identified at Building 162 during review of Navy maps and documents. Figure 3.9.2 illustrates the proposed soil boring locations included in this study. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.9.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 10 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.9.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.9.1.

All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch.

Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.9.5 Monitoring Well Installation

Table 3.9.2 and Figure 3.9.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.9.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.9.2. These samples will be analyzed for the parameters listed in Table 3.9.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the wells shown in Figure 3.9.2, these include wells installed during the 1980 and 1985 investigations. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.9.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.10 Building 114 (Pest Control Area and Separator Pit) Site Investigation Work Plan

3.10.1 Site Specific Conditions

3.10.1.1 General Description and Current Conditions

Building 114 is located approximately 1/3-mile south of the main gate on Avenue C between Third and Fourth Streets (Figure 3.10.1). The western end of the building is currently used for administrative purposes, while the eastern portion continues to house Public Works Center activities. A number of maintenance activities, including a paint shop, are still in operation at Building 114.

3.10.1.2 Site History

Building 114 has previously housed the majority of Public Works' shops including woodworking, painting, and steam cleaning. The building also served as the pesticide and herbicide storage and operations area for the base. Steam cleaning, paint stripping, and paint spray booth activities generated approximately 250 gallons of wastewater per day, which was discharged directly to storm drains. Ultimately, the drains emptied into the San Francisco Bay via the Seaplane Lagoon. A separator pit, located in the western corner of Building 114 courtyard, was intended to separate sludges and floating scums from the wastewater stream; however, this system is known to have operated inadequately (E&E, 1983). Periodically, the separator pit was pumped out and the contents disposed of at the West Beach Landfill.

Prior to 1974, Building 114 was the center for weed control on the base. Materials were stored at Building 114 and equipment was rinsed in the yard. Pesticides used included chlordane, lindane, DDT, malathion and diazinan. Herbicides included Telvar, Chlorvar, 2,4-D, Roundup, Princep, and KrovarI. In 1974, the Public Works Center shifted operations to the Oakland Naval Supply Center; however, the same personnel, equipment and facilities are still used at Building 114 (E&E, 1983).

3.10.1.3 Summary of Previous Site Investigation

No characterization of potential contamination resulting from Building 114 operations has been made. There exists a need to determine whether ground water and soil have been contaminated, and whether the separator pit contains residual contaminants.

3.10.2 Sampling Objectives

The objective of the Building 114 sampling plan is to determine if contamination has been introduced into the subsurface from surface spills

or from leaks in the subsurface sewer system. The types of samples to be collected and the analyses to be performed have been developed on the basis of information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS.

Soil borings will be advanced in the central courtyard area (Figure 3.10.2) to determine if any contaminants are present in the subsurface environment. Contamination may be present due to the result of releases from the oil/grease separator pit located in this area, and from surface runoff of painting and stripping activities which occurred in the courtyard area.

Soil borings will be advanced around the perimeter of the building near the junction points of sewers which received effluent from these areas (Figure 3.10.2) because these junctions would be more likely to leak and, because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth. Monitoring wells will be installed (Figure 3.10.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

The proposed sample types and analyses for Building 547 along with the rationale for the analyses can be seen in Table 3.10.1.

3.10.3 Site Reconnaissance

See section 2.2

3.10.4 Soil Sampling

Figure 3.10.1 shows all subsurface utilities and obstructions identified at Building 114 during review of Navy maps and documents. Figure 3.10.2 illustrates the proposed soil boring locations for this area. The actual

boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.10.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samples will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.10.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.10.1.

All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.10.5 Monitoring Well Installation

Table 3.10.2 and Figure 3.10.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.10.6 Ground Water Sampling

A ground water sample will be collected from the wells listed in Table 3.10.2. These samples will be analyzed for the parameters listed in Table 3.10.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the well has been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analysis of the ground water parameters listed on Table 3.10.1. Refer to section 5.3.3. of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.11 Building 410 Site Investigation Work Plan

3.11.1 Site Specific Conditions

3.11.1.1 General Description and Current Conditions

Building 410 is located approximately 1/3-mile west of the south gate, on Eighth Street between Avenues L and M (Figure 3.11.1). The building houses the aircraft paint stripping operation for NAS Alameda. All wastes resulting from this area are attributable to the paint stripping process. Wastewaters contain high concentrations of oil, paint, paint skins, detergent and stripper. During a site visit conducted in March, 1988, strong phenolic odors could be detected outside the building during paint stripping operations.

The wastewaters, high in chromium, phenols and methylene chloride, are discharged to the Building 410 Industrial Waste Treatment Facility (IWTF) and then to the Building 25 IWTF, entering the POTW. Prior to October, 1987, the wastewater from the Building 410 IWTF was discharged directly to the industrial wastewater collection system.

3.11.1.2 Site History

The Industrial Waste Treatment facility was constructed at Building 410 in 1973. Prior to its existence, all wastewater from the paint stripping operations was discharged directly to the industrial wastewater collection system without treatment.

3.11.1.3 Summary of Previous Site Investigations

Composite analyses were performed on Building 410 wastewater in 1981 as part of the NARF Industrial Waste Survey. Results of these analyses, presented in the Initial Assessment Study (E&E, 1983), indicated high chromium, phenol, surfactants, total solids, BOD and COD.

3.11.2 Sampling Objectives

The objectives of the Building 410 sampling plan is to determine if contamination has been introduced to the subsurface from surface spills or leaks in the subsurface sewer system. The site will be visually inspected for evidence of surface spills and releases. Any surface areas exhibiting evidence of gross surface contamination will be investigated.

The potential for contamination exists in several key areas at Building 410. These are: above-ground tanks on the north side of the building; sewers on the north side of the building which appear contaminated; a concrete slab inside the building with floor drains to collect paint stripping fluid; a small fenced chemical waste storage area at the south side of the building; and a concrete area containing drains on the east

side of the building. Therefore, both soil borings and monitoring wells will be constructed to examine the extent of contamination resulting from past activities in these areas.

Soil borings will be advanced around the perimeter of the building near sewer junction points (Figure 3.11.2) on the basis that these junctions would be more likely to leak, and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

Monitoring wells will be installed (Figure 3.11.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

The types of samples to be collected at Building 410, the types of analyses to be performed on these samples, and the rationale for this collection and analysis program can be seen in Table 3.11.1.

A site-specific and analytical sampling plan has been developed for the Building 410 area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and comments and concerns of the EPA and DHS.

3.11.3 Site Reconnaissance

See Section 2.2.

3.11.4 Soil Sampling

Figure 3.11.1 shows all subsurface utilities and obstructions identified at Building 410 during review of Navy maps and documents. Figure 3.11.2 illustrates the proposed soil boring locations for this area. The actual

boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.4.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samples will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.11.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.11.1.

All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.11.5 Monitoring Well Installation

Table 3.11.2 and Figure 3.11.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.11.6 Ground Water Sampling

A ground water sample will be collected from the wells listed in Table 3.11.2. These samples will be analyzed for the parameters listed in Table 3.11.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area. Ground water samples will be collected from the monitoring wells after the well has been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analysis of the ground water parameters listed on Table 3.11.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.12 Building 530 (Missile Rework Operations) Site Investigation Work Plan

3.12.1 Site Specific Conditions

3.12.1.1 General Description and Current Conditions

Building 530 is located immediately west of the south gate and is the current site for missile rework operations (Figure 3.12.1). Activities include electrical maintenance; cleaning; grinding; welding; paint stripping and painting; and fabricating. Current waste handling procedures at Building 530 are tightly controlled, with all wastes and paint stripping baths disposed of off-site in 55-gallon drums.

3.12.1.2 Site History

Missile rework operations have been conducted in Building 530 since 1972.

3.12.1.3 Summary of Previous Site Investigations

No previous sampling of environmental media or wastewaters has been performed at Building 530. However, based on information generated by wastewater sampling at Building 5 (E&E, 1983) and a site inspection, waste water constituents are assumed consistent at Building 530. The main characteristics being high levels of solvents, heavy metals, and phenols (E&E, 1983).

3.12.2 Sampling Objectives

The objective of the Building 530 sampling plan is to determine if contamination has been introduced to the subsurface from surface spills or leaks in the subsurface sewer system. The site will be visually inspected for evidence of surface spills and releases. Any surface areas exhibiting evidence of gross surface contamination will be investigated.

Soil borings will be advanced around the perimeter of the building near junction points of sewers which received effluent from these areas (Figure 3.12.2) on the basis that these junctions would be more likely to leak, and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

Monitoring wells will be installed (Figure 3.12.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

A site-specific and analytical sampling plan has been developed for the Building 530 site area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the

March, 1988 site visit, review of existing reports, and comments and concerns of the EPA. The sampling and analysis plan for Building 530 can be seen in Table 3.12.1.

3.12.3 Site Reconnaissance

See Section 2.2.

3.12.4 Soil Sampling

Figure 3.12.1 shows all subsurface utilities and obstructions identified at site 530 during review of Navy maps and documents. Figure 3.12.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.12.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.12.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.12.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch.

Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.12.5 Monitoring Well Installation

Table 3.12.2 and Figure 3.12.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.12.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.12.2. These samples will be analyzed for the parameters listed in Table 3.12.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time.

Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.12.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.13 Building 400 (Missile Rework Operations) Site Investigation Work Plan

3.13.1 Site Specific Conditions

3.13.1.1 General Description and Current Conditions

Building 400, located on Avenue F at the northwestern corner of the Seaplane Lagoon, is the former site of missile rework operations (Figure 3.13.1). Building 400 currently houses a small paint stripping and fiberglass operation and aircraft parts' cleaning area. Waste handling procedures are consistent with those of Building Nos. 5, 360, and 410.

3.13.1.2 Site History

Missile rework operations were shifted from Building 400 to Building 530 in 1972. Wastes generated at Building 400 prior to 1972 included paint sludges, metal shavings, paint strippers, cleaning solvents (trichloroethene and carbon tetrachloride), testing fluids, and miscellaneous waste oils and grease. These wastes were disposed of in the West Beach Landfill. Wastewaters resulting from operations were discharged to the industrial waste collection system. As with wastewater and rinse water from Building Nos.5, 360, and 410, no pre-treatment was occurring at that time.

3.13.1.3 Summary of Previous Site Investigations

No previous sampling of environmental media or wastewaters has been performed at Building 400. However, based on information generated by wastewater sampling at Building 5 (E&E, 1983) and a site inspection, wastewater constituents are assumed consistent at Building 400. The main characteristics being high levels of solvents, heavy metals, and phenols (E&E, 1983).

3.13.2 Sampling Objectives

The objective of the Building 400 sampling plan is to determine if contamination has been introduced to the subsurface from surface spills or leaks in the subsurface sewer system. The site will be visually inspected for evidence of surface spills and releases. Any surface areas exhibiting evidence of gross surface contamination will be investigated.

Soil borings will be advanced around the perimeter of the building near junction points of sewers which received effluent from these areas (Figure 3.13.2) on the basis that these junctions would be more likely to leak, and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

Monitoring wells will be installed (Figure 3.13.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

A site-specific and analytical sampling plan has been developed for the Building 400 site area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and comments and concerns of the EPA.

The sampling and analyses plan for Building 400 can be seen in Table 3.13.1.

3.13.3 Soil Reconnaissance

See Section 2.2.

3.13.4 Soil Sampling

Figure 3.13.1 shows all subsurface utilities and obstructions identified at site 400 during review of Navy maps and documents. Figure 3.13.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.13.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.13.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.13.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch.

Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.13.5 Monitoring Well Installation

Table 3.13.2 and Figure 3.13.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the con-

tinual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.13.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.13.2. These samples will be analyzed for the parameters listed in Table 3.13.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area. Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.13.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.14 Building 14 (Test Shop) Site Investigation Work Plan

3.14.1 Site Specific Conditions

3.14.1.1 General Description and Current Conditions

Building 14 is located on Fifth Street, adjacent to the eastern side of the Seaplane Lagoon (Figure 3.14.1). The building currently houses two active engine testing chambers, the remainder are inoperative. The second floor of the building is occupied by a number of laboratories which appear to use

small quantities of mercury in manometers and thermometers. Instrumentation in the laboratory is relatively new and no recent mercury spills were reported during a site investigation conducted in March, 1988. No visible signs of mercury contamination were apparent in either the laboratories or areas below them.

3.14.1.2 Site History

Building 14 served as the primary area for aircraft engine testing until a more modern facility was constructed elsewhere on the base. Laboratories located on the second floor have reportedly contained mercury in various devices for many years. Minor spills, amounts of several ounces, have occurred in the past which may have been washed into the industrial waste collection system. Spills that were cleaned up resulted in contaminated materials that were disposed of at the West Beach Landfill and 1943-1956 Disposal Area. The site inspection and interviews revealed that the earlier mercury spills generally amounted to self-contained overflows within instrument measuring devices. The area of potential contamination is about 4 square feet on the second floor. No further investigation of mercury contamination at this site is recommended.

3.14.1.3 Summary of Previous Site Investigations

No sampling of environmental media or wastewater discharges has been performed at Building 14.

3.14.2 Sampling Objectives

The objective of the Building 14 sampling plan is to determine if contamination has been introduced into the subsurface from surface spills or from leaks in the subsurface sewer system. The types of samples to be collected and the analyses to be performed have been developed on the basis of information gathered during the March, 1988 site visit, review of existing reports, and review of the comments and concerns of the EPA and DHS.

The proposed sample types and analyses for Building 14 along with the rationale for the analyses can be seen in Table 3.14.1.

3.14.3 Site Reconnaissance

The specific objectives of the Building 14 site reconnaissance are to designate the floor drains that show evidence of gross contamination for investigation, define the locations of underground tanks on the southern side of the building. It should be noted that Building 14 will be included in the Area 97 site reconnaissance and subsequent soil gas investigation. The final sampling locations and analytical results for both study areas should be used in coordination with one another.

For a general overview of the Building 14 site reconnaissance objectives refer to Section 2.2.

3.14.4 Soil Sampling

Figure 3.14.1 shows all subsurface utilities and obstructions identified at the Building 14 site during review of Navy maps and documents. Figure 3.14.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.14.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected

from each boring is presented in Table 3.14.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.14.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch.

Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.14.5 Monitoring Well Installation

Table 3.14.2 and Figure 3.14.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.14.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.14.2. These samples will be analyzed for the parameters listed in Table 3.14.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.14.1. Refer to section 5.3.3 of the QAPP for information

regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.15 Building 10 (Power Plant) Site Investigation Work Plan

3.15.1 Site Specific Conditions

3.15.1.1 General Description and Current Conditions

Building 10 is located on Avenue F between Second and Third Streets (Figure 3.15.1). It currently houses seven operative boilers, which are primarily fueled by natural gas; diesel fuel is used for back-up purposes. Eight above-ground diesel tanks, with a total capacity of 150,000 gallons were installed on the south side of the plant. The area where the tanks are located is bermed, and no incidents of leakage have been documented (E&E, 1983).

3.15.1.2 Site History

Bunker "C" fuel was used at Building 10 until the early 1970's. The fuel was stored in underground tanks located north of the building. Spills have occurred in the past, resulting in accumulation of fuel oil in steam pipe trenches on the northern side of the building. Suction trucks skimmed the oil off the surface and disposed of it in the oil sump at the West Beach Landfill (E&E, 1983).

3.15.1.3 Summary of Previous Site Investigations

A tank testing study conducted in 1987 (ERM-West, 1987), discovered five underground tanks at Building 10. Four were reportedly filled with sand and the fifth has been proposed for removal. No sampling of environmental media has been performed in the vicinity of Building 10.

3.15.2 Sampling Objectives

The objectives of the Building 10 sampling plan is to determine if contamination has been introduced to the subsurface. The site will be visually inspected for evidence of surface spills and releases. Any surface areas exhibiting gross surface contamination will be investigated. Subsurface soil and ground water sampling will be targeted at the possibility of bunker "C" oil contamination and releases of boiler blowdown containing caustic soda, phosphate, and sulfide along the sewer line.

Soil borings will be advanced around the perimeter of the building near junction points of sewers which received effluent from these areas (Figure 3.15.2) on the basis that these junctions would be more likely to leak, and because waste may be more prone to pool at elbow and T-joints where the soil has been excavated to a greater depth.

In addition to the building perimeter sampling, it is proposed that soil borings and ground water monitoring wells be placed on the northern side of the building. Known spills of Bunker "C" fuel have occurred and fuel has accumulated in the steam pipe trenches north of the building. In addition, abandoned underground storage tanks are present on the north side of the building.

Monitoring wells will be installed (Figure 3.15.2) to allow the monitoring of water levels and to facilitate the sampling of ground water. The ground water samples will be analyzed to determine if contaminants are present in the ground water found in this area. Water level measurements will be used to help determine the flow patterns of ground water at the NAS Alameda area.

A site-specific and analytical sampling plan has been developed for the Building 10 area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and comments and concerns of the DHS.

The sampling and analyses plan for Building 10 can be seen in Table 3.15.1.

3.15.3 Site Reconnaissance

See Section 2.2.

3.15.4 Soil Sampling

Figure 3.15.1 shows all subsurface utilities and obstructions identified at Building 10 during review of Navy maps and documents supplied. Figure 3.15.2 illustrates the proposed soil boring locations for this area. The actual boring locations will be determined by field personnel after all the utilities and obstructions shown in Figure 3.15.1 have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Site Reconnaissance section) must be completed before field sampling can begin.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samplers will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.15.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.15.1. All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch.

Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.15.5 Monitoring Well Installation

Table 3.15.2 and Figure 3.15.2 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.15.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.15.2. These samples will be analyzed for the parameters listed in Table 3.15.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.15.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.16 Oil Refinery Site Investigation Work Plan

3.16.1 Site Specific Conditions

3.16.1.1 General Description and Current Conditions

The Pacific Coast Oil Refinery was in operation from 1879 to 1903. It was located in the southeastern corner of the base (Figure 3.16.1) which has since been developed and occupied by other buildings.

3.16.1.2 Site History

During its 24 years of operation, refinery waste and asphalt-type residue were dumped at the site. After operations had ceased, the area was surfaced by the Navy in the 1940s. However, vapor pressure buildup resulting from previous site activities caused this surface to rupture. The problem was eventually addressed, by excavating a 30 ft^2 area of the old material, pouring a concrete slab over the surface, and backfilling. Although no further disturbance of the surface has occurred, drilling operations have encountered "black oil" in the area (E&E, 1983).

3.16.2 Sampling Objectives

The objective of the oil refinery sampling plan is to determine if residual contamination from the refinery operation is leaching into the ground water in this area.

The former site of the oil refinery has been developed. Three sites included in this investigation are built on the oil refinery site. Sampling and analytical plans for these three areas have already been developed. Additional data needed to evaluate the oil refinery site will be collected during the field investigations of these sites. Table 3.16.1 illustrates the sample collection and analytical plan needed to generate the data necessary to evaluate the oil refinery site. Figure 3.16.1 shows

the proposed additional soil borings for the area. Refer to the Building 530, Yard D-13 and Cans C-2 area plans for other sampling points within this area.

3.16.3 Site Reconnaissance

Site reconnaissance of the oil refinery site will be conducted during the Building 530, Building 547, Yard D-13, and Cans C-2 site investigations.

3.16.4 Soil Sampling

Soil sampling of the oil refinery site will be conducted during the Building 530, Yard D-13, and Cans C-2 site investigations.

3.16.5 Monitoring Well Installation

Monitoring wells at the oil refinery site will be installed during the Building 530, Yard D-13, and Cans C-2 site investigations. Figure 3.16.1 and Table 3.16.2 indicate the proposed additional monitoring well for the area.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.16.6 Ground Water Sampling

Ground water samples will be collected during the Building 530, Yard D-13, and Cans C-2 site sampling programs.

A site specific and analytical sampling plan has been developed for the oil refinery site. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and the comments and concerns of the EPA. Based on the previous reports, possible contaminants consist of waste

oils and asphalt-type waste (E&E, 1983). Although no specific sampling has been done, drilling operations in the area had encountered a "black oil" zone leaving a residue on drilling equipment.

The proposed sample types and analyses for the oil refinery site can be seen in Table 3.16.1.

3.17 Fire Training Area Site Investigation Work Plan

3.17.1 Site Specific Conditions

3.17.1.1 General Description and Current Conditions

The Fire Training Area is located on the northern perimeter of the base in the vicinity of Building 443 (Figure 3.17.1). A steel tank, which sits on a concrete slab is used to burn waste fuels from NAS Alameda plane defueling operations. The site also serves as a fire extinguisher discharge point, and fire-fighting training area. Ansulite fire-fighting foam is mixed in a nearby tank and used to extinguish the fires.

3.17.1.3 Summary of Previous Site Investigations

No sampling of environmental media has been performed in the vicinity of the Fire Training Area. No sampling of environmental media has been performed in the vicinity of the fire training area. Waste at the fire training site include aqueous fire-fighting foam, CO_2, potassium chloride, purple K and Bowser fuels containing heavy metals (E&E, 1983).

3.17.2 Sampling Objectives

The objectives of the fire training area sampling plan is to determine the nature and extent of contamination that has been introduced to the subsurface from surface spills, leaks or releases of: contaminated fuels and oils from plane defueling operations and bowsers; aqueous fire-fighting foam;

and potassium chloride from the discharge of fire extinguishers. A site-specific and analytical sampling plan has been developed for this site. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and comments and concerns of the EPA.

The sampling and analyses plan for the fire-training area can be seen in Table 3.17.1.

3.17.3 Site Reconnaissance

See Section 2.2.

3.17.4 Soil Sampling

Field personnel will lay out a sample grid with a 10-foot spacing. Each node point of the sample grid will be sampled to a depth of 6 inches using a hand auger. This method is explained in section 5.3.2 of the QAPP. Additional soil samples will be collected from the interior sides of the earthen berm to determine if this soil has become contaminated. Soil sampling points can be seen in Figure 3.17.1.

Two soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from this boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. A thin-walled tube sampler will be used to collect an undisturbed soil sample for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.17.2. The order in which these samples are collected from a boring is left to the discrimination of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.17.1.

Soil sample collection methods have been described in Section 2. For specific information regarding the collection of samples or the decontamination of equipment refer to section 5.3.2 of the QAPP.

3.17.5 Monitoring Well Installation

Table 3.17.2 and Figure 3.17.1 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. Wells will be completed to monitor the water table. The actual depth of screen placement will be determined in the field

3.17.6 Ground Water Sampling

A ground water sample will be collected from the wells FT-1 and FT-2. These samples will be analyzed for the parameters listed in Table 3.17.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. A water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.17.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.18 Buildings 301 and 389 Site Investigation Work Plan

3.18.1 Site Specific Conditions

3.18.1.1 General Description and Current Conditions

Building 301 and the building 389 foundation slabs are located north of Runway 7-25, approximately 500 feet inland of the Oakland Inner Harbor channel (Figure 3.18.1). Building 389 has been torn down, although its concrete floor slab and perimeter footings still remain. Building 301 and its associated yards serve as storage areas for electrical equipment, oil filled transformers and other disused machinery. During a site visit conducted in March, 1988, no visible signs of contamination were apparent other than the staining of a small area of bare ground immediately north of Building 301. Building 301 contained several 55-gallon drums of hydraulic fluid. No signs of contamination were visible.

3.18.1.2 Site History

An estimated 200 to 400 gallons of PCB oil may have been present in transformers stored at Building 389 in the past. Occasional leaks are believed to have occurred, but it has been stated that oil was routinely drained from the transformers and sprayed on the ground to control weed growth in the yards (E&E, 1983).

3.18.1.3 Summary of Previous Investigations

Based on the findings of the Initial Assessment Study, which concluded that PCBs had leaked and been sprayed on the ground, sampling of surface soil was performed by Wahler Associates during the verification step of the NACIP program (Wahler, 1985). Twelve shallow soil samples were taken north of the Building 389 concrete foundation pad. These were analyzed for PCBs only. The highest PCB concentration detected was 3 ppm (Wahler, 1985).

3.18.2 Sampling Objectives

The sampling objective at the Building 301 site is to determine the nature and extent of the contamination with a more representative sampling scheme and detailed analyses than was previously used.

The objective of the site investigation around Buildings 301 and 389 (Figure 3.18.1) is to discover the amount and extent of PCB contamination in the soil of this area.

A previous soil characterization study (Wahler, 1985) detected low levels of PCB contamination around the Building 301 foundation. This RI/FS sampling plan will expand the area of investigation and conduct a more systematic sampling of soils to increase the statistical accuracy and precision of the analytical results. Table 3.18.1 lists the types of samples to be collected and the analyses to be performed on these samples.

3.18.3 Site Reconnaissance

See Section 2.2.

3.18.4 Soil Sampling

Field personnel will lay out a sample grid with a 25-foot spacing as shown in Figure 3.18.1.

Any surface runoff channels into the Oakland Estuary will be noted and sampled. These samples will be collected at the point where the channel intersects the estuary to determine if contaminants are entering the estuary as surface runoff.

All soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. A thin-walled tube

sampler will be used to collect an undisturbed soil sample for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.18.2. The order in which these samples are collected from a boring is left to the discrimination of the field personnel. The types of analyses to be performed on soil samples is presented in Table 3.18.1.

Soil sample collection methods have been described in Section 2. For specific information regarding the collection of samples of the decontamination of equipment refer to section 5.3.2 of the QAPP.

3.18.5 Monitoring Well Installation

Table 3.18.2 and Figure 3.18.1 indicate the borings in which monitoring wells will be installed. This well will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The wells will be completed to monitor the water table. The actual depth of screen placement will be determined in the field.

3.18.6 Ground Water Sampling

Ground water samples will be collected from the wells. These samples will be analyzed for the parameters listed in Table 3.18.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at the wells prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters

listed on Table 3.18.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.19 Cans C-2 Area Site Investigation Work Plan

3.19.1 Site Specific Conditions

3.19.1.1 General Description and Current Conditions

The CANS C-2 Area is located in the southeastern corner of the air station (Figure 3.19.1). The area is 6-1/2 acres in size, of which 3 acres are used as a storage yard and 3-1/2 acres are occupied by the "CANS". The CANS are large shipping containers that have been converted into warehouses; there are a total of 27 on the site. The storage yard is the site under investigation.

The CANS C-2 Area yard contains a variety of disused equipment and wastes. As of March, 1988, the area contained disused plating and paint stripping baths; electrical equipment; aircraft parts; and miscellaneous materials. The main storage yard is mostly unpaved though much of it is covered with perforated-steel temporary runway-plates.

3.19.1.2 Site History

In addition to the items identified above, the site has been a storage area for hazardous wastes. Materials stored include paints, solvents, acids, and PCB contaminated oils. Chemicals were contained in drums that leaked, corroded or were open, resulting in spills over a period of years. PCBs were used, as needed, for weed control in the area. This practice continued until 1963. One PCB spill from a transformer resulted in the excavation of 10 yd^3 of contaminated soil from the northwestern corner of the yard. The removal action was performed by IT Corporation in August, 1982.

3.19.1.3 Summary of Previous Site Investigations

Based on the recommendations of the Initial Assessment Study (E&E, 1983), sampling of ground water and surface soils was performed during the verification step of the NACIP program. One monitoring well was installed in the southwestern corner of the site, and ten shallow soil samples were taken. Elevated levels of lead and cadmium were detected in the soil, and low levels of cadmium and herbicides were found in the ground water.

3.19.2 Sampling Objectives

The objectives of the sampling and analyses plan at the CANS C-2 area is to access the nature and extent of the contamination introduced to the subsurface from spills, leaks, or releases.

A site-specific and analytical sampling plan has been developed for the CANS C-2 area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and comments and concerns of the EPA and DHS.

The proposed sample types and analyses for the CANS C-2 area can be seen in Table 3.19.1.

3.19.3 Site Reconnaissance

Refer to Section 2.2.

3.19.4 Soil Sampling

A grid system consisting of 50-foot squares will be used for systematic sampling for PCB contamination. Samples will be taken with a hand auger to a depth of 6 inches at all grid nodes specified in Figure 3.19.1. Also shown in Figure 3.19.1 are six borings whose location was chosen by means of random selection of grid squares. The three borings in which monitoring

wells will be installed are located along the perimeter of the CANS C-2 areas and were chosen specifically as a check for migration of contamination from the site. The actual boring locations and exact placement of the grid will be determined by field personnel after all the utilities and obstructions have been identified and located.

All relevant regulatory agencies will be notified before borings are begun. All preparation work at each site (see Section 2.2) must be completed before field sampling can begin. Hand augered soil samples will be advanced to a depth of 6 inches.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samples will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.19.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on the soil samples is presented in Table 3.19.1. All borings not designated for monitoring well installation will be grouted.

Soil sample collection methods have been described in Section 2. For the decontamination of equipment refer to section 5.3.2 of the QAPP.

3.19.5 Monitoring Well Installation

Table 3.19.2 and Figure 3.19.1 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. The actual depth of screen placement will be determined in the field.

3.19.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.19.2. These samples will be analyzed for the parameters listed in Table 3.19.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring well shown in Figure 3.19.1 after the well has been installed, developed, and allowed a sufficient recovery time. WA-6, if locatable, will be sampled. It was installed during a previous investigation (Wahler, 1985). Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.19.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.20 Seaplane Lagoon Site Investigation Work Plan

3.20.1 Site Specific Conditions

3.20.1.1 General Description and Current Conditions

The Seaplane Lagoon is located on the southern side of the base, with a surface area of approximately 110 acres (Figure 3.20.1). The lagoon ranges in depth from 12 to 20 feet, opening to the San Francisco Bay in the south-western corner.

Untreated wastewaters from industrial activities are no longer discharged directly to the Seaplane Lagoon. After 1975, industrial wastewater began to be separated, collected, treated onsite, and discharged via the sanitary sewer system. The lagoon does receive overland drainage and storm drain discharge during wet weather.

3.20.1.2 Site History

The Seaplane Lagoon received raw industrial wastewaters from four outflows between 1940 and 1975. Maintenance activities at Pier 1, south of the lagoon, are also thought to have contributed to contamination of the area. Wastewaters contaminated with heavy metals, acids, solvents, paints, radium, organics, and possibly PCBs have all reportedly been discharged to the lagoon. Studies concluded just prior to the abatement of lagoon discharges, indicated average flows in the region of 150,000 gallons per day (E&E, 1983). Discharge points were reportedly located in the northeastern and northwestern corners of the lagoon. Limited dredging has occurred. In 1981, 21,000 yd^3 were removed from the southeast side of the lagoon. Spoils were disposed of at the West Beach Landfill (E&E, 1983).

3.20.1.3 Summary of Previous Site Investigations

A number of studies have been conducted since the mid-1960s to determine flow rates to the lagoon and composition of discharges (Kurgmen, 1970; Navy, 1972). However, the most recent investigation was conducted by Wahler Associates as part of the NACIP Verification Step (Wahler, 1985). Ten sediment samples were collected from the lagoon and analyzed for metals, pesticides and PCBs. Elevated levels of some metals were detected in the samples, but no PCBs or pesticides were found (Wahler, 1985).

3.20.2 Sampling Objectives

As stated in Section 3.20.1.2, the Seaplane Lagoon has received untreated industrial discharges in the past, and continues to receive discharge from storm drains. Dredging operations were conducted in the 1940s, and 21,000 yd^3 of sediment was removed from the southwest side of the lagoon in 1981 (E&E, 1983). However, the potential for residual contamination exists, and more recent activities at Pier 1 may have further contributed to contamination of the lagoon. A current assessment of the water and sediment quality and the status of the aquatic habitat is therefore warranted.

The sampling and analyses objective for the Seaplane Lagoon site is to adequately define the nature and extent of the contamination present. Due to the diversity of contaminants entering the lagoon, a broad base of analyses will be used. A site-specific sampling and analytical plan has been developed for the Sea Plane Lagoon.

The types of samples to be collected and analyses to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and the comments and concerns of the EPA and DHS.

The proposed sample types and analyses for the Seaplane Lagoon can be seen in Table 3.20.1.

3.20.3 Site Reconnaissance

See Section 2.2.

3.20.4 Sediment and Water Sampling

Sampling of the water column and sediments in the lagoon is proposed to fully characterize contaminant distribution and type. A sample grid has been created covering the Seaplane Lagoon. Sediment samples will be collected at each of the node points. In addition, bioassays to determine the toxicity of sediments to marine macrobenthos are proposed. Sampling and laboratory procedures will be followed that are consistent with EPA accepted protocols (U.S. EPA, 1977).

Sampling of the water column is proposed in the lagoon. It is believed that flows into the lagoon from wastewater outfalls and storm drains are insufficient to produce significant flushing (Kennedy, 1985). Therefore, the combined sampling of sediments and the water column, and the conducting of marine macrobenthos bioassays will provide the necessary data to assess the impacts of contamination on the benthic and pelagic organisms associated with the area. Water samples will be collected from the Seaplane Lagoon at four of the sediment sampling node points. Water samples will be collected before sediment samples to avoid the excessive turbidity typically created during sediment sampling.

A sample grid has been created to facilitate the systematic collection of samples for chemical analysis. Bioassay sediment samples will also be collected at four grid points. Two surface water samples will be collected at the northeast and southeast corners of the lagoon, since these areas can be expected to experience the least flushing action by tidal flows. Locations for two additional surface water samples and for four bioassay sediment samples will be chosen after the results are available of laboratory analyses performed on the sediment samples collected for chemical analysis. Locations will be selected in sediment areas of high chemical concentrations. Sampling locations for the Seaplane Lagoon are shown on Figure 3.20.1.

3.21 Station Sewer System Site Investigation Work Plan

3.21.1 Site Specific Conditions

3.21.1.1 General Description and Current Conditions

The station sewer system currently receives no untreated industrial discharges from activities occurring on the base. The station sanitary sewer system discharges to the East Bay Municipal Utilities District (EBMUD), and has been doing so since 1956. Industrial wastewaters are subject to pretreatment at Buildings 5, 360, and 410 prior to discharge to the sewer system. Storm drains flow directly into either the Seaplane Lagoon or the Oakland Inner Harbor. The integrity of the complex system of pipelines is not known.

3.21.1.2 Site History

Prior to 1956, NAS Alameda operated its own sanitary wastewater facility. The facility discharged directly to the estuary (E&E, 1983). After 1956 sanitary wastewaters were routed to the EBMUD system, and between 1972 and 1975 industrial wastewaters were also discharged to the system. Potential for contamination of the system resulted from Buildings 5, 360, 410, 114, 400, 14, and 10. Based on the nature of the industrial processes occurring in these buildings, the system would have received wastes from plating bath dumps; paints and paint strippers; pesticides and herbicides; waste fuels and oils; cleaning and degreasing solvents; and possibly PCB contaminated oils.

In addition, wastewaters have been reportedly discharged directly to the storm drains. This system ultimately discharged to the Seaplane Lagoon or the Oakland Inner Harbor Channel.

3.21.1.3 Summary of Previous Site Investigations

No comprehensive studies to determine the condition or contamination of the static sewer system have been conducted.

3.21.2 Sampling Objective

The sampling and analytical objective for the station sewer system is to determine if contamination has been introduced to the subsurface from surface spills or leaks in the subsurface sewer system. Because of the complexity of the station sewer system, it is beyond the scope of work for this project to attempt to assess the integrity of the entire system. However, the system will be characterized through sampling and analyses and ancillary data acquired from testing at Buildings 5, 360, 410, 114, 400, 14, and 10. Through the assessment of the integrity of the sewer system at these selected sites, a generalization of the overall integrity of the station system can be made and a decision on any further sampling could be formulated.

A site-specific and analytical sampling plan has been developed for the buildings mentioned above. The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and comments and concerns of the EPA and DHS.

The proposed sample types and analyses for the station sewer system along with the rationale for the analyses can be seen in Table 3.21.1.

3.21.3 Site Reconnaissance

For a general overview of the site reconnaissance objectives refer to Section 2.2.

3.22 Yard D-13 Site Investigation Work Plan

3.22.1 Site Specific Conditions

3.22.1.1 General Description and Current Conditions

Yard D-13 is located immediately southwest of Building 360, approximately 1500 feet east of the Seaplane Lagoon (Figure 3.22.1). The yard is approximately 1-1/2 acres in size and is fenced on all sides. A small building, numbered 616, is located in the northwestern corner of the yard. The yard is a storage area for 55-gallon drums, most of which contain hazardous waste generated by activities on the base. Yard D-13 is operated pursuant to an Interim Status Document issued by DHS on April 30, 1981. Drummed wastes are stored by chemical class in rows separated by berms. There is also an empty drum storage area along the southern edge of the yard. As of March, 1988, the yard had recently been repaved to provide better traction for the fork-lift trucks. Waste types include alkali and Poison B; acid and acid oxidizer; and flammable and combustible (ERM-West and Aqua Resources, 1987).

3.22.1.2 Site History

The yard has served as a storage area for hazardous materials for several years. The old surface of the yard was reportedly broken in places which may have allowed seepage of contaminants into the soil.

3.22.1.3 Summary of Previous Site Investigations

No sampling of soil or ground water has been performed in the vicinity of Yard D-13. An operation plan for the Yard and Building 13 was prepared in 1987 by Environmental Resources Management and Aqua Resources (ERM-West and Aqua Resources, 1987).

3.22.2 Sampling Objectives

The objective of the Yard D-13 site investigation is to determine if hazardous waste has been introduced to the subsurface as a result of the handling and storage of hazardous materials in this area. This objective will be obtained by employing a soil boring, monitoring well installation, and ground water sampling program at the site.

A site-specific and analytical sampling plan has been developed for the Yard D-13 area. The types of samples to be collected and analyses to be performed have been developed using information gathered during the March, 1988 site visit.

The types of samples to be collected at Yard D-13, the types of analyses to be performed on these samples, and the rationale for this collection and analyses program can be seen in Table 3.22.1.

3.22.3 Site Reconnaissance

See Section 2.2.

3.22.4 Soil Sampling

A total of six borings will be advanced in the Yard D-13 area as part of this investigation. Three soil boring locations have been randomly chosen in the Yard D-13 storage area for subsurface investigation. Three borings will be advanced immediately outside the fenced storage area and used for monitoring well installations. Figure 3.22.1 illustrates the proposed soil boring locations for this area. Actual boring locations will be determined by field personnel during the site reconnaissance phase of the investigation (see Section 2.2). All relevant regulatory agencies will be notified before borings are begun.

Soil borings will be advanced to a depth of 15 feet. Continuous soil samples will be collected from each boring, and borings will be lithologically and geophysically logged. Split spoon samples will be used to collect soil samples for contaminant analyses. Thin-walled tube samples will be used to collect undisturbed soil samples for physical property analyses. The type and number of soil samples to be collected from each boring is presented in Table 3.8.2. The order in which these samples are collected from a boring is left to the discretion of the field personnel. The types of analyses to be performed on soil samples are presented in Table 3.8.1.

All borings not designated for monitoring well installation will be backfilled with cement/bentonite grout and where appropriate, capped with either an asphalt or concrete patch. Soil sample collection methods have been described in Section 2. Refer to section 5.3.2 of the QAPP for specific information regarding the collection of samples and the decontamination of equipment.

3.22.5 Monitoring Well Installation

Table 3.22.2 and Figure 3.22.1 indicate the borings in which monitoring wells will be installed. These wells will be installed to allow the continual monitoring of ground water levels and to facilitate the collection of ground water samples.

Figure 2.4 is a generalized well construction diagram. Specific well construction procedures will be outlined in section 4.5 of the QAPP. Water table wells will be completed so that the screened well interval will begin approximately 2 feet above the surface of the water table and at least 3 feet below the ground surface. The actual depth of screen placement will be determined in the field.

3.22.6 Ground Water Sampling

Ground water samples will be collected from the wells listed in Table 3.22.2. These samples will be analyzed for the parameters listed in Table 3.22.1. The analytical results of these samples will be evaluated to determine if any contamination is present in the ground water in this area.

Ground water samples will be collected from the monitoring wells after the wells have been installed, developed, and allowed a sufficient recovery time. Water level measurements will be taken and recorded at each well prior to purging and sampling. A sufficient number of water samples will be collected to allow for the analyses of the ground water parameters listed on Table 3.22.1. Refer to section 5.3.3 of the QAPP for information regarding well purging and sample collection procedures. The types of samples to be collected and the preservation method for these samples are also listed in section 5.3.3 of the QAPP.

3.23 Estuary (Oakland Inner Harbor) Site Investigation Work Plan

3.23.1 Site Specific Conditions

3.23.1.1 General Description and Current Conditions

The Oakland Inner Harbor channel borders the entire northern edge of NAS Alameda, a distance of approximately 2.2 miles (Figure 3.23.1). There are several discharge points along the northern perimeter, which are fed by the storm water collection system. No industrial wastewaters are directly discharged to the estuary.

3.23.1.2 Site History

Similar to the Seaplane Lagoon, the estuary served as a discharge point for approximately 150,000,000 gallons of untreated industrial and nonindustrial wastewater disposed of in the sewer system from 1943 to 1975. Wastes would have included organics, metals, oils, detergents and pesticides.

3.23.1.3 Summary of Previous Site Investigations

No sampling of sediment or aquatic biota has been performed along the southern shore of the estuary. A study conducted by the U.S. Army Corps of Engineers in 1987 did assess the water and sediment quality of the estuary. However, the majority of samples were taken along the northern bank of the estuary. Bioassay results did show an increase in mortality which may have resulted from the presence of metals and organics at elevated concentrations (U.S. Army Corps of Engineers, 1987).

Sampling of sediments is proposed at a number of locations along the southern edge of the Oakland Inner Harbor Channel to fully characterize contamination from past and present outfalls. Sediment sample and collection locations are shown as Figure 3.22.1.

Sediment samples collected for bioassays will be used to determine the toxicity of the sediments to marine macrobenthos. Sampling and laboratory procedures will be followed consistent with EPA accepted protocols (U.S. EPA, 1977).

3.23.2 Sampling Objectives

The sampling objective for the estuary is to adequately define the nature and extent of the contamination present. Because of the quantity and quality of the wastewater discharged into the estuary, a representative sample base and wide range of chemical analyses are proposed in this study.

The types of samples to be collected and analyses to be performed have been developed using information gathered during the site visit, review of existing reports, and the comments and concerns of the EPA and DHS.

The proposed sample types and analyses for the estuary can be seen in Table 3.23.1.

3.23.4 Sediment Sampling

As stated in Section 3.23.1.2, the estuary has received industrial and non-industrial wastewater discharges resulting from operations at NAS Alameda. Untreated industrial wastewaters ceased to be discharged to the estuary in 1975, and dredging has been conducted since then. However, an assessment of sediment quality and the aquatic habitat is warranted based on past discharges and the continuing outflows from storm drains.

A sample grid has been created to facilitate the systematic collection of samples for chemical analyses. Bioassay sediment samples will be collected at four locations. One bioassay sediment sample will be collected near the sanitary sewer outfall as shown on Figure 3.23.1. The locations for the three remaining bioassay sediment samples will be chosen from areas of high chemical concentrations in sediments as indicated by the results of laboratory analyses performed on the sediment samples collected for chemical analysis. Sampling locations for the Estuary are shown as Figure 3.23.1.

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REFERENCES

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TABLES

TABLE 2.5.1

PARAMETERS TO BE ANALYZED FOR

Priority Pollutant Inorganics	Priority Pollutant Volatile Organics	Pesticides/PCBs
Antimony	Benzene	Aldrin
Arsenic	Bis(Chloromethyl)Ether	alpha-BHC
Beryllium	Bromoform	beta-BHC
Cadmium	Bromodichloromethane	delta-BHC
Chromium III & IV	Bromomethane	gamma-BHC
Copper	Carbon Tetrachloride	Chlordane
Cyanide	Chlorobenzene	4,4'-DDD
Lead	Chloroethane	4,4'-DDE
Mercury	2-Chloroethyl Vinyl Ether	4,4'-DDT
Nickel	Chloroform	Dieldrin
Selenium	Chloromethane	Endosulfan I
Silver	Cis-1,3-Dichloropropene	Endosulfan II
Thallium	Dibromochloromethane	Endosulfan Sulfate
Zinc	Dichlorodifuoromethane	Endrin
	1,1-Dichloroethane	Endrin Aldehyde
	1,2-Dichloroethane	Heptachlor
	1,1-Dichlorethene	Heptachlor Epoxide
	Trans-1,2-Dichlorethene	Toxaphene
	Trans-1,3-Dichlorpropene	PCB-1016

TABLE 2.5.1

PARAMETERS TO BE ANALYZED FOR
(Continued)

Priority Pollutant Inorganics	Priority Pollutant Volatile Organics	Pesticides/PCBs
	1,2-Dichloropropane	PCB-1221
	Ethylbenzene	PCB-1232
	Methylene Chloride	PCB-1242
	1,1,2,2-Tetrachloroethane	PCB-1248
	Tetrachloroethene	PCB-1254
	Toluene	PCB-1260
	1,1,1-Trichloroethene	
	1,1,2-Trichloroethane	
	Trichloroethene	
	Trichlorofluoromethane	
	Vinyl Chloride	

Priority Pollutant Semivolatile Organics	
Acenapthene	Fluoranthene
Acenapthylene	Fluorene
Anthracene	Hexachlorobenzene
Benzidine	Hexachlorobutadiene
Benzo(a)Anthracene	Hexachlorocyclopentadiene
Benzo(a)Pyrene	Hexachloroethane
Benzo(b)Fluoranthene	Indeno(1,2,3)Pyrene
Benzo(g,h,i)Perylene	Isophrone
	2-Methylnaphthalene

TABLE 2.5.1

PARAMETERS TO BE ANALYZED FOR
(Continued)

Priority Pollutant Semivolatile Organics (Continued)

Bis(2-Cholorethoxy)Methane	Napthalene
Bis(2-Chloroethyl)Ether	Nitrobenzene
Bis(2-Chloroisopropyl)Ether	N-Nitroso-Dimethylamine
Bis(2-Ethylhexyl)Phthalate	
4-Bromophenyl Phenyl Ether	N-Nitroso-di-N-Propylamine
Butyl Benzyl Phthalate	N-Nitrosodiphenylamine
2-Chloronapthalene	Phenanthrene
4-Chlorophenyl Phenyl Ether	Pyrene
Chrysene	1,2,4-Trichlorobenzene
Dibenzo(a,h)Anthracene	4-Chloro-3-Methylphenol
1,2-Dichlorobenzene	2,-Chlorophenol
1,3-Dichlorobenzene	2,4-Dichlorophenol
1,4-Dichlorobenzene	2,4-Dimethylphenol
3,3'-Dichlorobenzidine	4,6-Dinitro-2-Methylphenol
Diethyl Phthalate	2,4-Dinitrophenol
Dimethyl Phthalate	2-Nitrophenol
Di-n-Butyl Phthalate	4-Nitrophenol
2,4-Dinitrotoluene	Pentachlorophenol
2,6-Dinitrotoluene	Phenol
Di-n-Octyl Phthalate	2,4,6-Trichlorophenol
1,2-Diphenylhydrazine	

TABLE 2.5.2

ANALYTICAL METHODS

Chemical class	Matrix	Method	Reference
Volatile Organics	Water	624	(1)
	Soil/Sediment	8240	(2)
Base/Neutrals and Acid Extractables	Water	625	(1)
	Soil/Sediment	8270	(2)
Pesticides/PCBs	Water	608	(1)
	Soil/Sediment	8080	(2)
Herbicides	Water	509B	(3)
	Soil/Sediment	509B	(3)
Metals (except Mercury)	Water	200.7	(4)
	Soil/Sediment	3050/6010	(3)
Mercury	Water	245.1	(4)
	Soil/Sediment	245.5	(4)
Chromium VI	Water	7195	(2)
	Soil/Sediment (EP Tox)	7195	(2)
Petroleum Hydrocarbons	Water	418	(4)
	Soil/Sediment	418	(4)
Oil and Grease	Water	413.1	(4)
Gross Alpha & Beta Radioactivity	Water	900.0	(5)
	Soil/Sediment	900.0	(5)
Uranium 226 and 228	Water	706/7	(5)
	Soil/Sediment	706/7	(5)
Cyanide	Water	335.3	(4)
	Soil/Sediment	9010	(2)
COD	Water	410.1	(4)
Chloride	Water	325.5	(4)
Fluoride	Water	340.2	(4)

TABLE 2.5.2

ANALYTICAL METHODS
(Continued)

(1) Federal Register. Vol. 49, No. 209, Friday, October 26, 1984.

(2) Test Methods for Evaluating Solid Waste, Physical/Chemical Meth Edition, U.S. EPA, Office of Solid Waste and Emergency Response, Washington, DC, July 1982. Revised 4/84.

(3) Standard Methods for the Examination of Waste and Wastewater, Edition, American Public Health Association, Washington, DC.

(4) Methods for Chemical Analysis of Water and Wastes, EPA-600/A-79-02, U.S. EPA, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, March 1979. Revised March 1982.

(5) Prescribed Procedures for the Measurement of Radioactivity in Drinking Water, EPA 600/4-80-032, U.S. EPA, Environmental Monitoring and Support Laboratory, Las Vegas, 1982.

TABLE 2.5.3

SAMPLE ANALYSES FOR NAS-ALAMEDA SITES

Sample Site	Sample Matrix	Analysis
West Beach Landfill & 1943-56 disposal area	Soil	VOA, BNA extractables, pesticides/PCBs, metals, gross alpha & beta, uranium 226 & 228
West Beach Landfill & 1943-56 disposal area	Ground Water	VOA, BNA extractables, pesticides/PCBs, metals, gross alpha & beta, uranium 226 & 228, COD, chloride, fluoride, cyanide, TOC
Building 459	Soil	VOA, BNA extractables, petroleum hydrocarbons, metals
Building 459	Ground Water	VOA, BNA extractables, petroleum hydrocarbons, metals
Building 547	Soil	Petroleum hydrocarbons, metals
Building 547	Ground Water	Petroleum hydrocarbons, metals
Building 14	Soil	Petroleum hydrocarbons, metals
Building 14	Ground Water	Petroleum hydrocarbons, metals
CANS C-2 Area	Surface Soils	Pesticides/PCBs, metals
CANS C-2 Area	Soil	VOA, BNA extractables, metals, pesticides/PCBs,
CANS C-2 Area	Ground Water	VOA, BNA extractables, metals, pesticides/PCBs, petroleum hydrocarbons
Yard D-13	Soil	VOA, BNA extractables, metals, pesticides/PCBs
Yard D-13	Ground Water	VOA, BNA extractables, metals, pesticides/PCBs, petroleum hydrocarbons
Building 410	Soil	VOA, BNA extractables, metals
Building 410	Ground Water	VOA, BNA extractables, metals
Building 410	Air	VOA
Building 114	Soil	VOA, BNA extractables, metals, pesticides/PCBs
Building 114	Ground Water	VOA, BNA extractables, metals, pesticides/PCBs

TABLE 2.5.3

SAMPLE ANALYSES FOR NAS-ALAMEDA SITES
(Continued)

Sample Site	Sample Matrix	Analysis
Area 97	Surface Soils	Petroleum hydrocarbons, metals
Area 97	Soil	VOA, BNA extractables, petroleum hydrocarbons, metals
Area 97	Ground Water	VOA, BNA extractables, petroleum hydrocarbons, metals
Fire-Training Area	Surface Soils	Metals, pesticides/PCBs
Fire-Training Area	Soil	VOA, BNA extractables, metals, pesticides/PCBs
Fire-Training Area	Ground Water	VOA, BNA extractables, petroleum hydrocarbons, metals
Buildings 301 & 389	Surface Soils	Metals, pesticides/PCBs
Buildings 301 & 389	Soil	VOA, BNA extractables, metals, pesticides/PCBs
Buildings 301 & 389	Ground Water	VOA, BNA extractables, petroleum hydrocarbons, metals, pesticides/PCBs
Building 5	Soil	VOA, BNA extractables, metals
Building 5	Ground Water	VOA, BNA extractables, metals
Building 360	Soil	VOA, BNA extractables, metals
Building 360	Ground Water	VOA, BNA extractables, metals
Estuary	Sediment	VOA, BNA extractables, metals, pesticides/PCBs, bioassay
Seaplane Lagoon	Surface Water	Metals, COD, BOD
Seaplane Lagoon	Sediment	VOA, BNA extractables, metals, pesticides/PCBs, bioassay
Station Sewer System	Soil	VOA, BNA extractables, metals, petroleum hydrocarbons

TABLE 2.5.3

SAMPLE ANALYSES FOR NAS-ALAMEDA SITES
(Continued)

Sample Site	Sample Matrix	Analysis
Building 41	Soil	VOA, BNA extractables, metals
Building 41	Ground Water	VOA, BNA extractables, metals
Building 400	Soil	VOA, BNA extractables, metals
Building 400	Ground Water	VOA, BNA extractables, metals
Building 530	Soil	Metals
Building 530	Ground Water	VOA, BNA extractables, metals, petroleum hydrocarbons
Building 10, Power Plant	Soil	Petroleum hydrocarbons, metals
Building 10, Power Plant	Ground Water	VOA, BNA extractables, metals

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Notes:

1. BNA indicates base neutral/acid.
2. VOA indicates volatile organic analysis.
3. PCBs indicates polychlorinated biphenyls.
4. COD indicates chemical oxygen demand.
5. TOC indicates total organic carbon.
6. BOD indicates biological oxygen demand.

The following tables are included in Volume 1A of the Work Plan (Volume 1A is the Sampling Plan - SWAT Proposal Addendum):

Tables 3.1.1
3.1.2
3.2.1
3.2.2

TABLE 3.3.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR AREA 97

Sample matrix	Analysis	Rationale
Soils		
Surface Samples	Metals	AVGAS releases
	Petroleum hydrocarbons	AVGAS releases
	VOA	AVGAS releases
Split Spoon Samples	BNA extractables	AVGAS releases
	Metals	AVGAS releases
	Petroleum Hydrocarbons	AVGAS releases
Thin-Walled Tube Samples	Gradation	Disposal Treatment Isolation
	Atterberg limits	Disposal Treatment Isolation
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in situ biotreatment
	pH	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine	Evaluate remedial response options
Ground Water	VOA	AVGAS releases
	BNA extractables	AVGAS releases
	Metals	AVGAS releases
	Petroleum Hydrocarbons	AVGAS releases
	Hardness	Affects treatment method
	Alkalinity	General treatment information
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Acidity	General treatment information
	Specific conductance	Describe fate and transport

TABLE 3.3.2.

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT AREA 97

Boring No.	Total Depth (ft)	Total Soil Samples	Split Spoon Samples	Thin-Walled Samples	Install Monitoring Well	Sample Ground Water
B97-1	15	5	4	1	MW97-1	Yes
B97-2	15	5	4	1	MW97-2	Yes
B97-3	15	5	4	1	MW97-3	Yes

TABLE 3.4.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 360

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Paint stripping
	BNA extractables	Paint stripping
	Metals	Metal stripping and plating
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	pH	Describe fate and transport
	C.E.C.	Determines mobility of metals
	T.O.C.	Describe fate and transport
Ground Water	VOA	Paint stripping
	BNA extractables	Paint stripping
	Metals	Metal stripping and plating
	Petroleum Hydrocarbons	
	Hardness	Affects treatment method
	Alkalinity	General treatment information
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Acidity	General treatment information
	Specific conductance	Describe fate and transport

TABLE 3.4.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 360

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B360-1	15	5	4	1	MW360-1	Yes
B360-2	15	5	5	-	MW360-2	Yes
B360-3	15	5	5	-	MW360-3	Yes
B360-4	15	5	4	1	MW360-4	Yes
B360-5	15	5	5	-	-	-
B360-6	15	5	4	1	-	-
B360-7	15	5	5	-	-	-
B360-8	15	5	5	-	-	-
B360-9	15	5	5	-	-	-

TABLE 3.5.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 5

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Paint stripping
	BNA extractables	Paint stripping
	Metals	Metal manufacturing
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	pH	Describe fate and transport
	Cation Exchange Capacity(CEC)	Determines mobility of metals
	T.O.C.	Describe fate and transport
Ground Water	VOA	Paint stripping
	BNA extractables	Paint stripping
	Metals	Metal manufacturing
	Hardness	Affects treatment method
	Alkalinity	General treatment information
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Acidity	General treatment information
	Specific conductance	Describe fate and transport

TABLE 3.5.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 5

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B5-1	15	5	5	-	MW5-1	Yes
B5-2	15	5	5	-	MW5-2	Yes
B5-3	15	5	4	1	MW5-3	Yes
B5-4	15	5	4	1	MW5-4	Yes
B5-5	15	5	5	-	MW5-5	Yes
B5-6	15	5	5	-	-	-
B5-7	15	5	4	1	-	-
B5-8	15	5	5	1	-	-
B5-9	15	5	5	-	-	-
B5-10	15	5	5	-	-	-
B5-11	15	5	5	-	-	-
B5-12	15	5	4	1	-	-
B5-13	15	5	4	1	-	-

TABLE 3.6.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 41

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Paint stripping
	BNA extractables	Paint stripping
	Metals	Metal stripping
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Modified Proctor Compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	T.O.C.	Describe fate and transport
Ground Water	VOA	Paint stripping
	BNA extractables	Paint stripping
	Metals	Metal Stripping

TABLE 3.6.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 41

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B41-1	15	5	5	-	MW41-1	Yes
B41-2	15	5	5	-	MW41-2	Yes
B41-3	15	5	5	-	MW41-3	Yes
B41-4	15	5	4	1	MW41-4	Yes
B41-5	15	5	5	-	MW41-5	Yes
B41-6	15	5	4	1	-	-
B41-7	15	5	5	-	-	-
B41-8	15	5	4	1	-	-
B41-9	15	5	5	-	-	-
B41-10	15	5	5	-	-	-
B41-11	15	5	5	-	-	-
B41-12	15	5	5	-	-	-
B41-13	15	5	5	-	-	-
B41-14	15	5	5	-	-	-
B41-15	15	5	5	-	-	-
B41-16	15	5	5	-	-	-
B41-17	15	5	5	-	-	-
B41-18	15	5	5	-	-	-
B41-19	15	5	5	-	-	-

TABLE 3.7.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 459

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Fuel spills/releases
	BNA extractables	Fuel spills/releases
	Metals	Fuel spills/releases
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in situ biotreatment
	pH	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine content	Evaluate remedial response options
Ground Water	VOA	Fuel spills/releases
	BNA extractables	Fuel spills/releases
	Metals	Fuel spills/releases
	Hardness	Affects treatment method
	T.O.C.	Evaluate treatment options
	Specific conductance	Describe fate and transport

TABLE 3.7.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 459

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B459-1	15	5	5	-	MW459-1	Yes
B459-2	15	5	5	-	MW459-2	Yes
B459-3	15	5	3	2	MW459-3	Yes
B459-4	15	5	3	2	MW459-4	Yes
B459-5	15	5	3	2	-	-
B459-6	15	5	3	2	-	-
B459-7	15	5	3	2	-	-

Note: Ground water samples will be taken from the three existing monitoring wells.

TABLE 3.8.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 547

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	Petroleum hydrocarbons	Fuel leaks
	Metals	
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in-situ biodegradation
	pH	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine content	Evaluate remedial response options
Ground Water	Petroleum hydrocarbons	Fuel leaks
	Metals	
	Hardness	Affects treatment method
	T.O.C.	Evaluate treatment options
	Specific conductance	Describe fate and transport

TABLE 3.8.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 547

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B547-1	15	5	5	0	MW547-1	Yes
B547-2	15	5	4	0	MW547-2	Yes
B547-3	15	5	4	0	MW547-3	Yes
B547-4	15	5	4	0	MW547-4	Yes
B547-5	15	5	4	0	MW547-5	Yes
B547-6	15	5	4	1	-	-
B547-7	15	5	4	1	-	-
B547-8	15	5	4	1	-	-
B547-9	15	5	4	1	-	-
B547-10	15	5	4	1	-	-

TABLE 3.9.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 162

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	Petroleum hydrocarbons	Fuel leaks
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in situ biodegradation
	pH	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine content	Evaluate remedial response options
Ground Water	Hardness	Affects treatment method
	T.O.C.	Evaluate treatment options
	Specific conductance	Describe fate and transport

TABLE 3.9.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 162

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B162-1	15	5	5	-	-	-
B162-2	15	5	5	-	-	-
B14-2	15	5	5	0	MW14-2	Yes
B14-3	15	5	2	3	-	-
B97-3	15	5	5	0	MW97-3	Yes
OW-21[a]	5	-	-	-	(Kennedy 1980)	Yes
OW-2[a]	8	-	-	-	(Kennedy 1980)	Yes
WA-8[a]	12	-	-	-	(Wahler 1985)	Yes

[a]Previously installed wells to be sampled.

TABLE 3.10.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 114

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Paint operations
	BNA extractables	Paint operations
	Metals	Possible mercury contamination
	Pesticides/PCBs	Pest and weed control
Ground Water	VOA	Paint operations
	BNA extractables	Paint operations
	Metals	Possible mercury contamination
	Pesticides/PCBs	Pest and weed control

TABLE 3.10.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 114

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B114-1	15	5	5	-	MW114-1	Yes
B114-2	15	5	5	-	MW114-2	Yes
B114-3	15	5	5	-	MW114-3	Yes
B114-4	15	5	4	1	MW114-4	Yes
B114-5	15	5	5	-	MW114-5	Yes
B114-6	15	5	5	-	-	-
B114-7	15	5	5	-	-	-
B114-8	15	5	4	1	-	-
B114-9	15	5	5	-	-	-
B114-10	15	5	5	-	-	-

TABLE 3.11.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 410

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Wastewater constituents: oil, metals, paints
	BNA extractables	
	Metals	
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	pH	Describe fate and transport
	C.E.C.	Determines mobility of metals
	T.O.C.	Describe fate and transport
Ground Water	VOA	Wastewater constituents: oils, metals, paints
	BNA extractables	
	Metals	
	Hardness	Affects treatment method
	Alkalinity	General treatment information
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Acidity	General treatment information
	Specific conductance	Describe fate and transport
Air	VOA	Wastewater constituents: oils, metals, paints

TABLE 3.11.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 410

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B410-1	15	5	4	1	MW410-1	Yes
B410-2	15	5	5	-	MW410-2	Yes
B410-3	15	5	4	1	MW410-3	Yes
B410-4	15	5	5	-	MW410-4	Yes
B410-5	15	5	5	-	-	-
B410-6	15	5	4	1	-	-
B410-7	15	5	5	-	-	-
B410-8	15	5	5	-	-	-
B410-9	15	5	5	-	-	-

TABLE 3.12.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 530

Sample matrix	Analysis	Rationale
Soils	VOA	Oil refinery waste
	Petroleum hydrocarbons	Oil refinery waste
Split Spoon Samples	Metals	Wastewater characteristics: solvents, heavy metals, phenols
Ground Water	VOA	Wastewater constituents: solvents, heavy metals, phenols
	BNA extractables	
	Metals	
	Petroleum hydrocarbons	Oil refinery waste

TABLE 3.12.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 530

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B530-1	15	5	5	-	MW530-1	Yes
B530-2	15	5	5	-	MW530-2	Yes
B530-3	15	5	5	-	MW530-3	Yes

TABLE 3.13.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 400

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	Metals BNA extractables Metals	Wastewater characteristics: solvents, heavy metals, phenols
Ground Water	VOA BNA extractables Metals	Wastewater constituents: solvents, heavy metals, phenols

TABLE 3.13.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 400

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B400-1	15	5	5	-	MW400-1	Yes
B400-2	15	5	5	-	MW400-2	Yes
B400-3	15	5	5	-	MW400-3	Yes
B400-4	15	5		5	-	-

TABLE 3.14.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 14

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	Petroleum hydrocarbons	Engine testing
Ground Water	Petroleum hydrocarbons	Engine testing

TABLE 3.14.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 14

Boring No.	Total Depth (ft)	Total Soil Samples	Split Spoon Samples	Thin-Walled Samples	Install Monitoring Well	Sample Ground Water
B14-1	15	5	5	--	MW14-1	Yes
B14-2	15	5	5	--	MW14-2	Yes
B14-3	15	5	5	--	MW14-3	Yes
B14-4	15	5	5	--	MW14-4	Yes
B14-5	15	5	2	3	--	--
B14-6	15	5	3	2	--	--
B14-7	15	5	5	--	--	--

TABLE 3.15.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDING 10

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	Petroleum hydrocarbons	Bunker "C" fuel present
	Metals	Bunker "C" fuel present
Thin-Walled Tube Samples	Gradation	Describe fate and transport
	Water content	Affects treatment method
	Specific gravity	Indicates density
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in situ biotreatment
	pH	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine	Evaluate remedial response options
Ground Water	VOA	Bunker "C" fuel present
	BNA extractables	Bunker "C" fuel present
	Metals	Bunker "C" fuel present
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Specific conductance	Describe fate and transport

TABLE 3.15.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE 10

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
B10-1	15	5	5	-	MW10-1	Yes
B10-2	15	5	4	1	MW10-2	Yes
B10-3	15	5	5	-	MW10-3	Yes
B10-4	15	5	4	1	MW10-4	Yes
B10-5	15	5	5	-	-	-
B10-6	15	5	4	1	-	-
B10-7	15	5	5	-	-	-
B10-8	15	5	5	-	-	-
B10-9	15	5	5	-	-	-
B10-10	15	5	5	-	-	-

TABLE 3.16.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR OIL REFINERY

Sample matrix	Analysis	Rationale
Soils*		
Split Spoon Samples	Petroleum hydrocarbons	Oil refinery waste
	VOA	Oil refinery waste
Thin Walled Tube Samples	Gradation	Disposal Treatment Isolation
	Atterberg limits	Disposal Treatment Isolation
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in situ biotreatment
	pH	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine	Evaluate remedial response options
Ground Water*	VOA	Oil refinery waste
	Petroleum hydrocarbons	Oil refinery waste
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Specific conductance	Describe fate and transport

* Some of these samples will be collected and analyzed as part of the Building 530, Yard D-13, and Cans C-2 site studies.

TABLE 3.16.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT OIL REFINERY SITE

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
BOR-1	15	5	4	1	MWOR-1	Yes
BOR-2	15	5	4	1	-	-
BOR-3	15	5	4	1	-	-
BOR-4	15	5	4	1	-	-
BOR-5	15	5	4	1	-	-
BOR-6	15	5	4	1	-	-
BOR-7	15	5	4	1	-	-
BOR-8	15	5	4	1	-	-
BOR-9	15	5	4	1	-	-
BOR-10	15	5	4	1	-	-
BOR-11	15	5	4	1	-	-
BOR-12	15	5	4	1	-	-
BOR-13	15	5	4	1	-	-
BOR-14	15	5	4	1	-	-
BOR-15	15	5	4	1	-	-

TABLE 3.17.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR FIRE TRAINING AREA

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Bowser fuels
	BNA extractables	Fuels
	Metals	Heavy metals in fuels
	Pesticides/PCBs	Waste oils
Surface Samples	Metals	Heavy metals in fuels
	Pesticides/PCBs	Waste oils
Ground Water	VOA	Bowser fuels
	BNA extractables	Fuels
	Petroleum Hydrocarbons	Heavy metals in fuels
	Metals	Waste oils

TABLE 3.17.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT THE FIRE TRAINING AREA SITE

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
Grid Samples	0.5		-	-	-	-
BFT-1	15	5	4	1	MW FT-1	Yes
BFT-2	15	5	4	1	MW FT-2	Yes
BFT-3	15	5	4	1	MW FT-3	Yes

TABLE 3.18.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR BUILDINGS 301 AND 389

Sample matrix	Analysis	Rationale
Soils		
Surface Samples	Metals	PCB waste oil present
	Pesticides/PCBs	PCB waste oil present
Split Spoon Samples	VOA	PCB waste oil present
	BNA extractables	PCB waste oil present
	Metals	PCB waste oil present
	Pesticides/PCBs	PCB waste oil present
Thin Walled Tube Samples	Gradation	Describe fate and transport
	Water content	Affects treatment method
	Specific gravity	Indicates density
	Permeability	Describe fate and transport
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine	Evaluate remedial response options
Ground water	VOA	PCB waste oil present
	BNA extractables	PCB waste oil present
	Metals	PCB waste oil present
	Petroleum Hydrocarbons	PCB waste oil present
	Hardness	Affects treatment method
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Specific conductance	Describe fate and transport
	Pesticides/PCBs	

TABLE 3.18.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE OF BUILDINGS 301 AND 389

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
Grid Samples	0.5		-	-	-	-
B301-1	15	5	4	1	MW 301-1	Yes
B301-2	15	5	4	1	MW 301-2	Yes
B301-3	15	5	4	1	MW 301-3	Yes

TABLE 3.19.1
SAMPLE TYPES AND ANALYSES/RATIONALE FOR CANS C-2 AREA

Sample matrix	Analysis	Rationale
Soils		
Surface Samples	Metals	Previous sampling revealed high levels
	Pesticides/PCBs	Herbicides found as well
Split Spoon Samples	VOA	Storage of paints and solvents
	BNA extractables	Storage of acids and bases
	Metals	Previous sampling revealed high levels
	Pesticides/PCBs	Herbicides found
Thin Walled Tube Samples	Gradation	Disposal treatment isolation
	Atterberg Limits	Disposal treatment isolation
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	Nutrients	Effectiveness of in situ biotreatment
	pH	Describe fate and transport
	CEC	Indicates mobility of metals
	TOC	Describe fate and transport
	Ash content	Evaluate remedial response options
	Btu value	Evaluate remedial response options
	Chlorine content	Evaluate remedial response options
Ground Water	VOA	Storage of paints and solvents
	BNA extractables	Storage of acids and bases
	Metals	Previous sampling revealed high levels
	Pesticides/PCBs	Herbicides found
	Hardness	Affects treatment method

TABLE 3.19.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR CANS C-2 AREA
(Continued)

Sample matrix	Analysis	Rationale
	Alkalinity	General treatment information
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Acidity	General treatment information
	Specific conductance	Describe fate and transport
	Petroleum hydrocarbons	Oil refinery waste

TABLE 3.19.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT SITE CANS C-2

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
BC2-1	15	5	5	-	MWC2-1	Yes
BC2-2	15	5	5	-	MWC2-2	Yes
BC2-3	15	5	5	-	MWC2-3	Yes
BC2-4	15	5	3	2	-	-
BC2-5	15	5	2	3	-	-
BC2-6	15	5	3	2	-	-
BC2-7	15	5	3	2	-	-
BC2-8	15	5	3	2	-	-
BC2-9	15	5	3	2	-	-
WA-6	Wahler, 1985	-	-	-	-	Yes
Hand augered samples	6 in.	Approx. 56	-	-	-	-

TABLE 3.20.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR SEAPLANE LAGOON

Sample matrix	Analysis	Rationale
Soils		
Sediment Samples	Metals VOA BNA Extractables Pesticides/PCBs	Due to the hazardous character of the waste streams entering the lagoon
	Gradation	Disposal treatment isolation
	Atterberg Limits	Disposal treatment isolation
	Modified Proctor Compaction	Evaluate disposal options
	Specific Gravity	Indicates density
	One-Dimensional Consolidation	Evaluate disposal options
	Bioassay	Determine toxicity to marine macrobenthos
Surface Water	Metals COD BOD	High levels detected in previous studies

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Notes:

1. COD indicates chemical oxygen demand.
2. BOD indicates biological oxygen demand.

TABLE 3.20.2

TYPE AND NUMBER OF SAMPLES TO BE COLLECTED
FROM THE SEAPLANE LAGOON

Sample type	Number of samples
Sediment	20
Bioassay sediment	4
Surface water	4

TABLE 3.21.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR STATION SEWER SYSTEM

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA BNA extractables Metals Petroleum hydrocarbons	Appears likely that untreated and treated hazardous substances and rinse waters may have entered the sewer systems
Ground water	VOA BNA extractables Metals Petroleum hydrocarbons	Appears likely that untreated and treated hazardous substances and rinse waters may have entered the sewer systems

TABLE 3.22.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR YARD D-13

Sample matrix	Analysis	Rationale
Soils		
Split Spoon Samples	VOA	Hazardous waste storage area
	BNA extractables	Hazardous waste storage area
	Metals	Hazardous waste storage area
	Pesticides/PCBs	Hazardous waste storage area
	Petroleum hydrocarbons	Oil refinery
Thin-Walled Tube Samples	Gradation	Disposal treatment isolation
	Atterberg limits	Disposal treatment isolation
	Modified Proctor compaction	Evaluate disposal options
	Water content	Affects treatment method
	Specific gravity	Indicates density
	One-dimensional consolidation	Evaluate disposal options
	Permeability	Describe fate and transport
	pH	Describe fate and transport
	CEC	Indicates mobility of metals
	T.O.C.	Describe fate and transport
	Ash content	Evaluate remedial response
	Btu value	Evaluate remedial response
	Chlorine content	Evaluate remedial response
Ground water	VOA	Hazardous waste storage area
	BNA extractables	Hazardous waste storage area
	Metals	Hazardous waste storage area
	Pesticides/PCBs	Hazardous waste storage area
	Hardness	Affects treatment method
	Alkalinity	General treatment information
	TDS	General treatment information
	T.O.C.	Evaluate treatment information
	Acidity	General treatment information
	Specific conductance	Describe fate and transport
	Petroleum hydrocarbons	Oil refinery

TABLE 3.22.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED AT YARD D-13

Boring No.	Total depth (ft)	Total soil samples	Split spoon samples	Thin walled samples	Install monitoring well	Sample ground water
BD13-1	15	5	-	-	MWD13-1	Yes
BD13-2	15	5	-	-	MWD13-2	Yes
BD13-3	15	5	-	-	MWD13-3	Yes
BD13-4	15	5	-	-	MWD13-4	Yes
BD13-5	15	5	4	1	-	-
BD13-6	15	5	4	1	-	-
BD13-7	15	5	4	1	-	-
BD13-8	15	5	4	1	-	-
BD13-9	15	5	4	1	-	-
BD13-10	15	5	4	1	-	-
BD13-11	15	5	4	1	-	-
BD13-12	15	5	4	1	-	-
BD13-13	15	5	4	1	-	-
BD13-14	15	5	4	1	-	-
BD13-15	15	5	4	1	-	-
BD13-16	15	5	4	1	-	-

TABLE 3.23.1

SAMPLE TYPES AND ANALYSES/RATIONALE FOR THE ESTUARY

Sample matrix	Analysis	Rationale
Soils		
Sediment Samples	Metals VOA BNA Extractables Pesticides/PCBs	Wastewater sampling has identified the constituents of concern.
	Gradation	Describe fate and transport.
	Bioassay	Determine toxicity to marine macrobenthos.

Notes:

1. VOA indicates volatile organic analysis.
2. BNA indicates base neutral/acid.
3. PCBs indicates polychlorinated biphenyls.

TABLE 3.23.2

NUMBER AND TYPE OF SAMPLES TO BE COLLECTED FROM THE ESTUARY

Sample type	Number of samples
Sediment	10
Bioassay Sediment	4

FIGURES

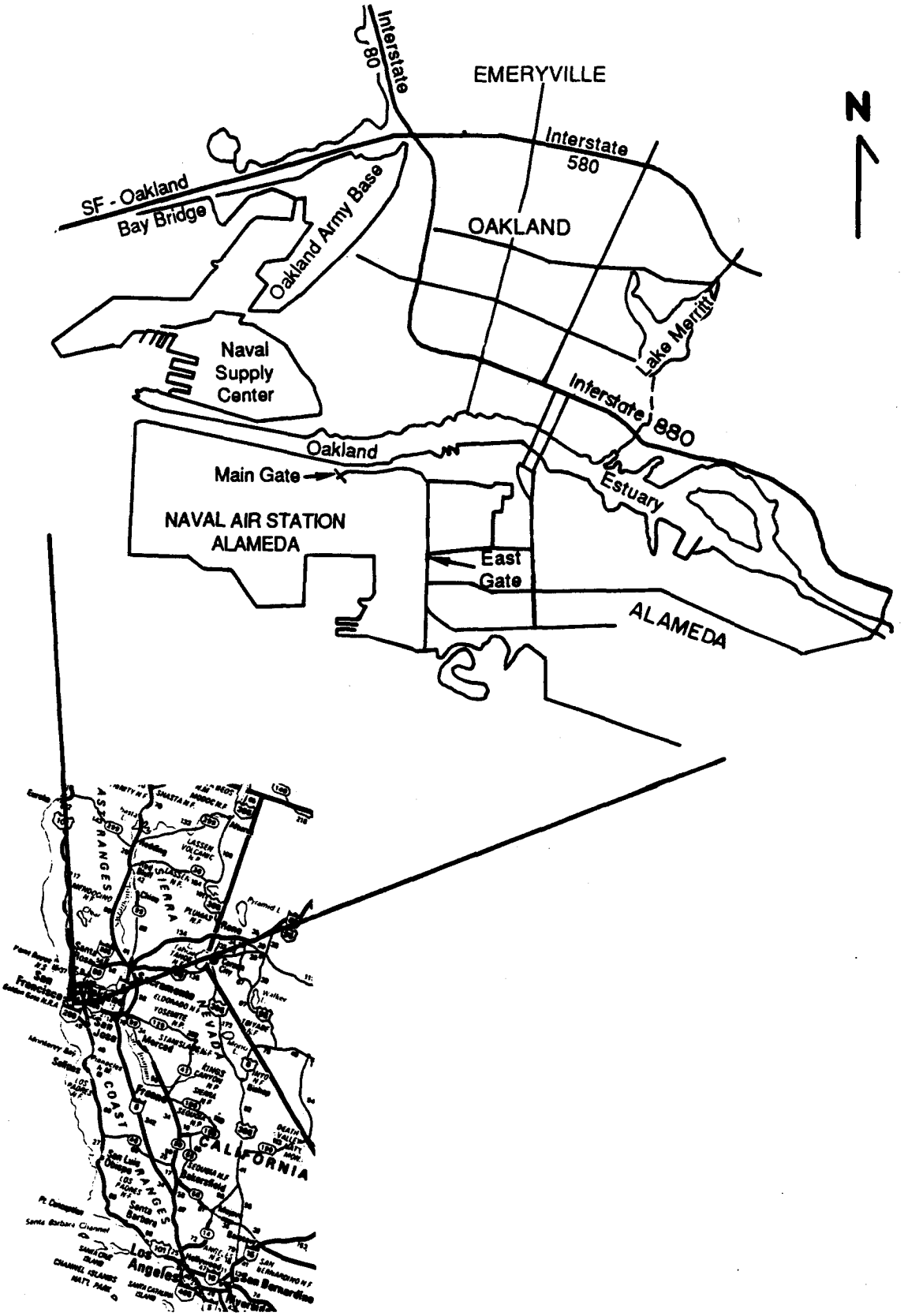

Figure 1.1. General location map.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

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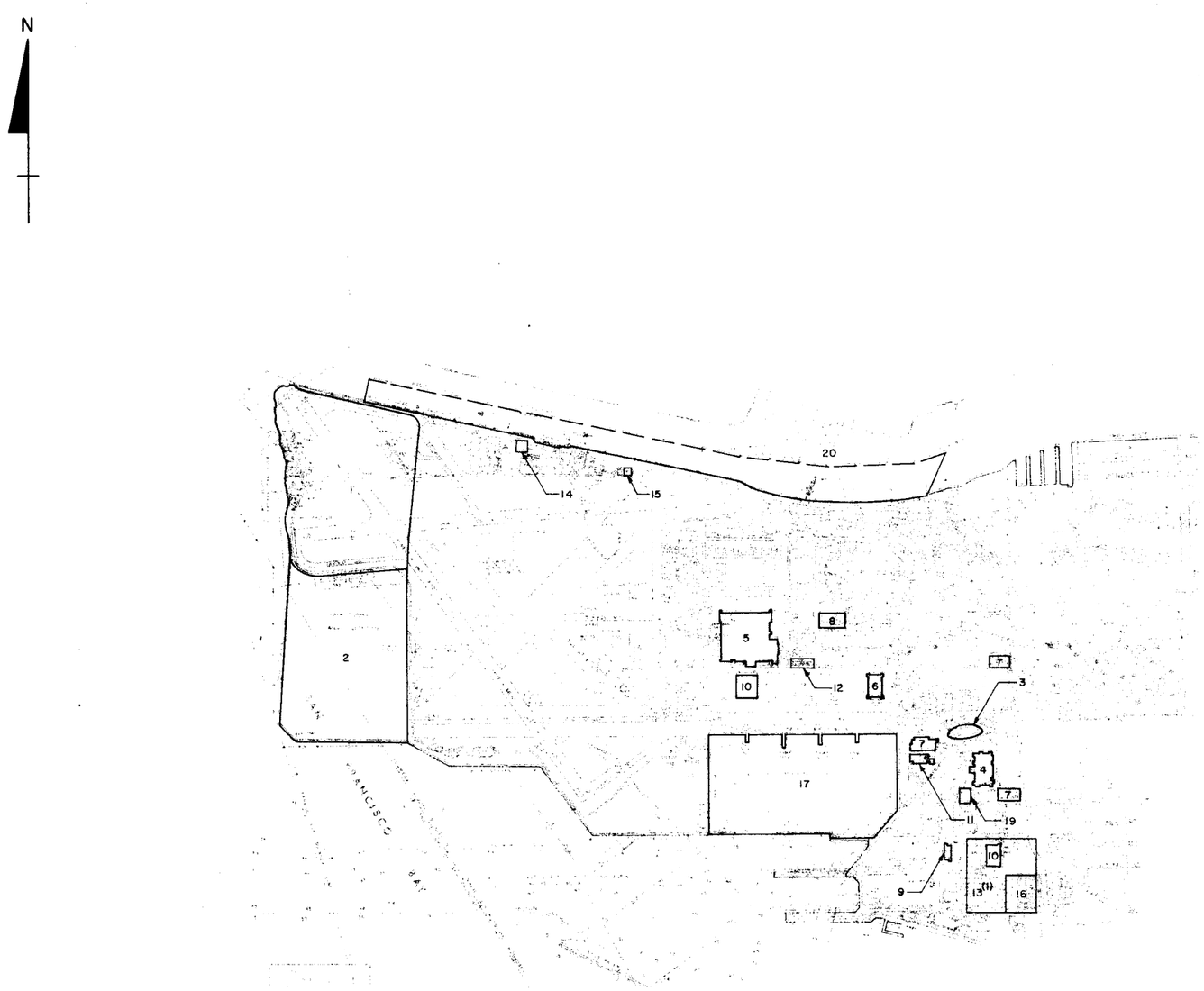
86-018-E2

REVISIONS	NO.	DATE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
L2			LEA 7-22-88	LEA 7-27-88		86-018-E3



REFERENCE:
U.S. NAVY MAP

NOTES:

1. THE AREA OF SITE 13 INCLUDES THE AREAS OF SITES 10 AND 16.

LEGEND:

Site No.	Site Description
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation Gasoline Tanks)
4	Building 360 (Plating Shop, Engine Cleaning Shop, Paint Shop, and Paint Stripping Shop)
5	Building 5 (Plating Shop, Paint Stripping Shop, Cleaning Shop, and Paint Shop)
6	Building 41 (Aircraft Intermediate Maintenance Dept.)
7	Buildings 162, 459, and 547 (Service Stations)
8	Building 114 (Pest Control Area and Separator Pit)
9	Building 410 (Paint Stripping)
10	Buildings 400 and 530 (Missile Rework Operations)
11	Building 14 (Engine Test Cell)
12	Building 10 (Power Plant)
13	Oil Refinery
14	Fire Training Area
15	Buildings 301 and 389 (Storage Area)
16	Cans C-2 Area
17	Seaplane Lagoon
18	Station Sewer System (Not on Site)
19	Yard D-13 (Hazardous Waste Solvents)
20	Estuary (Oakland Inner Harbor)

SCALE
1000 0 1000 2000 FEET

REMEDIAL INVESTIGATION/FEASIBILITY STUDY SITES NAVAL AIR STATION ALAMEDA, CALIFORNIA

PREPARED FOR

WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA

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DATE: 7-27-88	FIGURE 1-2	DRAWING NUMBER 86-018-E3
SCALE:		86-018-E2

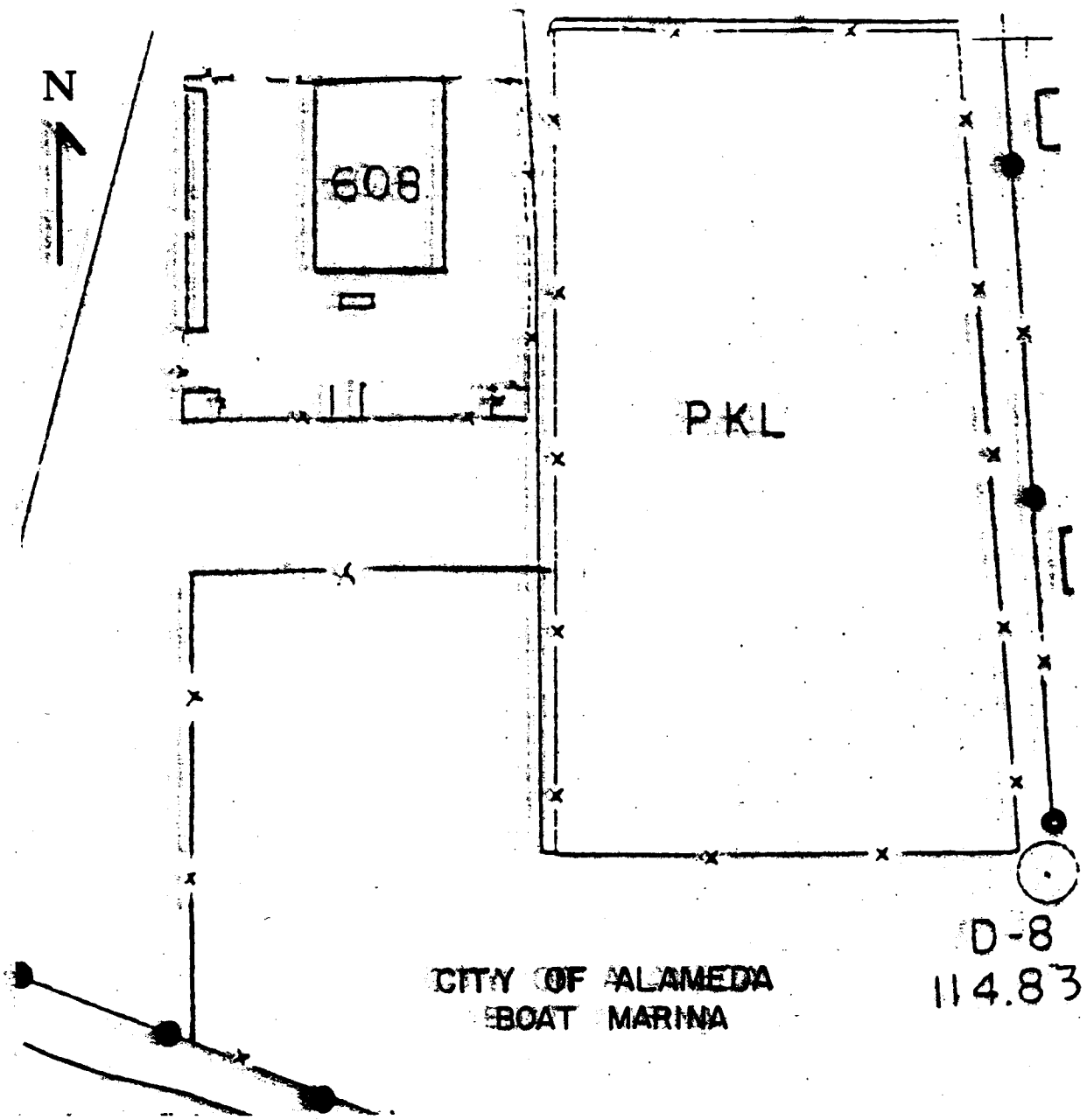


Figure 2.1. Proposed area for mobile field command center and decontamination center.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

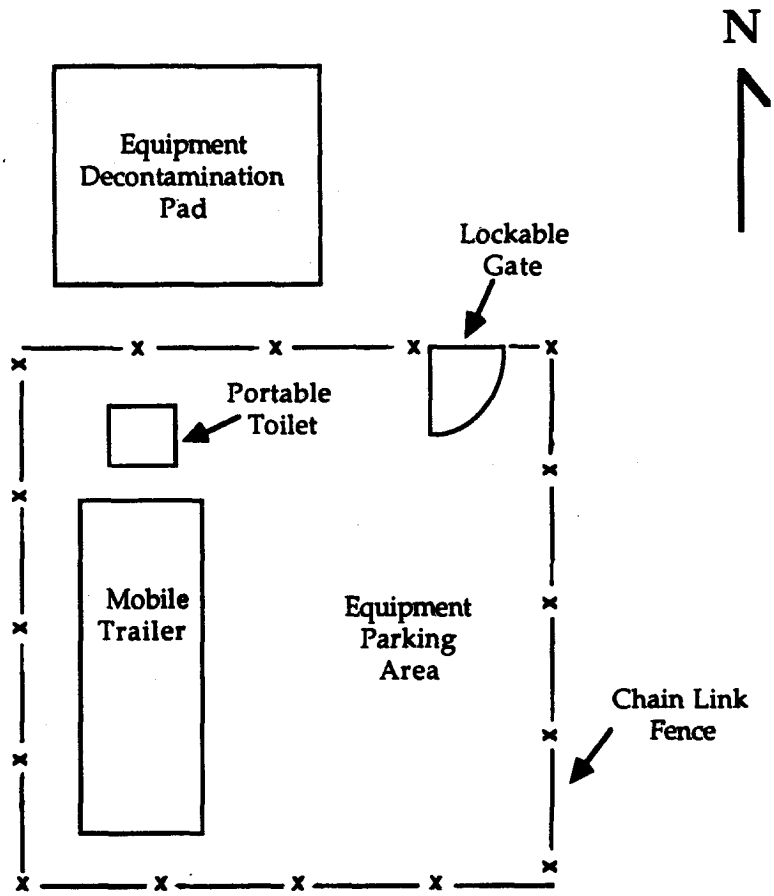


Figure 2.2. Field command center and decontamination pad.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

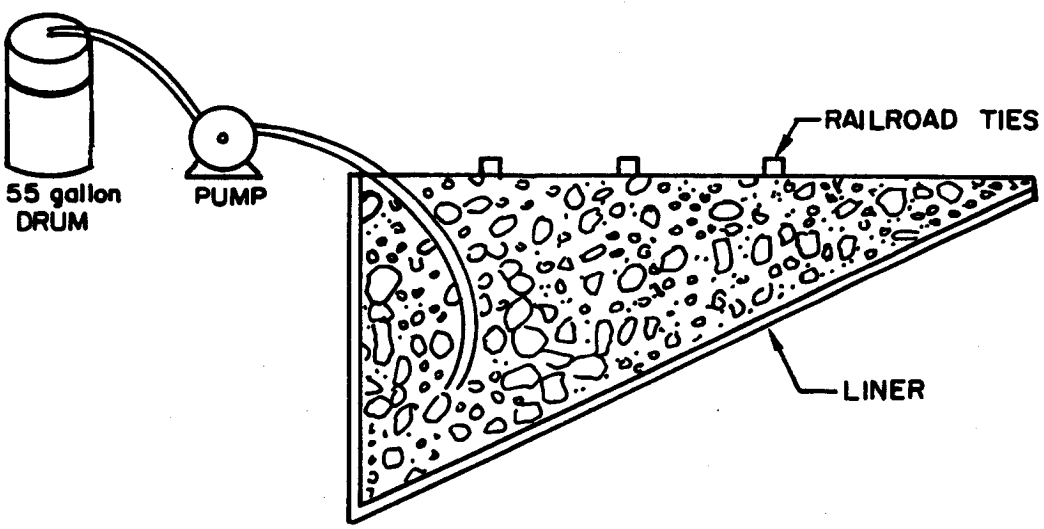


Figure 2.3. Decontamination pit.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

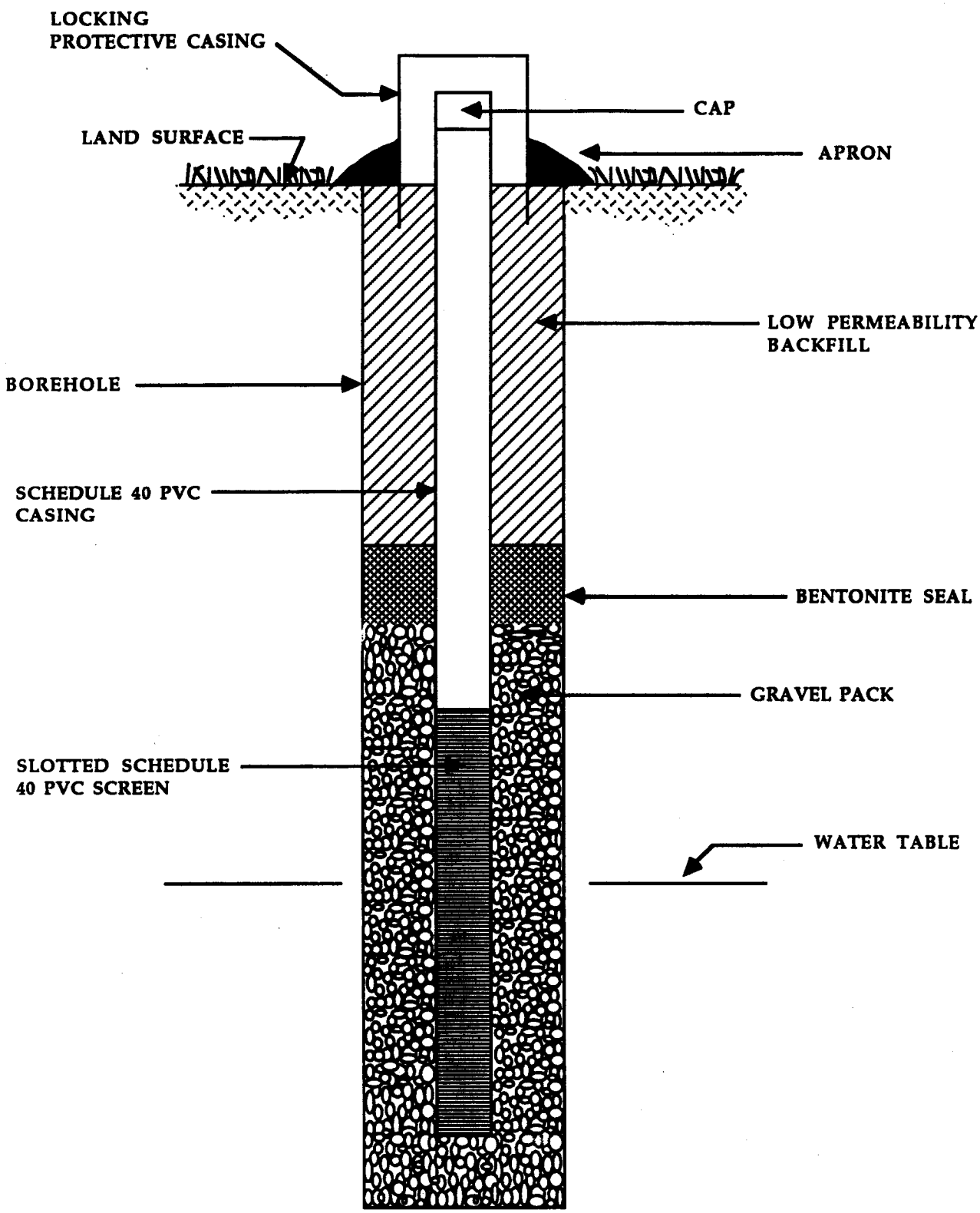


FIGURE 2.4 **Generalized monitoring well construction diagram.**

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

FIGURE 3.1 – SEE VOLUME 1A FOR FIGURES ON THE 1943-1956 DISPOSAL AREA

DRAFT SAMPLING PLAN
SOLID WASTE ASSESSMENT TEST (SWAT)
PROPOSAL ADDENDUM, VOLUME 1A

DATED 1 SEPTEMBER 1988

IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000807**

FIGURE 3.2 – SEE VOLUME 1A FOR FIGURES ON THE WEST BEACH LANDFILL

DRAFT SAMPLING PLAN
SOLID WASTE ASSESSMENT TEST (SWAT)
PROPOSAL ADDENDUM, VOLUME 1A

DATED 1 SEPTEMBER 1988

IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000807**

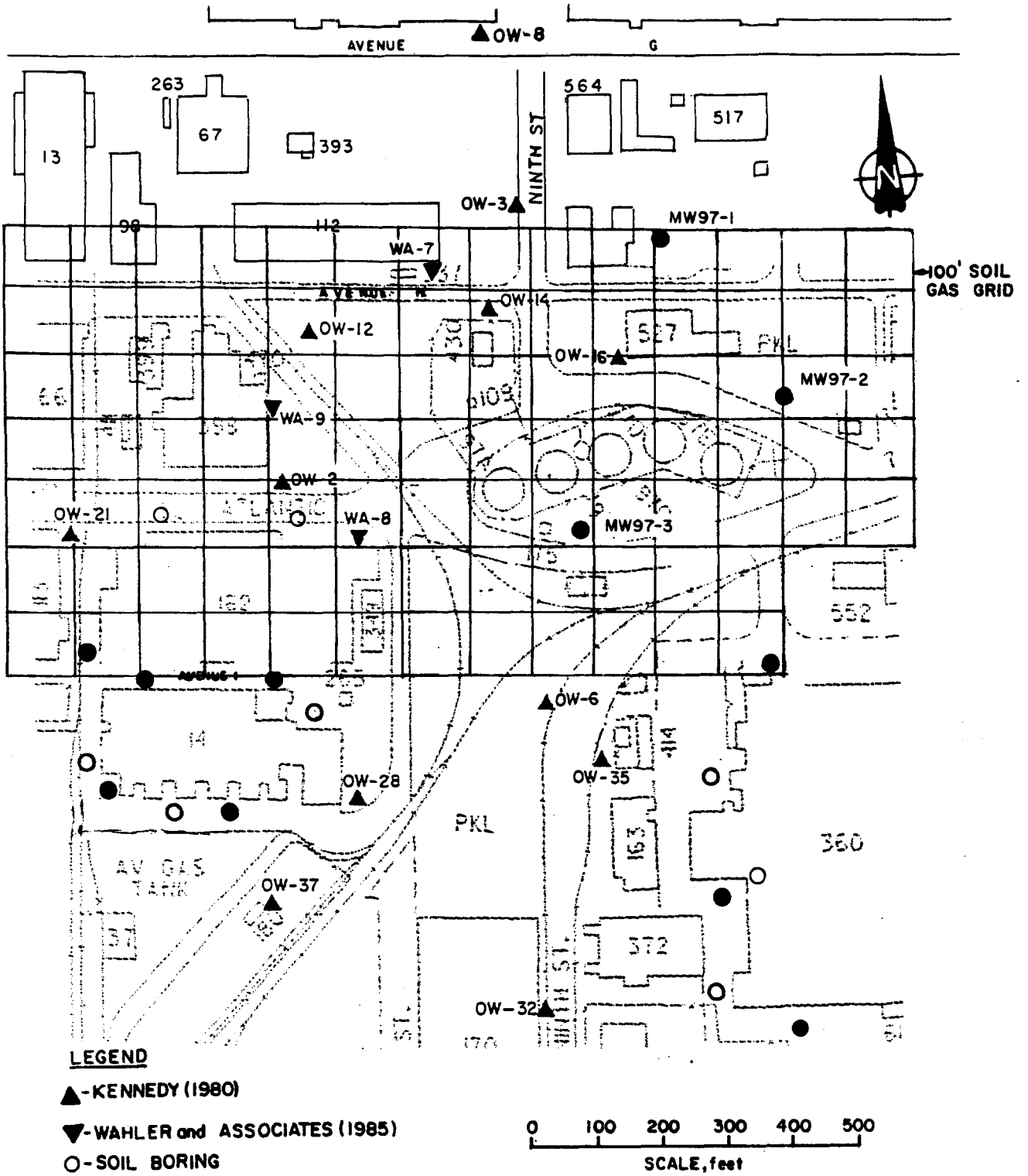
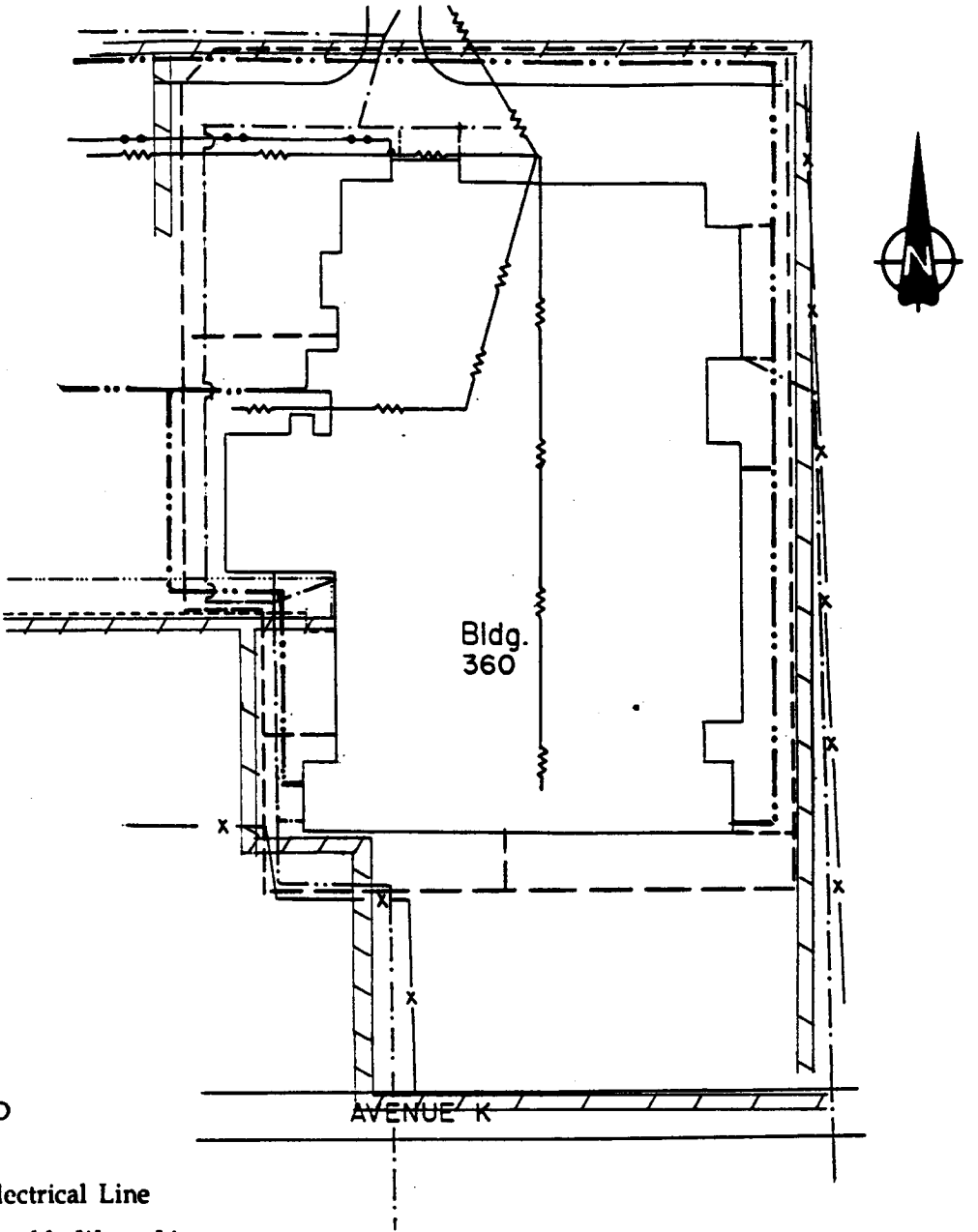


Figure 3.3.1. Area 97 sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND

- Electrical Line
- Potable Water Line
- Fire Protection Sprinkler System
- Steam Line
- Natural Gas Line
- Compressed Air Line
- Storm Sewer
- Sanitary Sewer
- Industrial Waste Sewer

Figure 3.4.1. Building 360 buried utility schematic.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

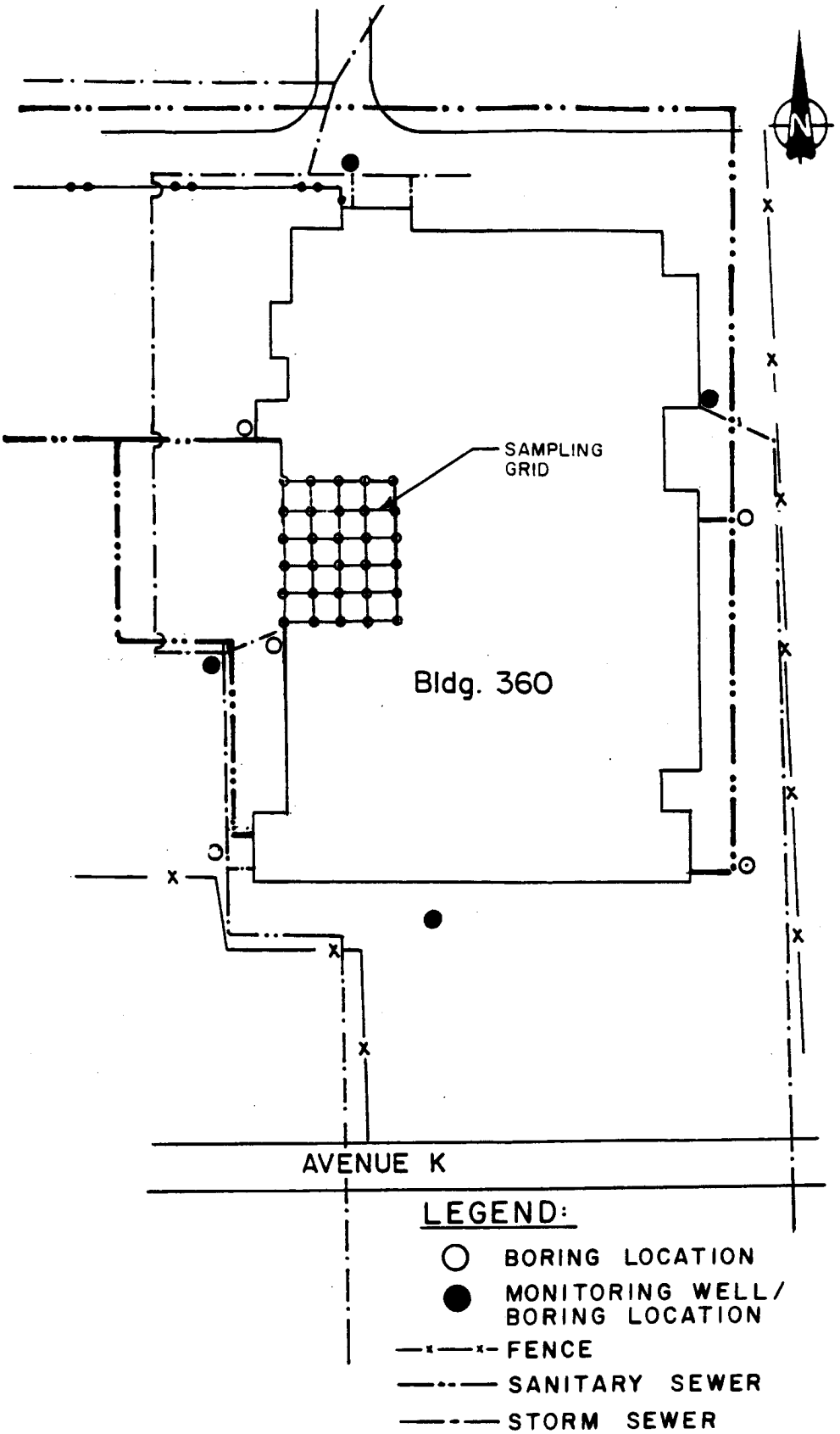


Figure 3.4.2. Building 360 sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

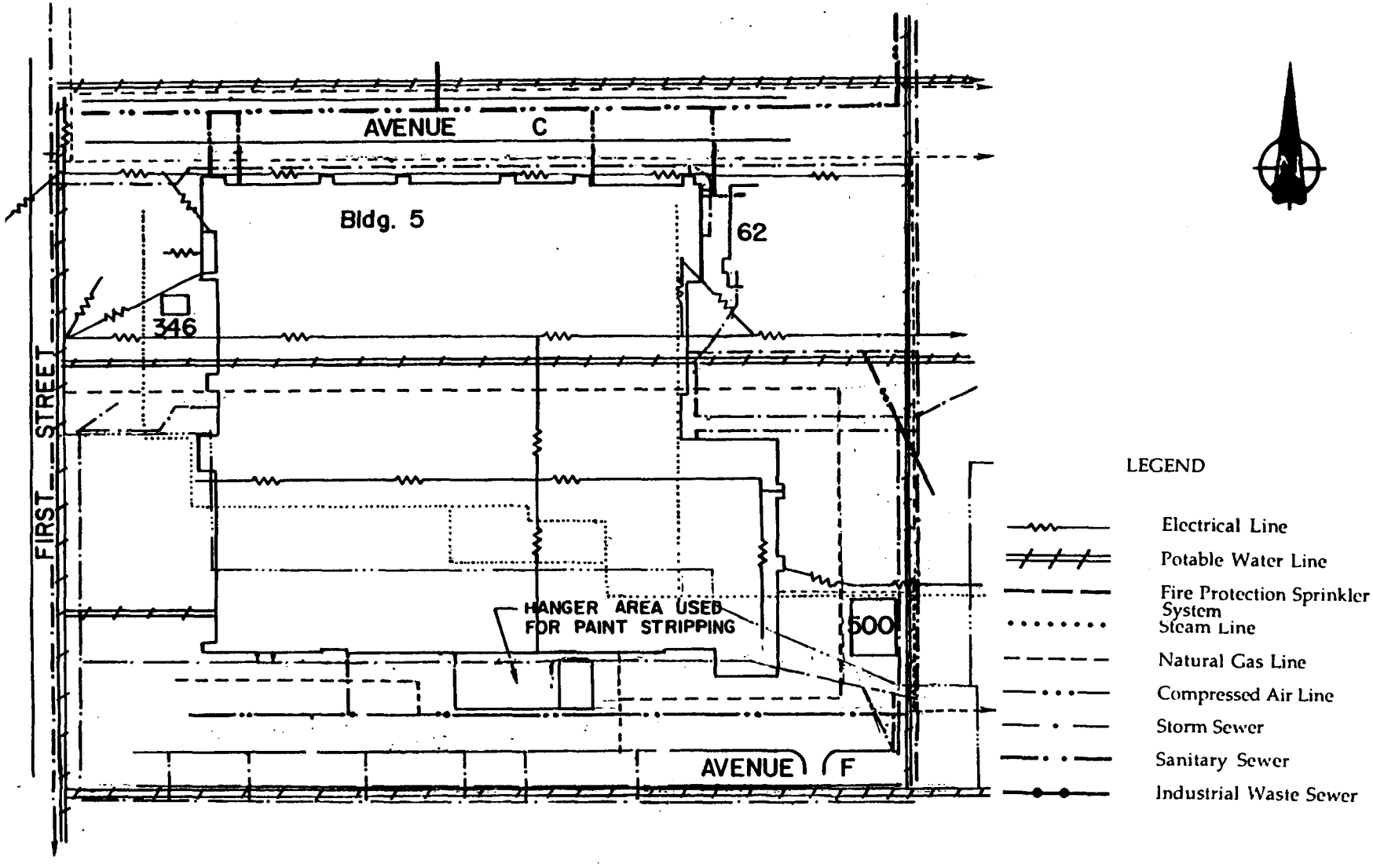


Figure 3.5.1. Building 5 buried utility schematic.

SOURCE:
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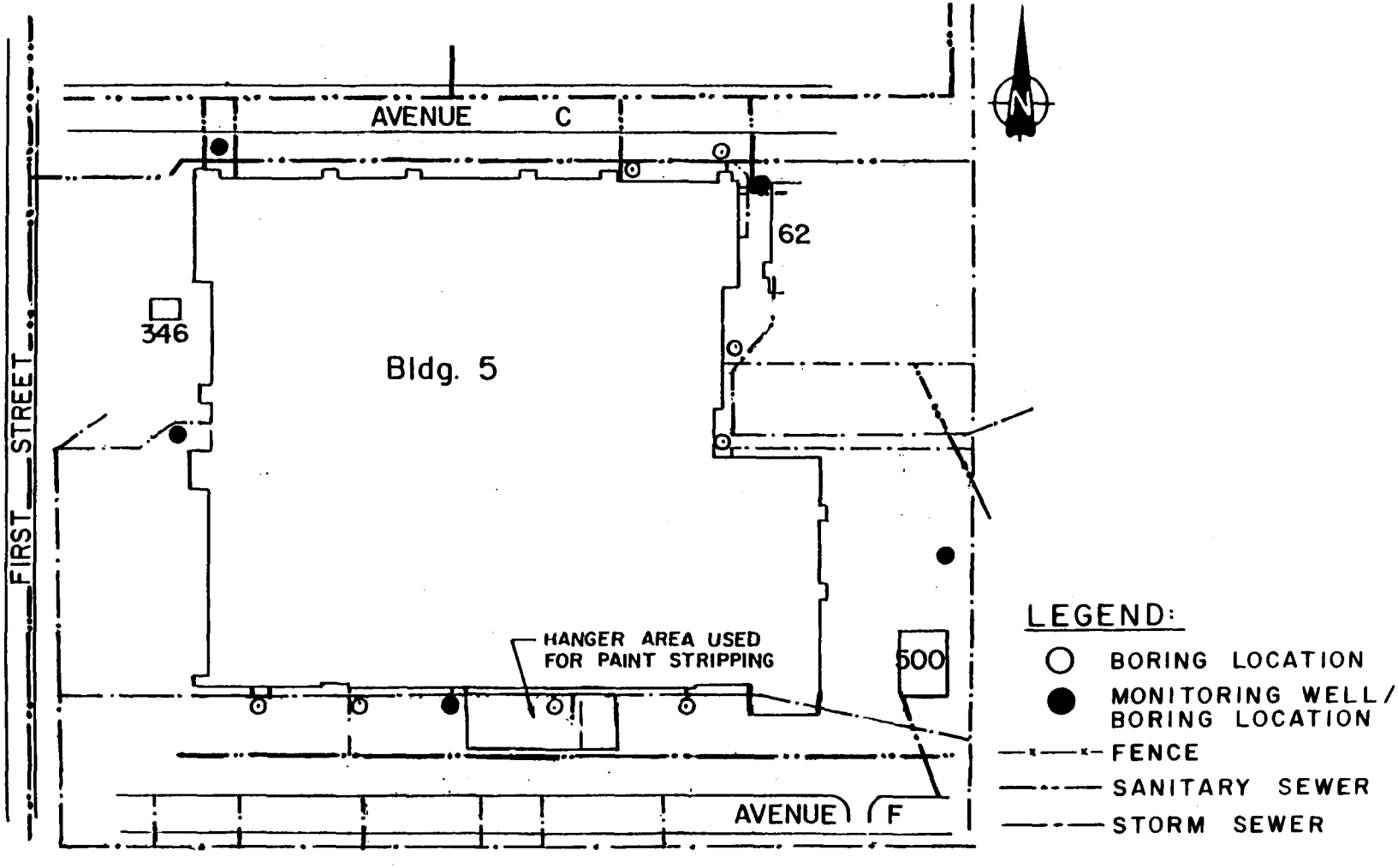


Figure 3.5.2. Building 5 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

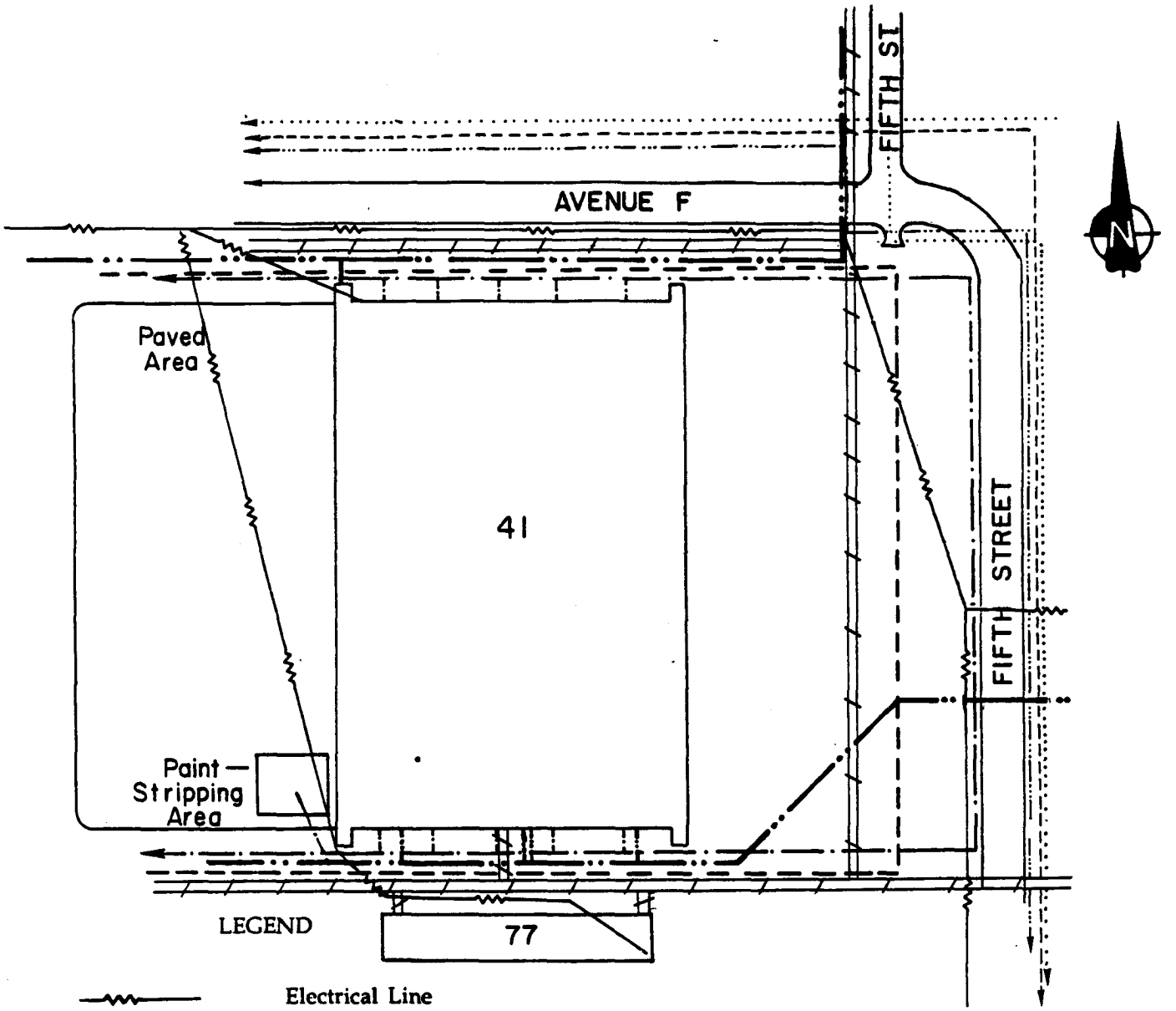


Figure 3.6.1. Building 41 buried utility schematic.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

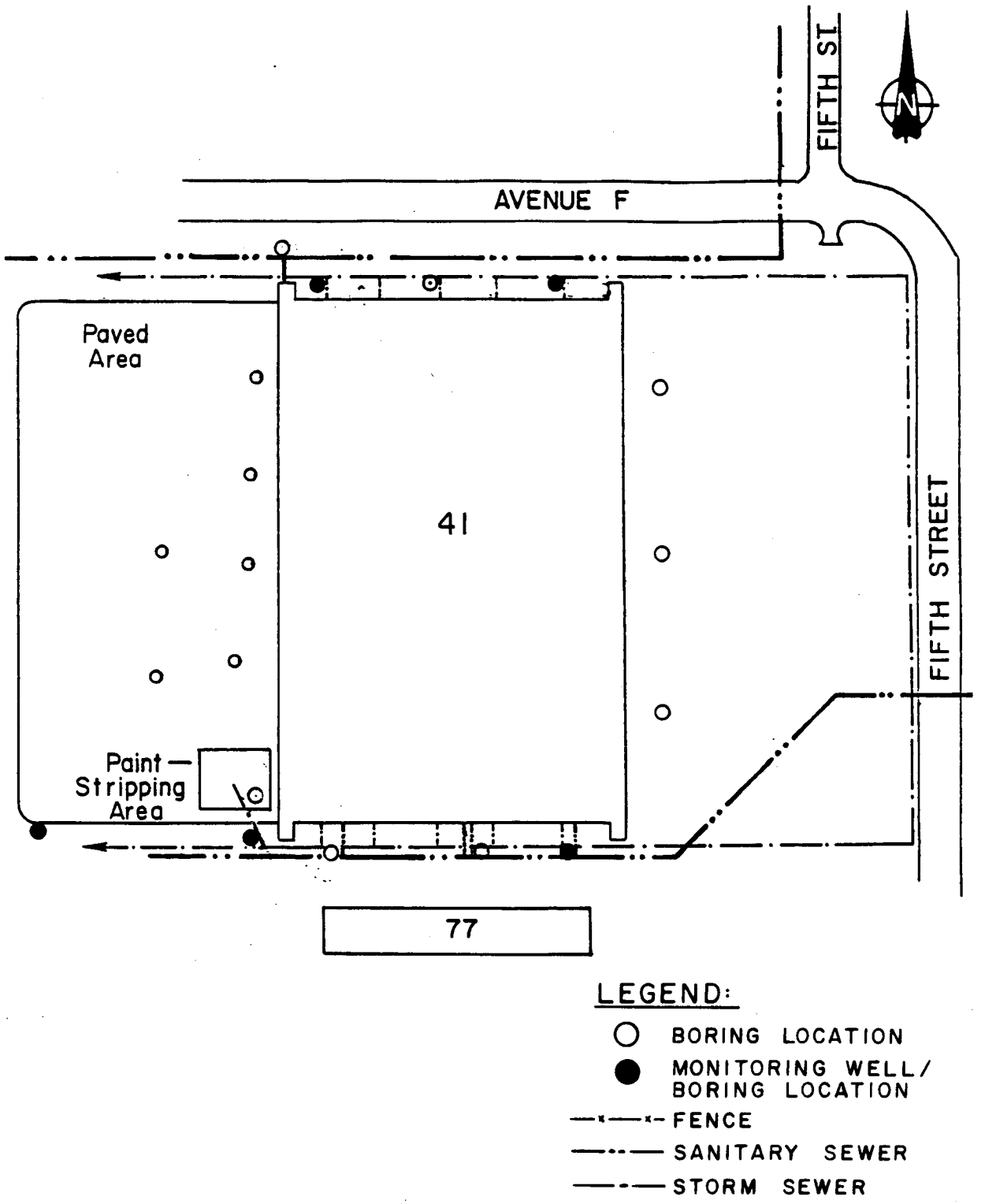
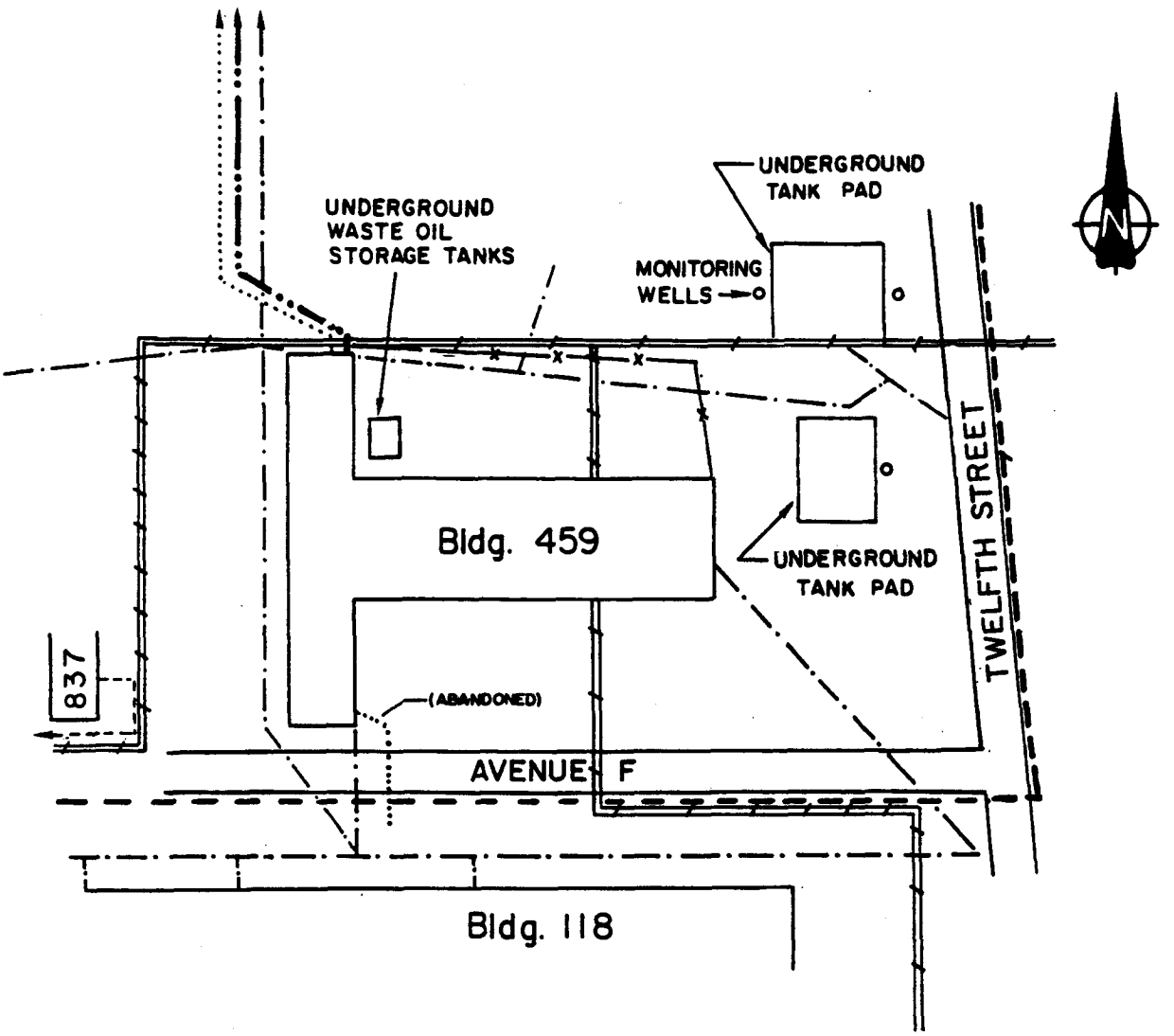


Figure 3.6.2. Building 41 sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND

- Electrical Line
- Potable Water Line
- Fire Protection Sprinkler System
- Steam Line
- Natural Gas Line
- Compressed Air Line
- Storm Sewer
- Sanitary Sewer
- Industrial Waste Sewer

Figure 3.7.1. Building 459 buried utility schematic.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

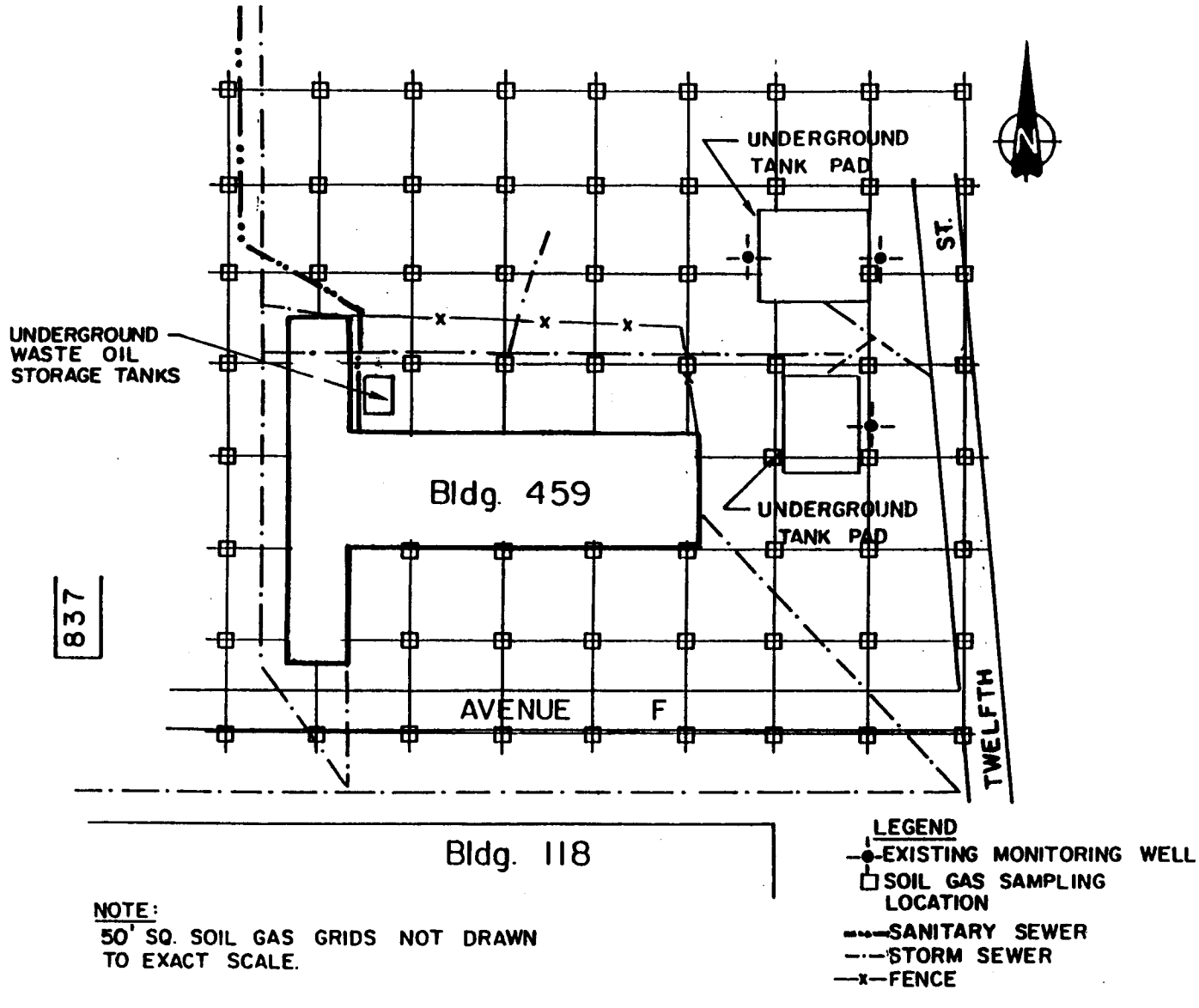


Figure 3.7.2. Building 459 soil gas survey locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

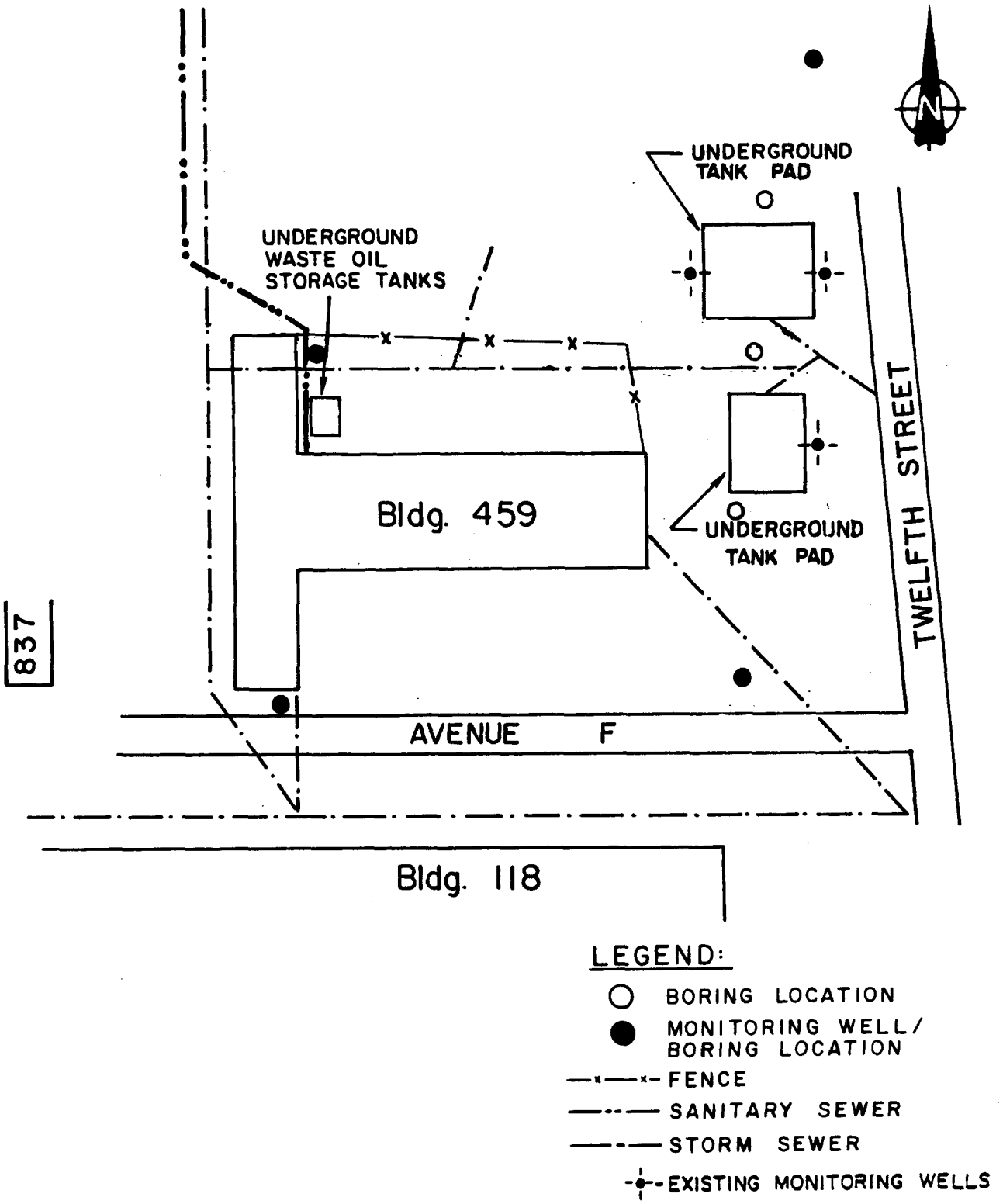


Figure 3.7.3. Building 459 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

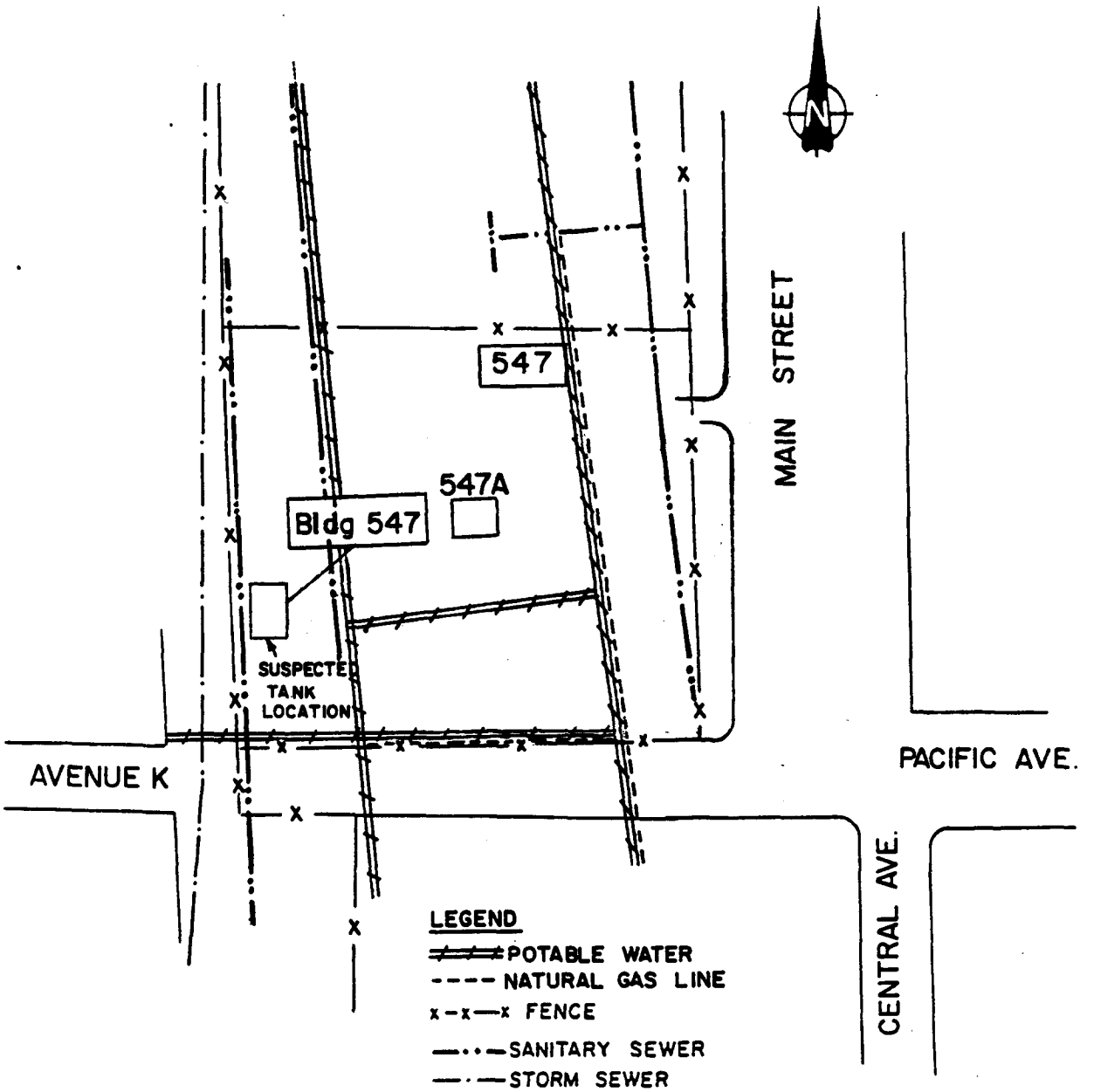


Figure 3.8.1. Building 547 buried utility schematic.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

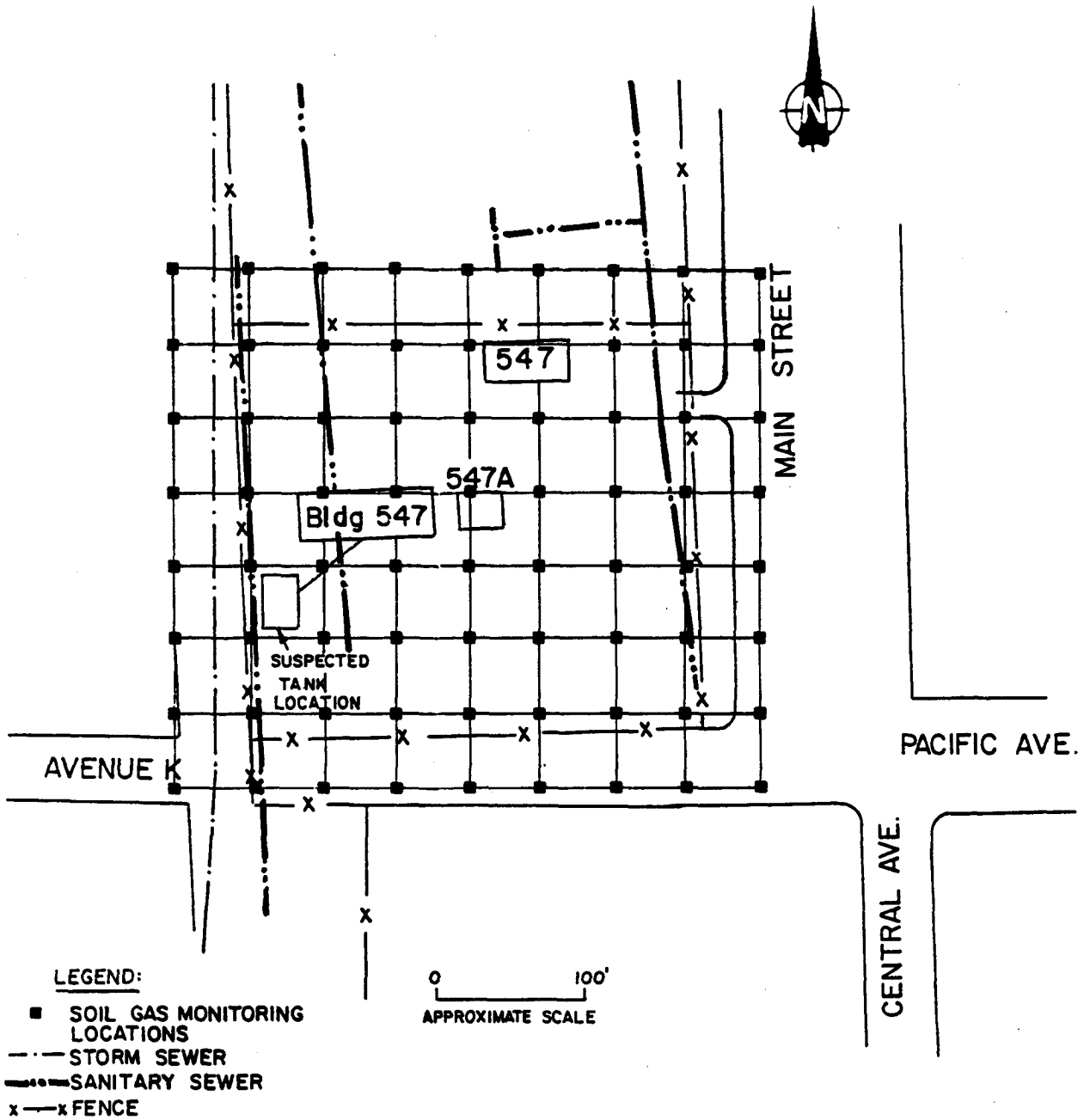


Figure 3.8.2. Building 547 soil gas survey locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

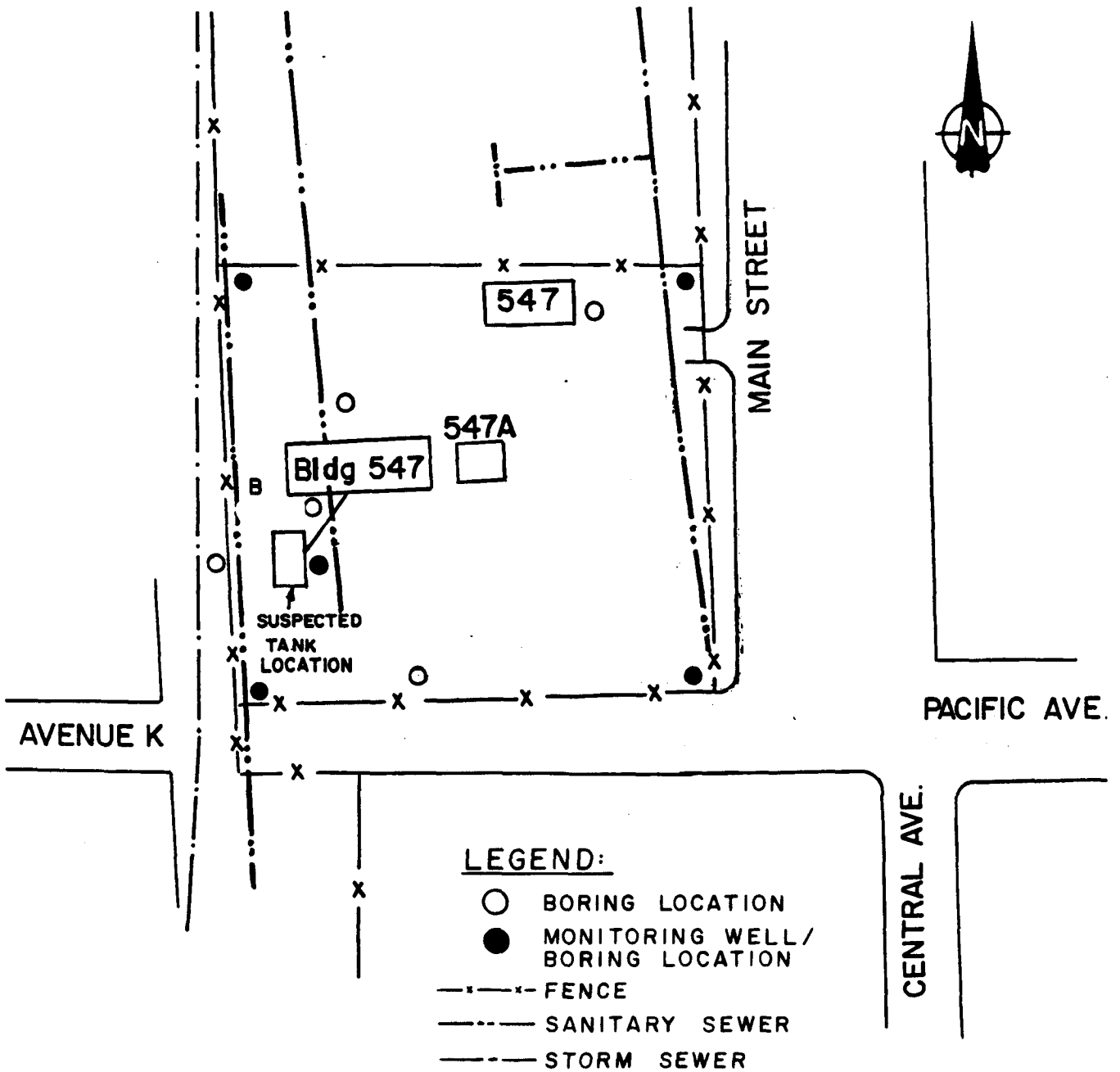


Figure 3.8.3. Building 547 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

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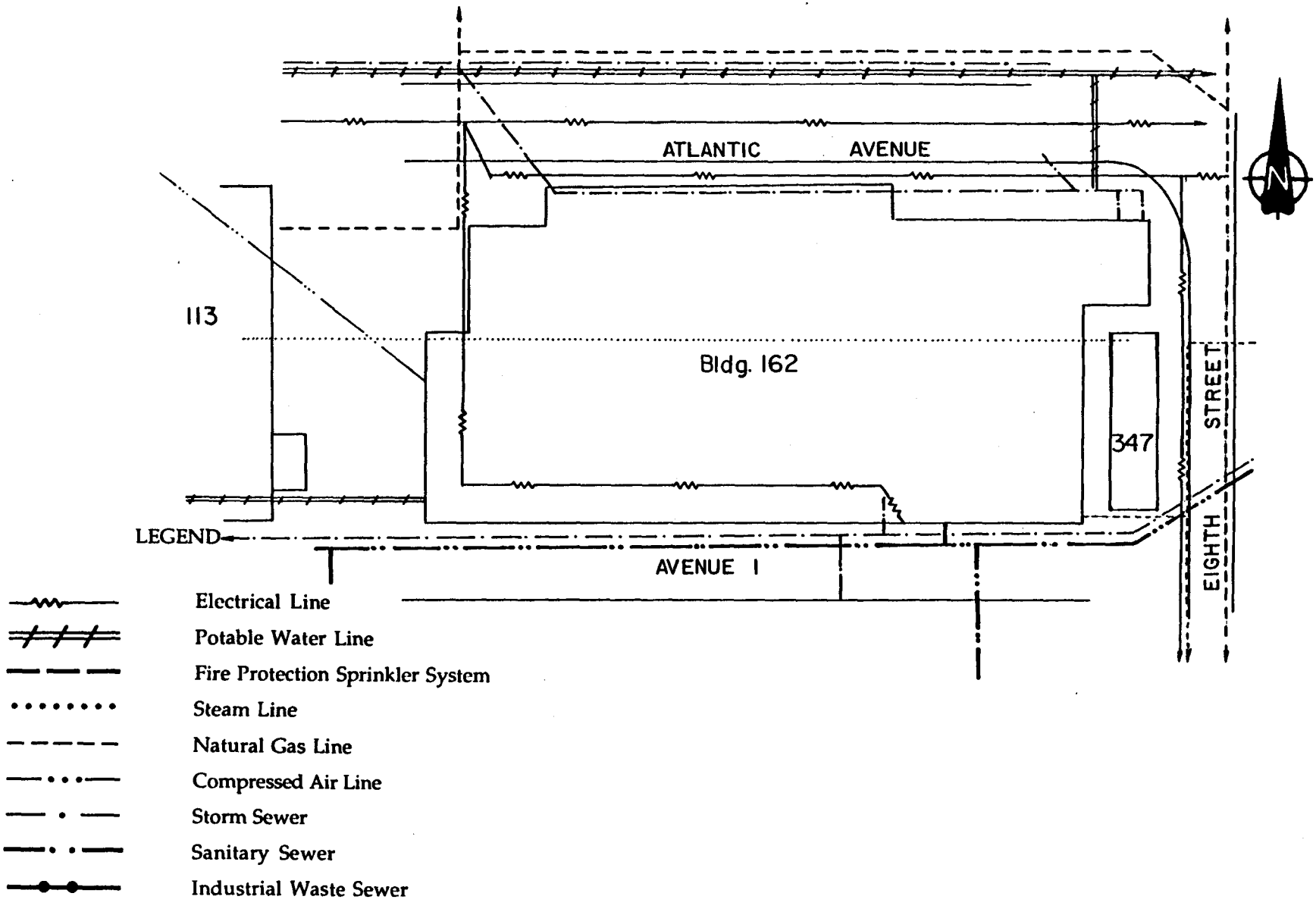


Figure 3.9.1. Building 162 buried utility schematic.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

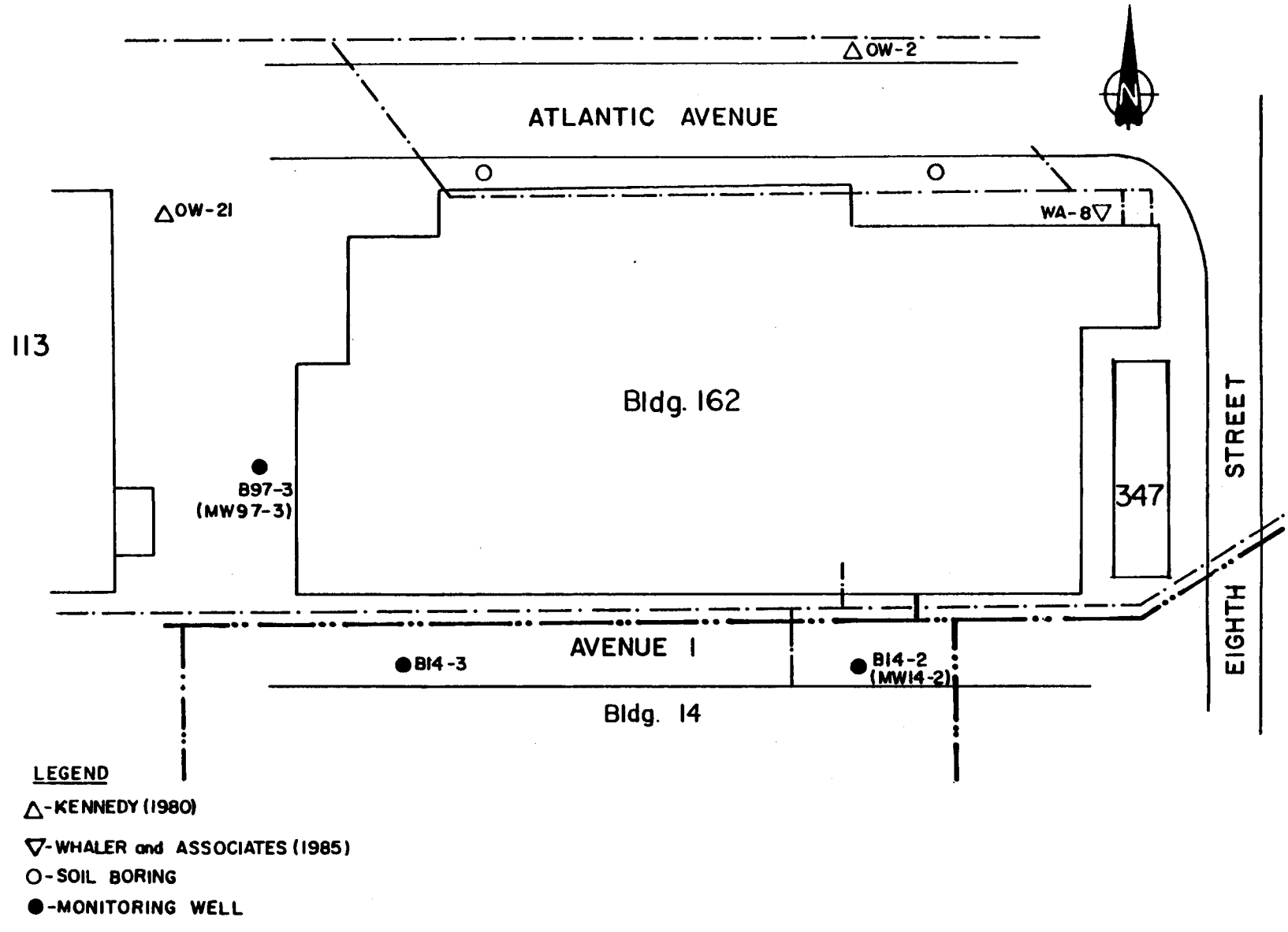


Figure 3.9.2. Building 162 sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

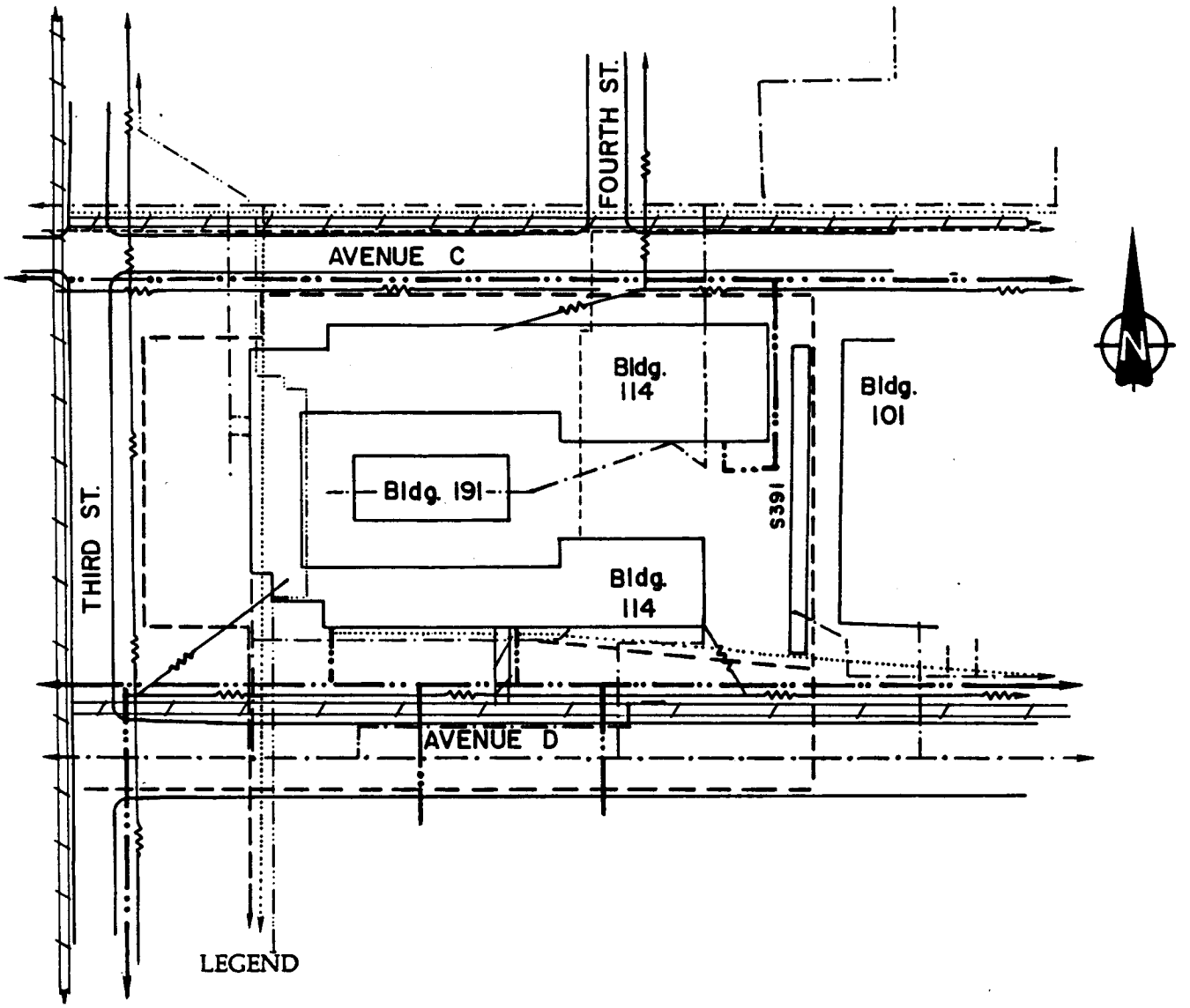


Figure 3.10.1. Building 114 buried utility schematic.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

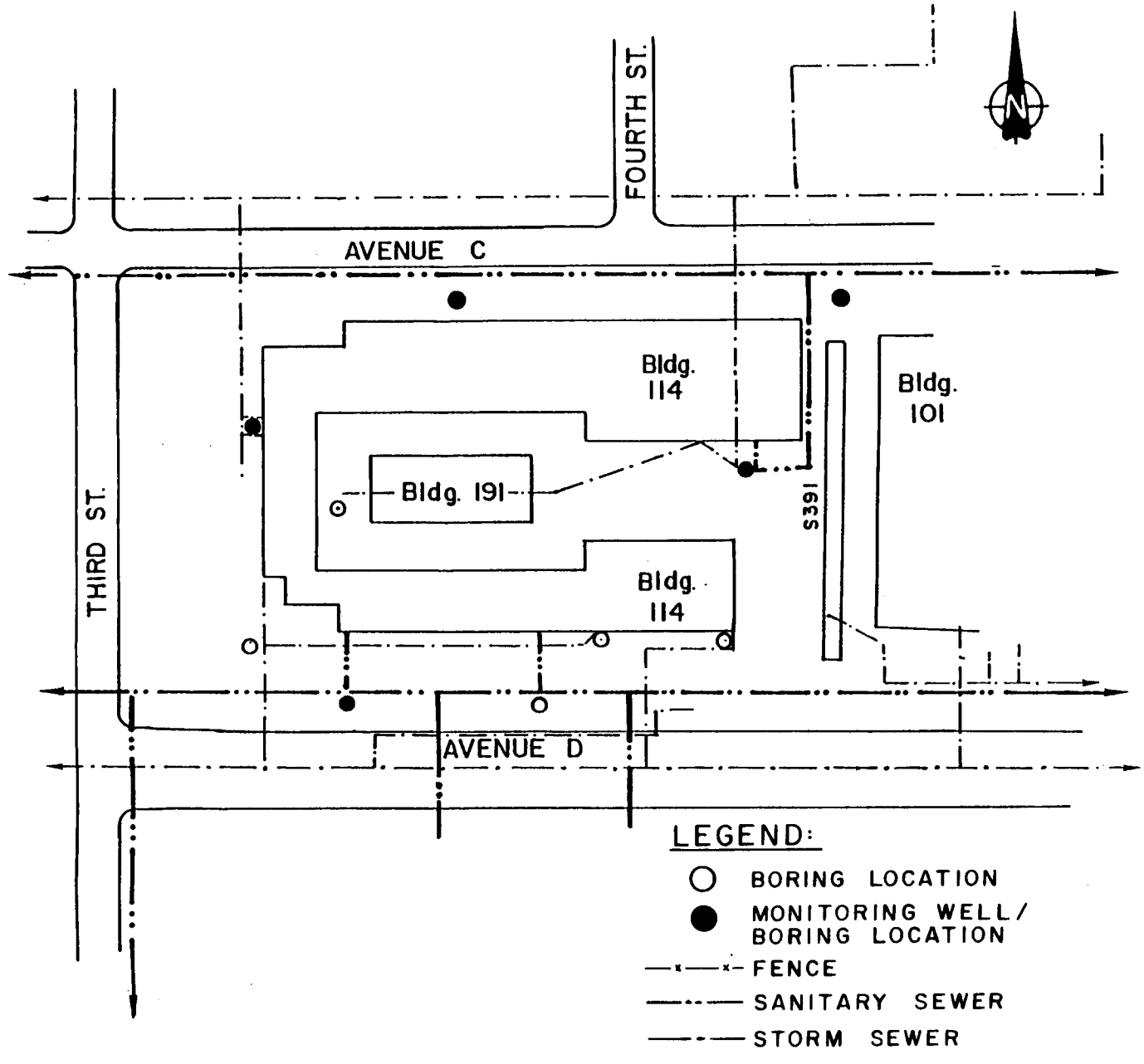
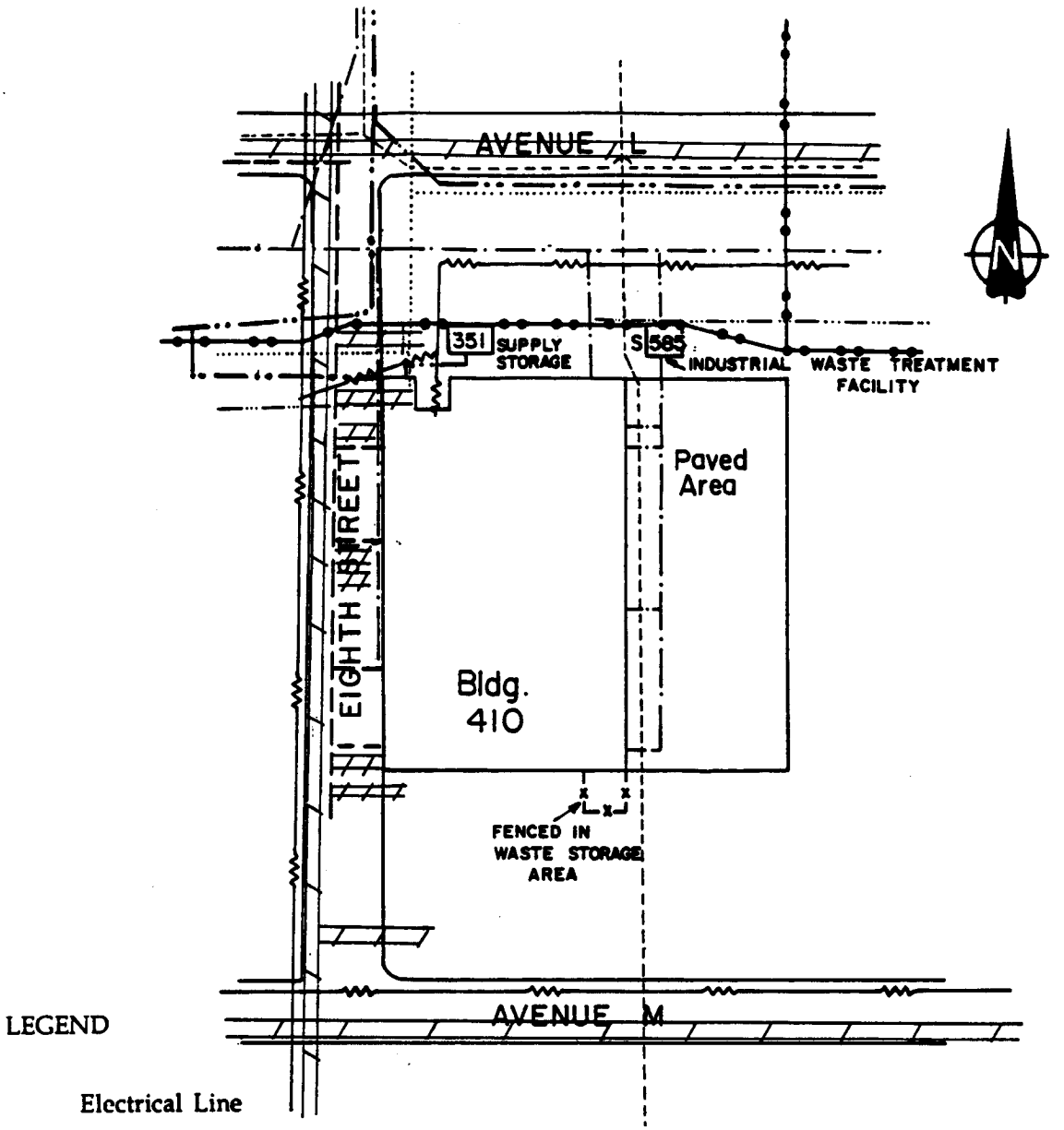


Figure 3.10.2. Building 114 sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND

- Electrical Line
- Potable Water Line
- Fire Protection Sprinkler System
- Steam Line
- Natural Gas Line
- Compressed Air Line
- Storm Sewer
- Sanitary Sewer
- Industrial Waste Sewer

Figure 3.11.1. Building 410 buried utility schematic.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

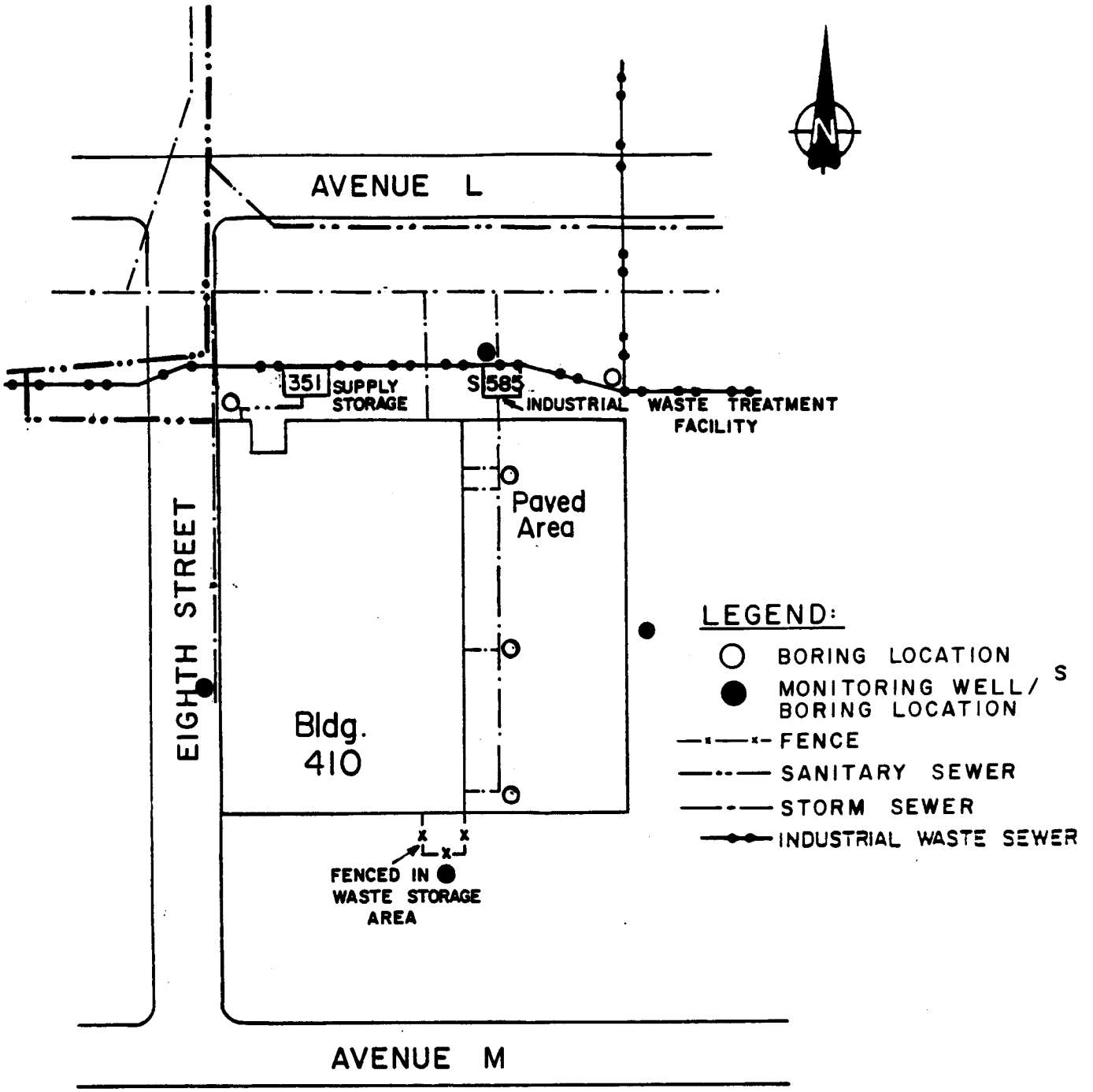
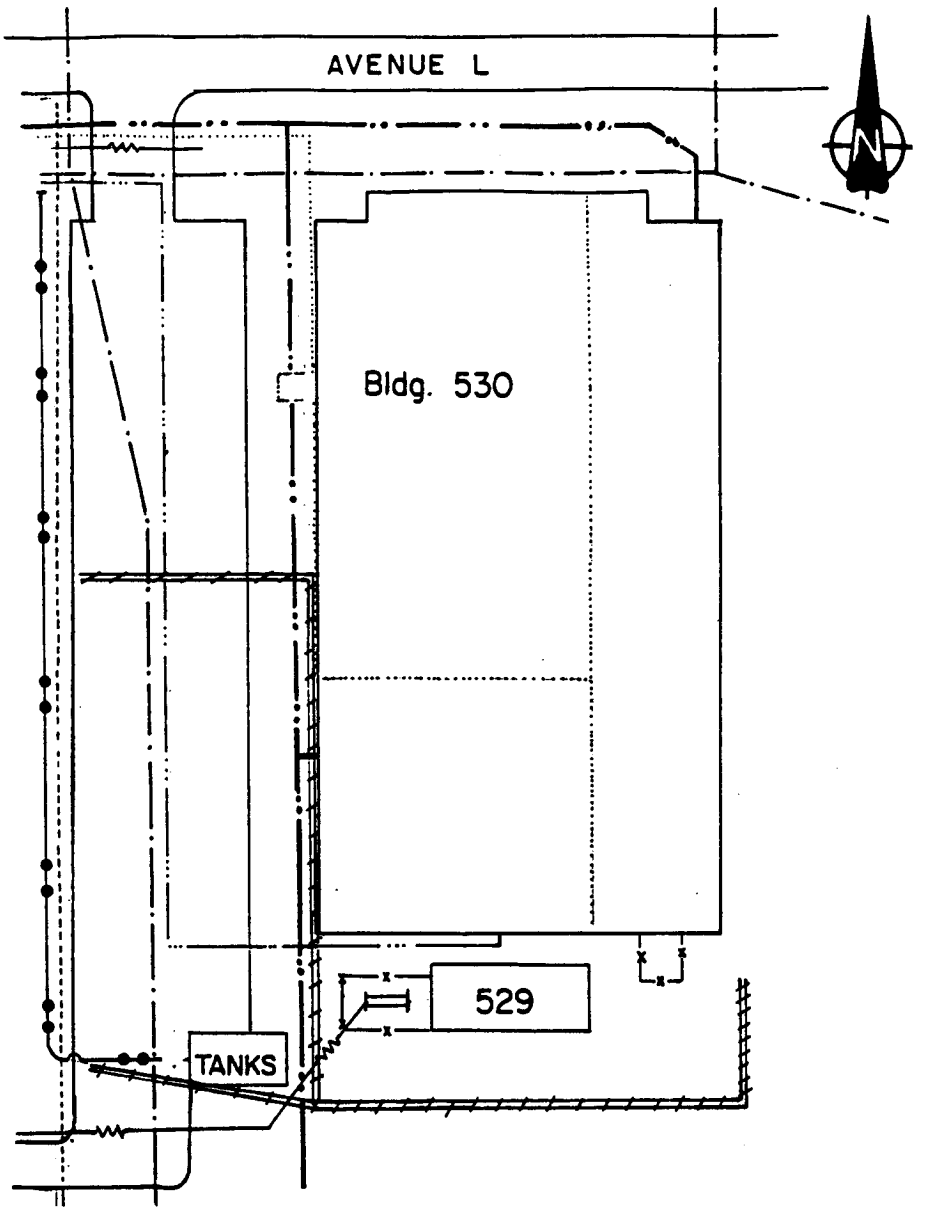


Figure 3.11.2. Building 410 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND

- Electrical Line
- Potable Water Line
- Fire Protection Sprinkler System
- Steam Line
- Natural Gas Line
- Compressed Air Line
- Storm Sewer
- Sanitary Sewer
- Industrial Waste Sewer

Figure 3.12.1. Building 530 buried utility schematic.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

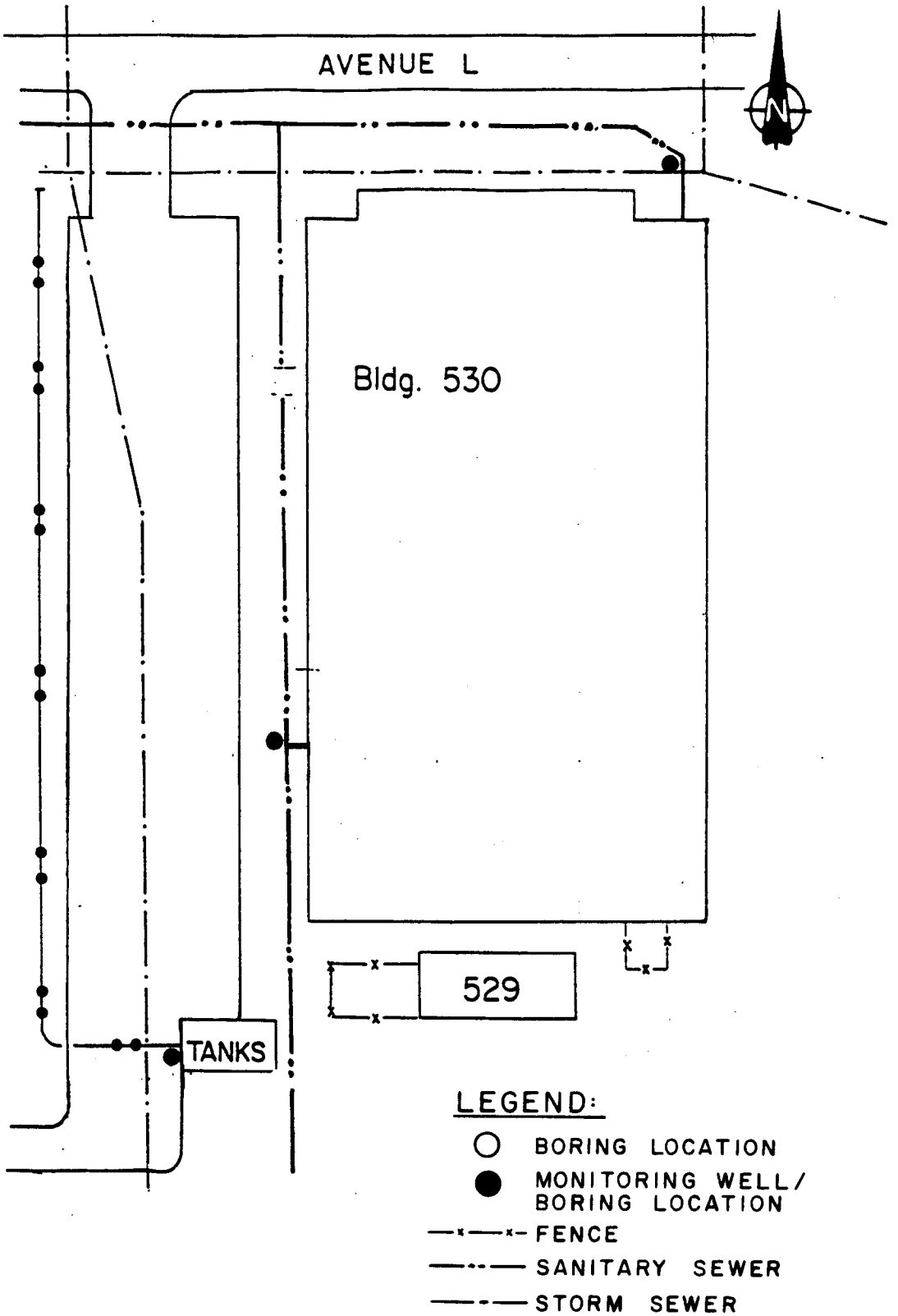
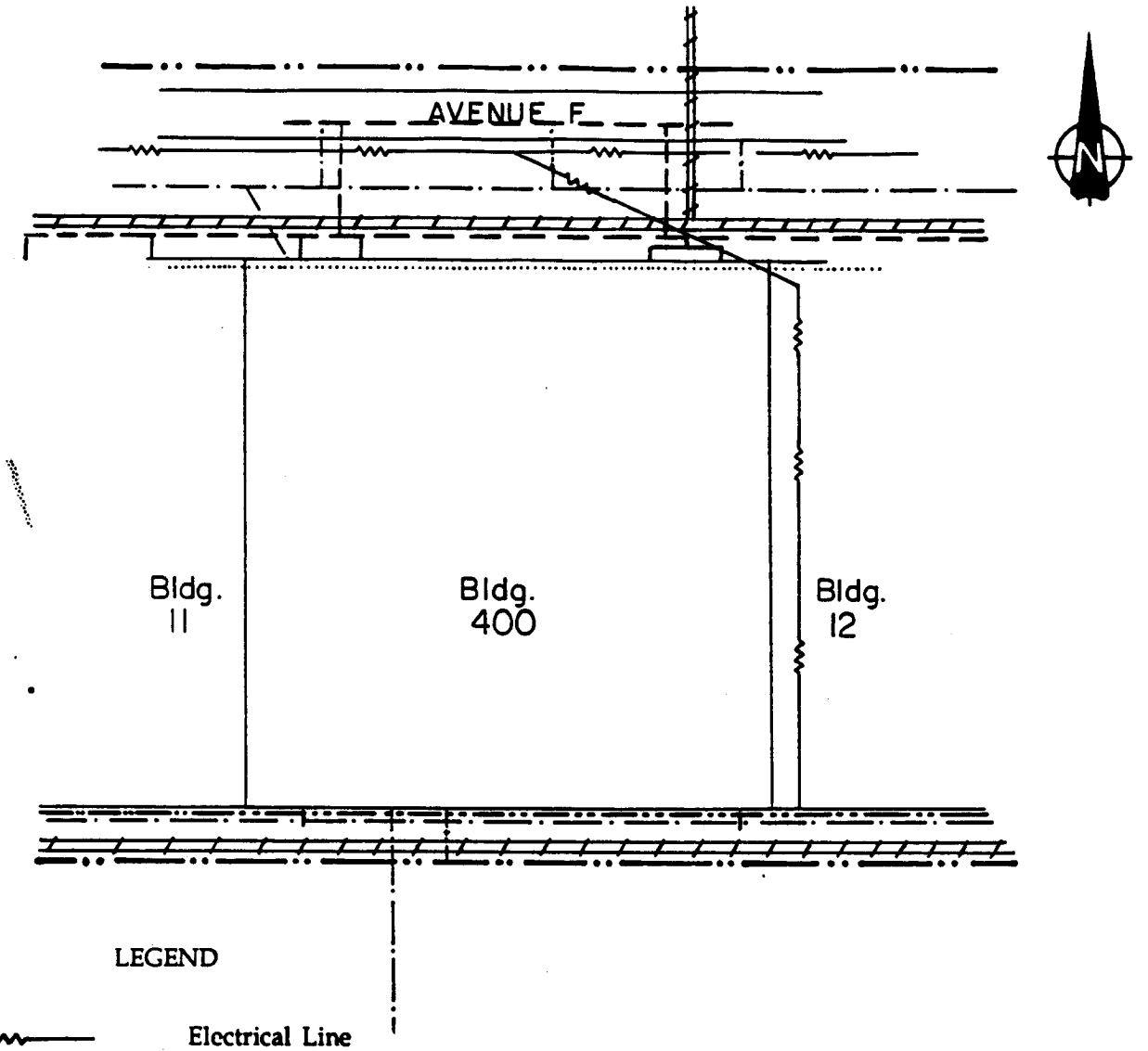


Figure 3.12.2. Building 530 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND

- Electrical Line
- Potable Water Line
- Fire Protection Sprinkler System
- Steam Line
- Natural Gas Line
- Compressed Air Line
- Storm Sewer
- Sanitary Sewer
- Industrial Waste Sewer

Figure 3.13.1. Building 400 buried utility schematic.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

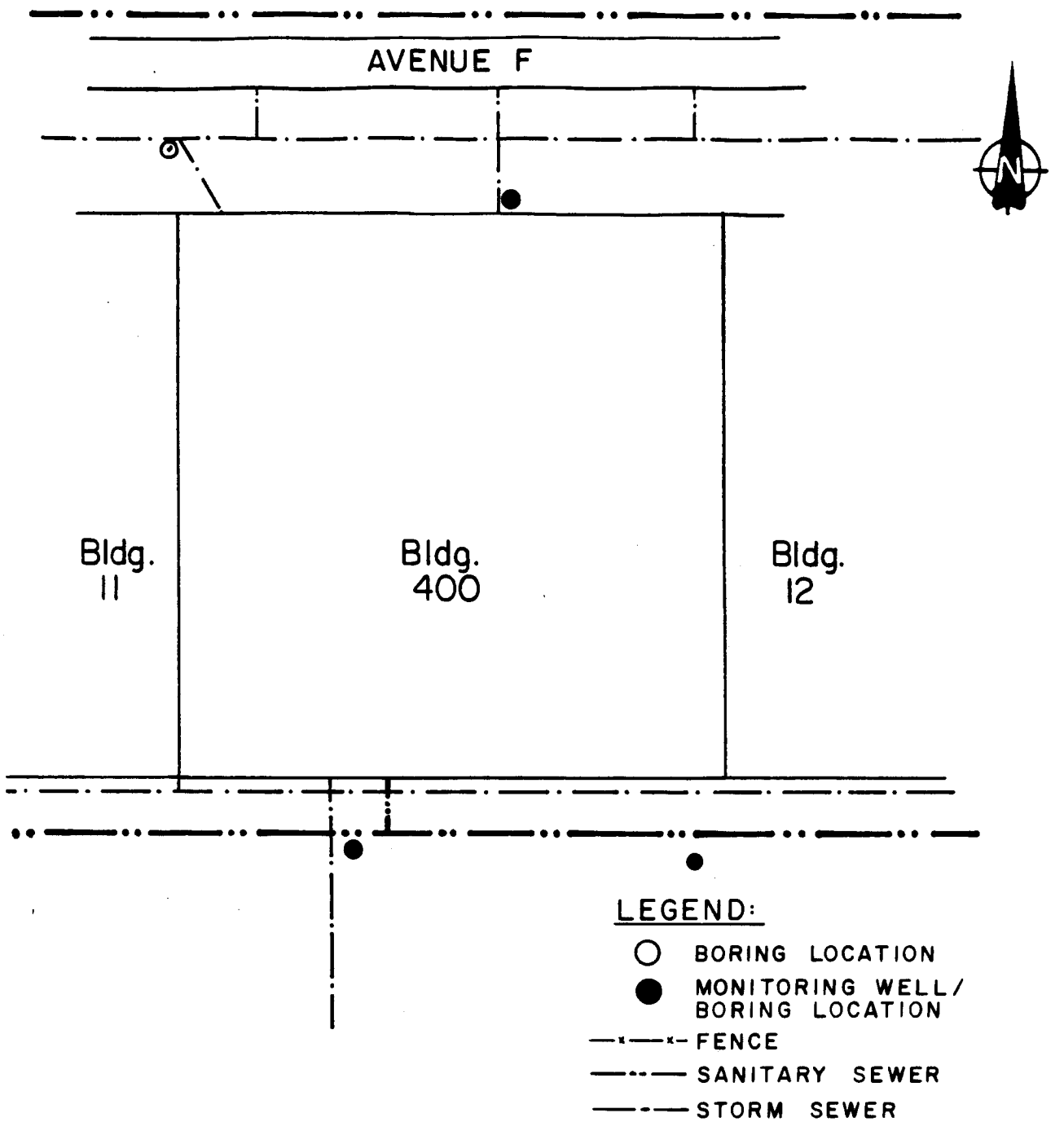


Figure 3.13.2. Building 400 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

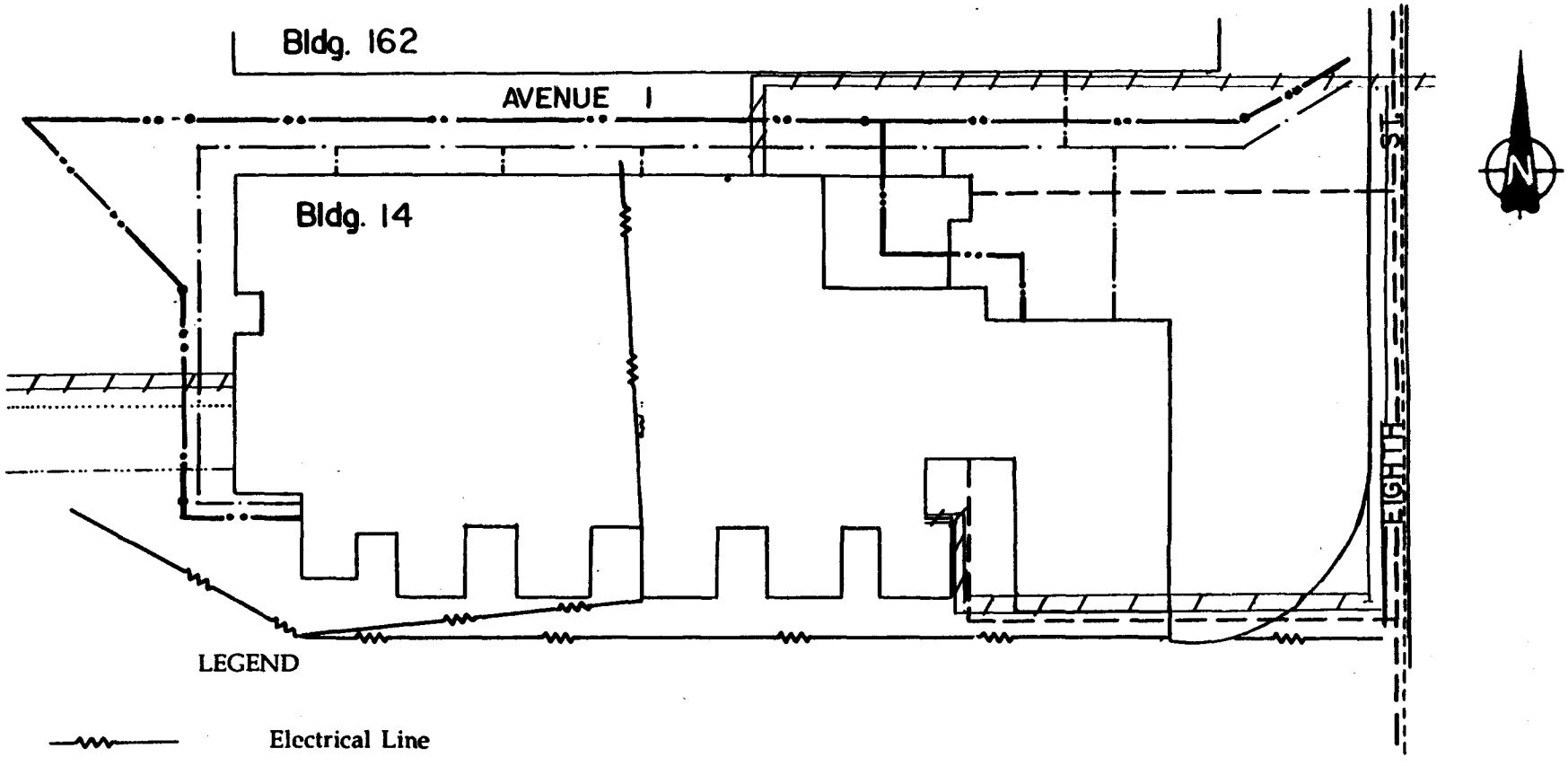


Figure 3.14.1. Building 14 buried utility schematic.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

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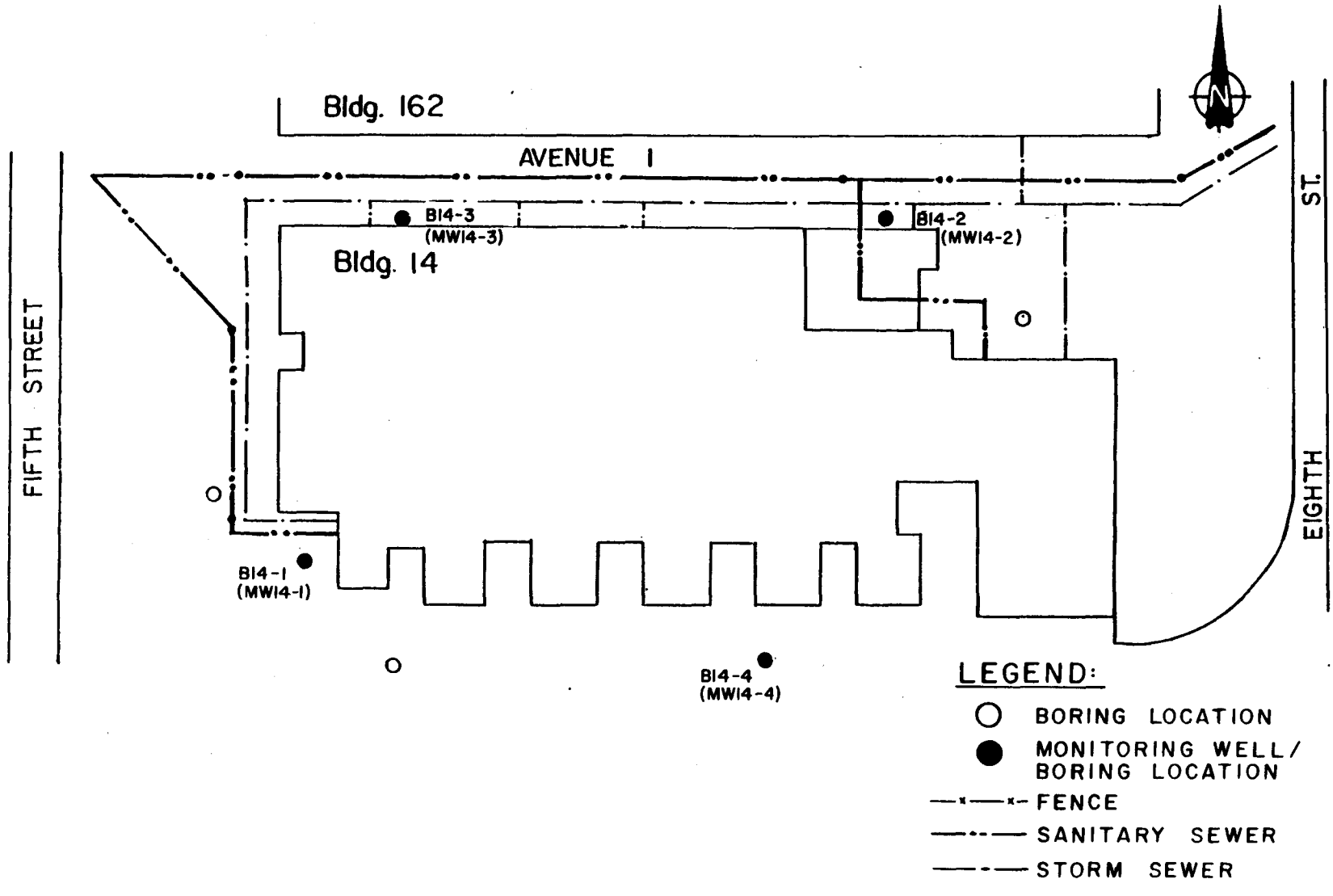
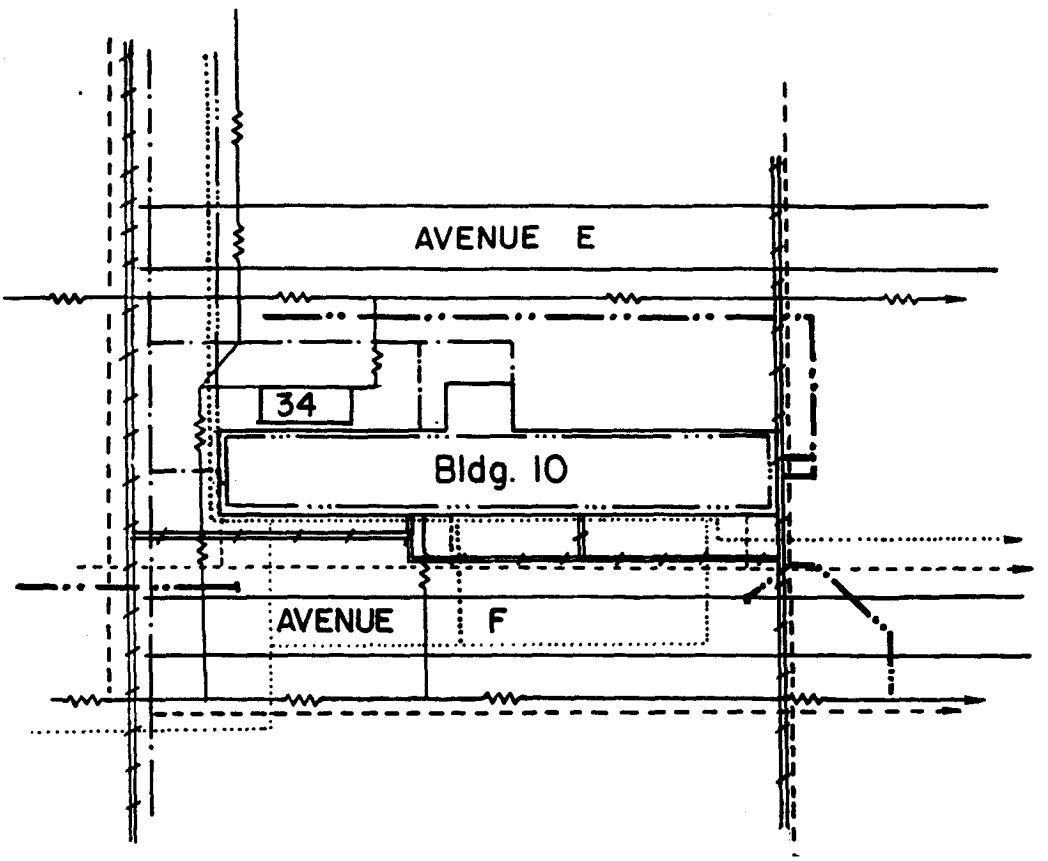


Figure 3.14.2. Building 14 sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND

- Electrical Line
- Potable Water Line
- Fire Protection Sprinkler System
- Steam Line
- Natural Gas Line
- Compressed Air Line
- Storm Sewer
- Sanitary Sewer
- Industrial Waste Sewer

Figure 3.15.1. Building 10 buried utility schematic.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

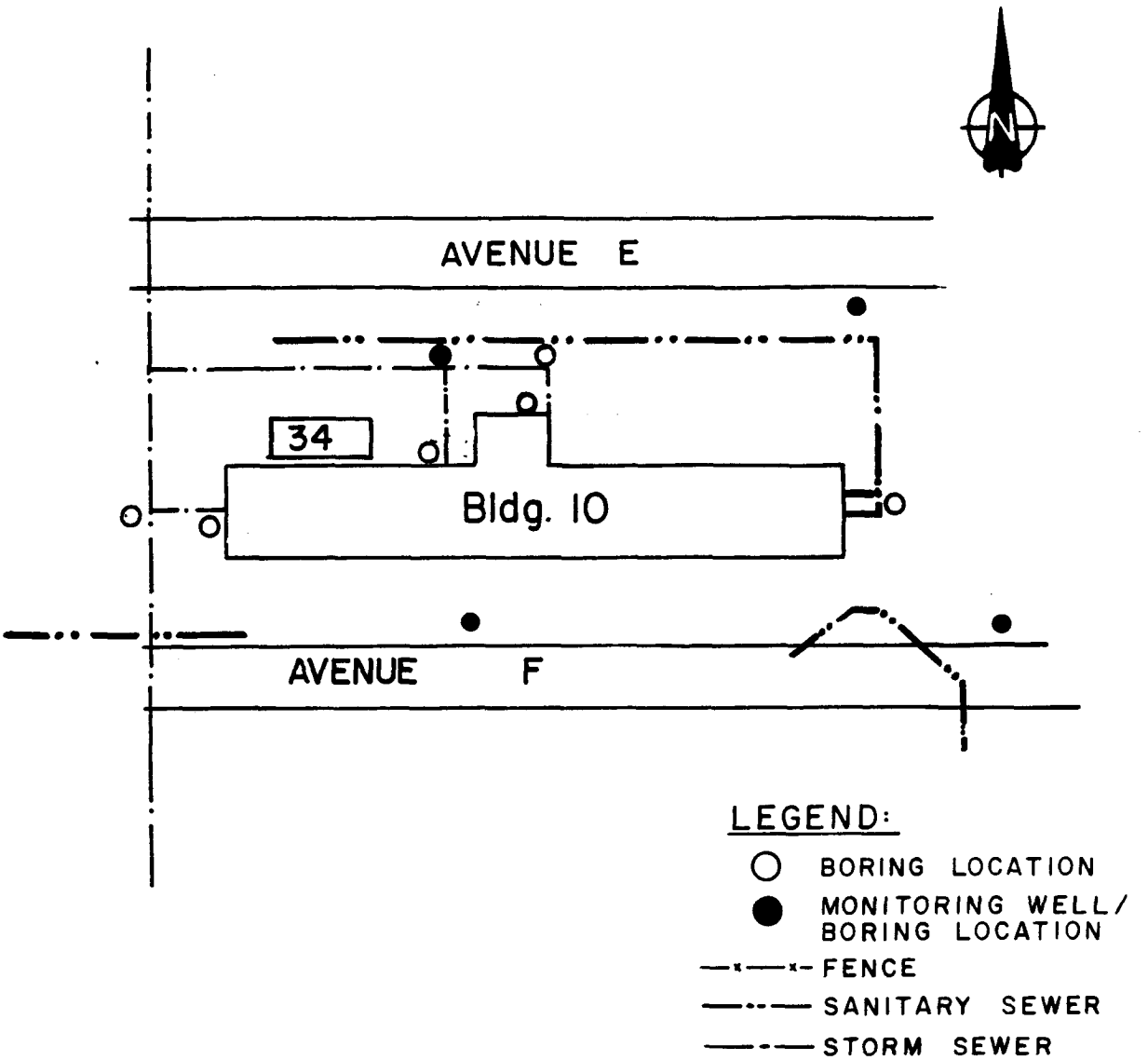
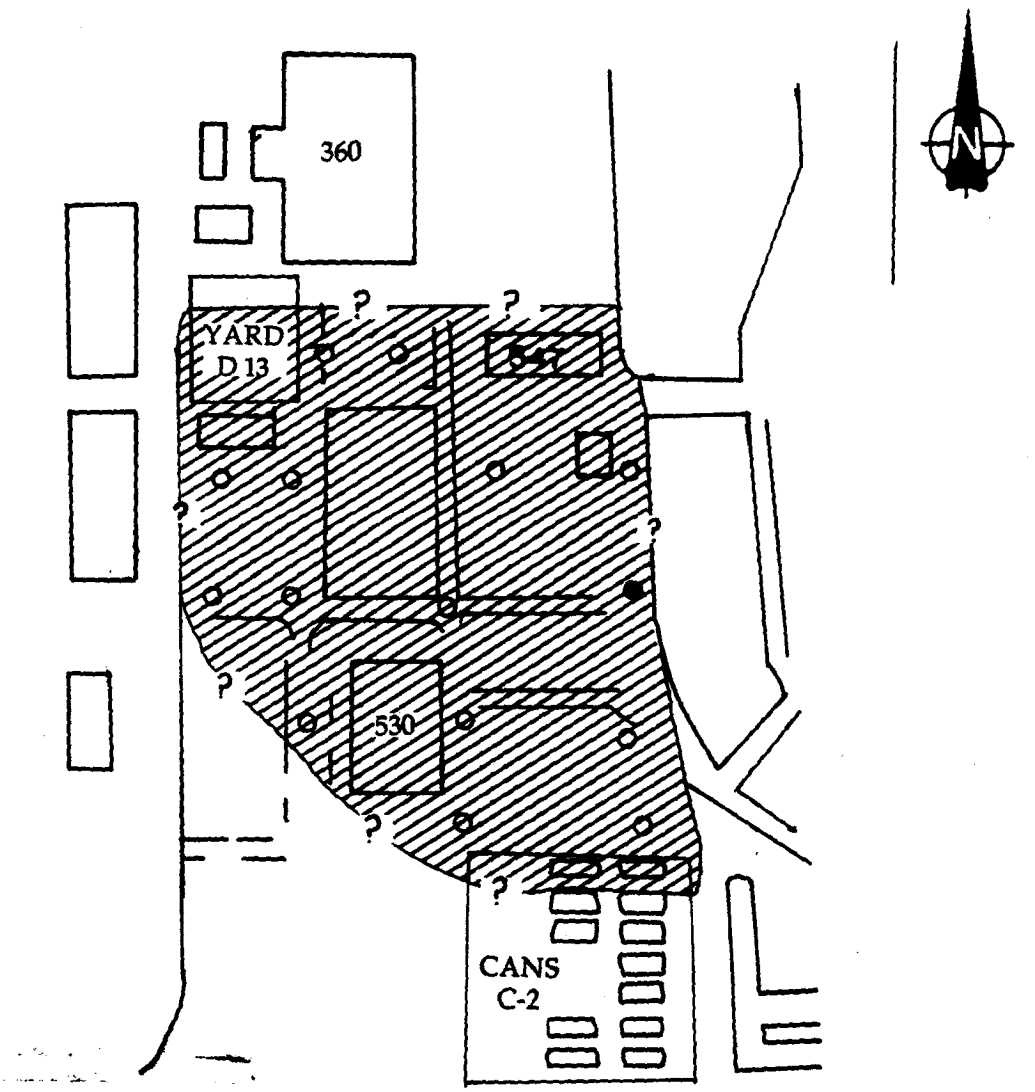


Figure 3.15.2. Building 10 sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT



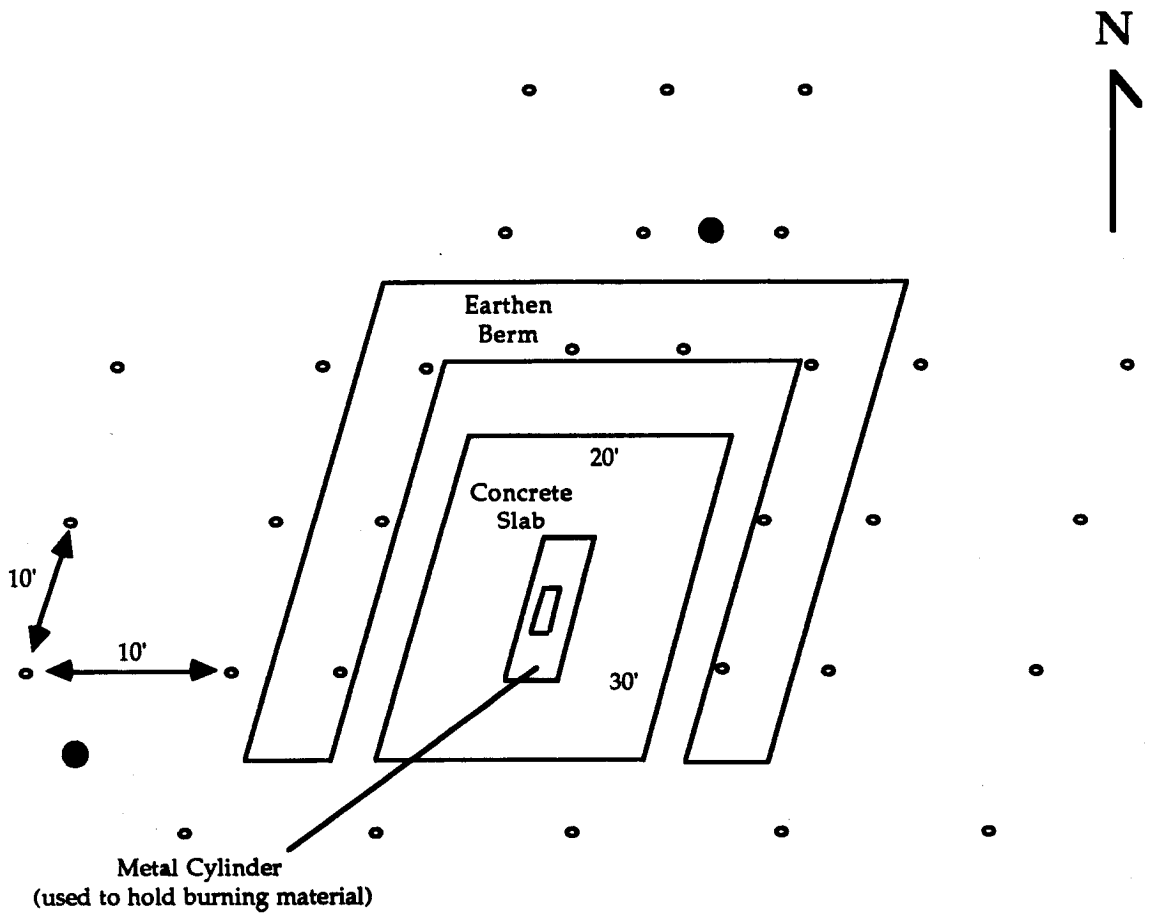
LEGEND:

- ● MONITORING WELL/BORING LOCATION
- ○ BORING LOCATION
- ▨ FORMER OIL REFINERY SITE

Figure 3.16.1. Oil refinery site.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT



LEGEND:

- ● MONITORING WELL LOCATION
- O HAND AUGER SAMPLING POINTS

Figure 3.17.1. Fire training area sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

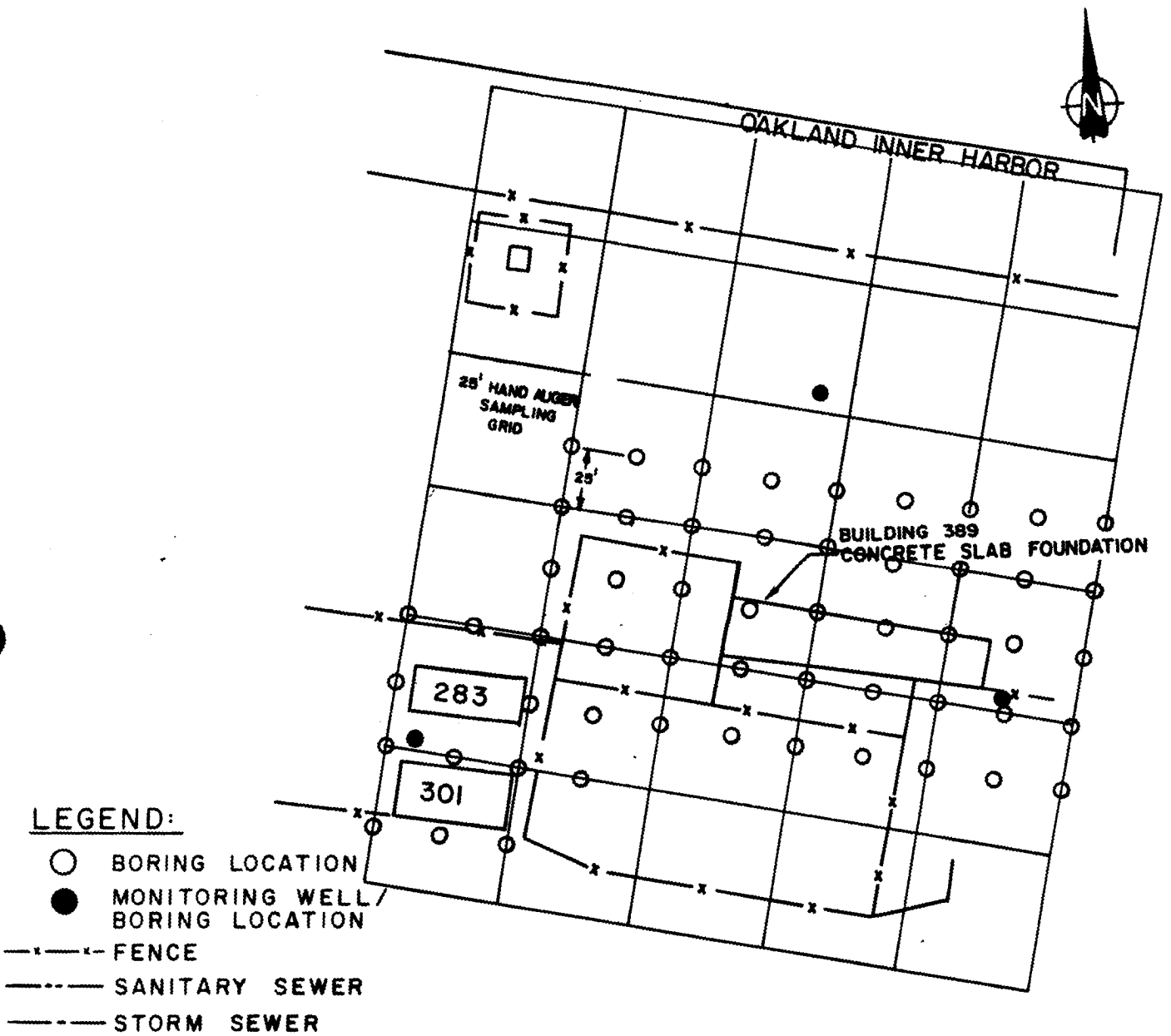


Figure 3.18.1. Building 301 and 389 sampling locations.

SOURCE:

- BEST AVAILABLE U.S NAVY BLUEPRINT

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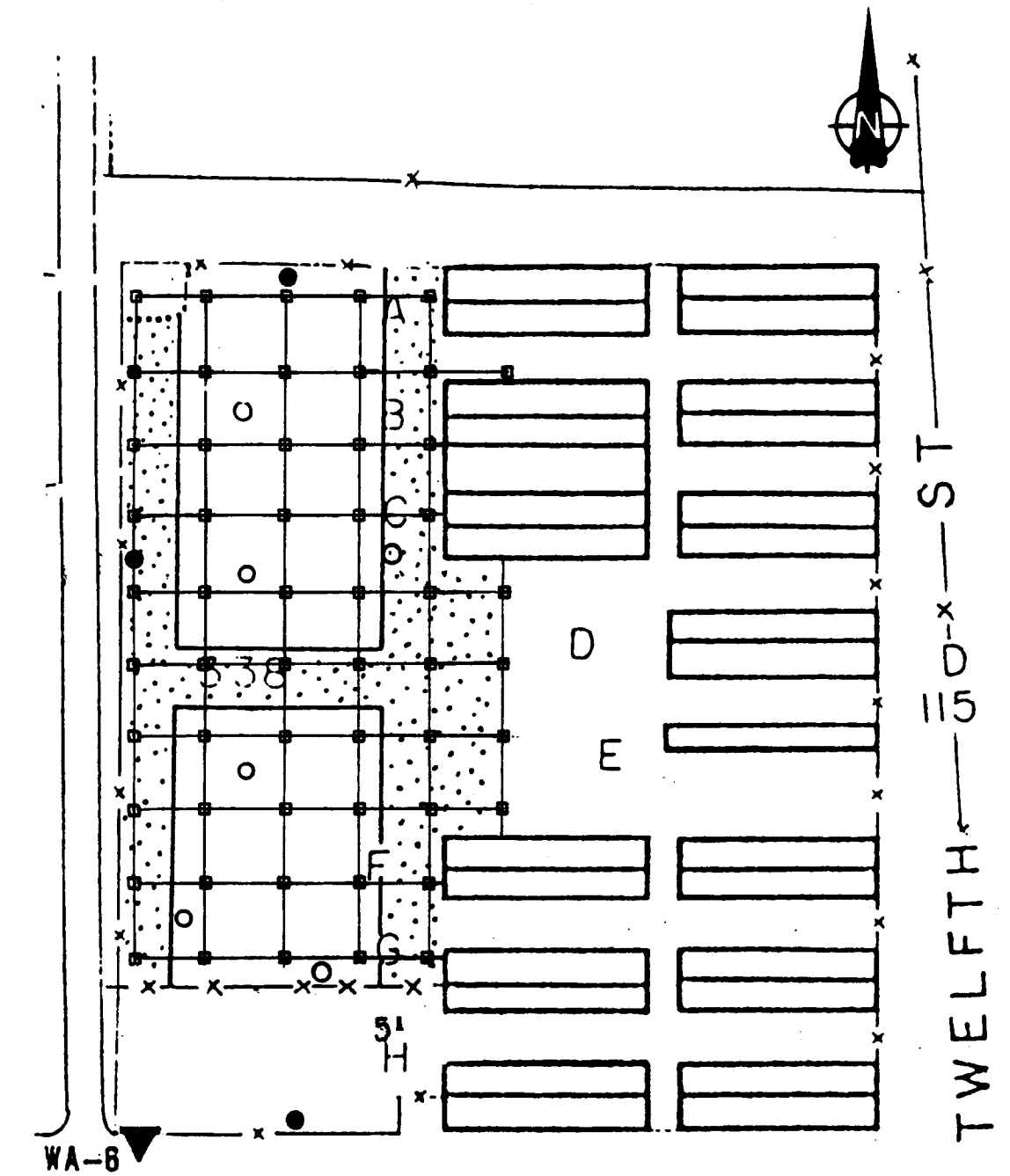

Figure 3.19.1. Cans C-2 area sampling locations.

SOURCE:
- BEST AVAILABLE U.S. NAVY BLUEPRINT

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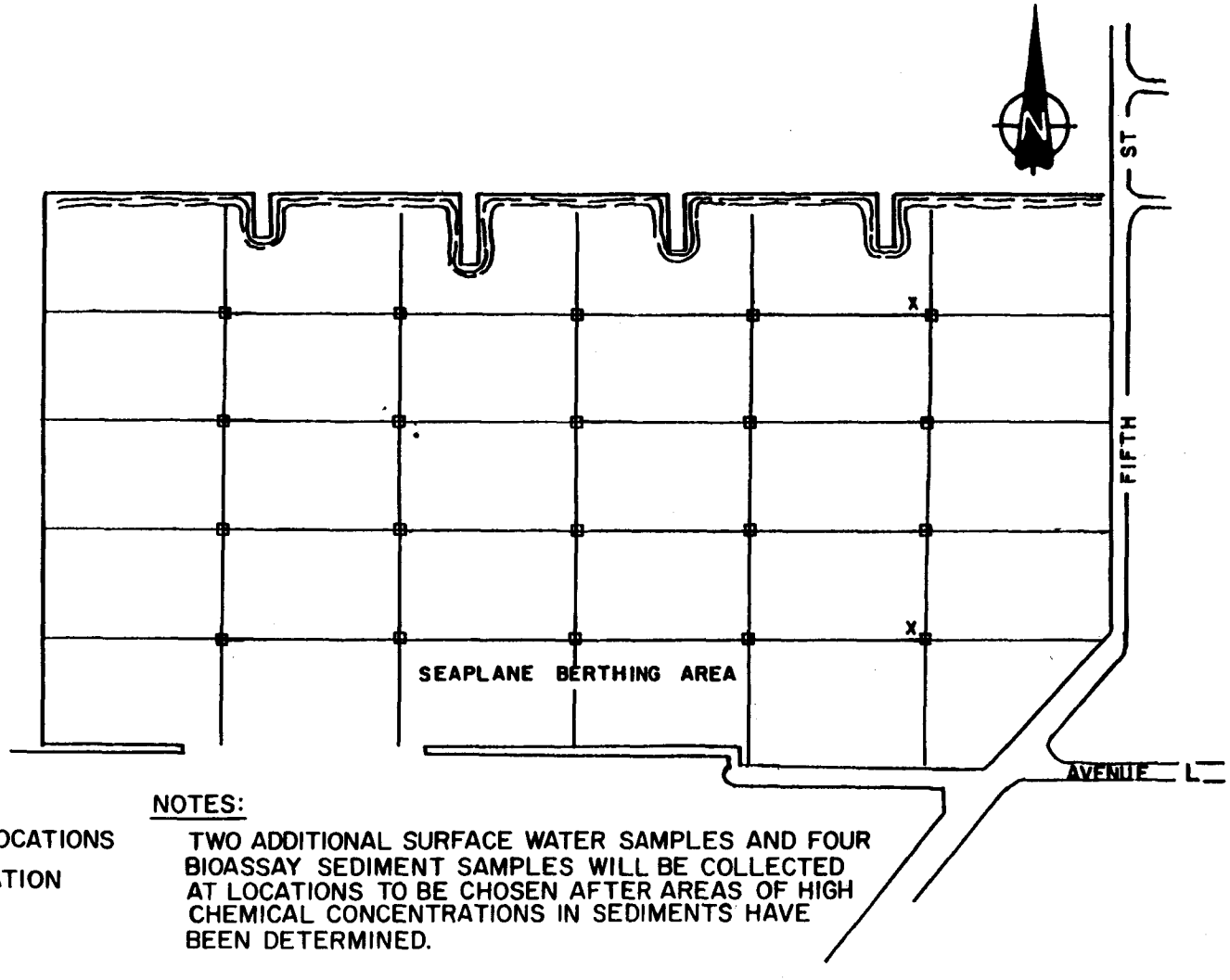


LEGEND:

□-SEDIMENT SAMPLING LOCATIONS

X-WATER SAMPLING LOCATION

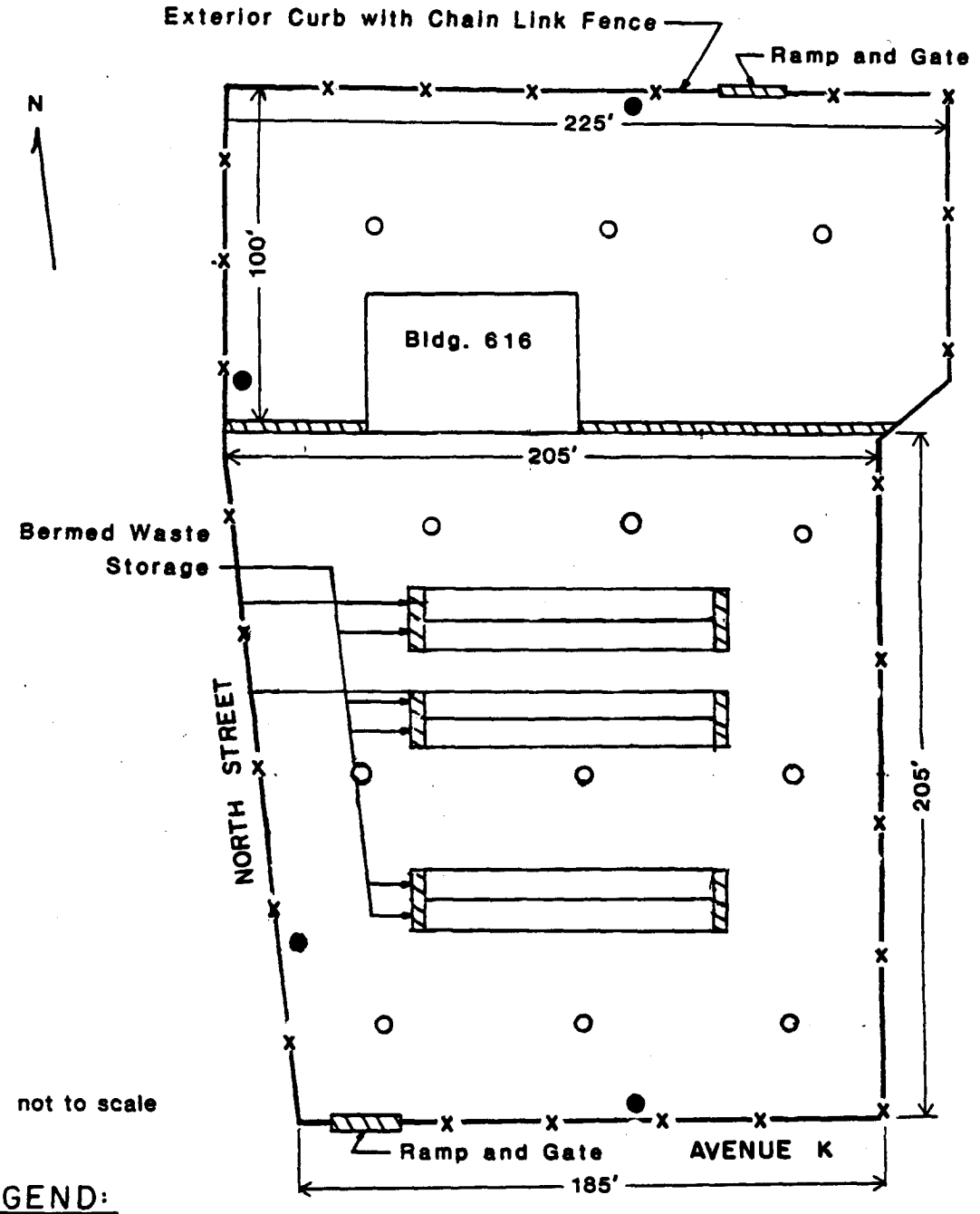
NOTES:

TWO ADDITIONAL SURFACE WATER SAMPLES AND FOUR BIOASSAY SEDIMENT SAMPLES WILL BE COLLECTED AT LOCATIONS TO BE CHOSEN AFTER AREAS OF HIGH CHEMICAL CONCENTRATIONS IN SEDIMENTS HAVE BEEN DETERMINED.

Figure 3.20.1. Seaplane lagoon sampling locations.

SOURCE:

- BEST AVAILABLE U.S NAVY BLUEPRINT



LEGEND:

- ○ BORING LOCATION
- ● MONITORING WELL/ BORING LOCATION
- —x—x— FENCE
- ▭ – Ramps/Rounded Berms

Bermed Waste Storage Areas are 7' x 90' with 4" high Asphalt Curbs

Figure 3.22.1. Yard D13 sampling locations.

SOURCE:

- BEST AVAILABLE U.S NAVY BLUEPRINT

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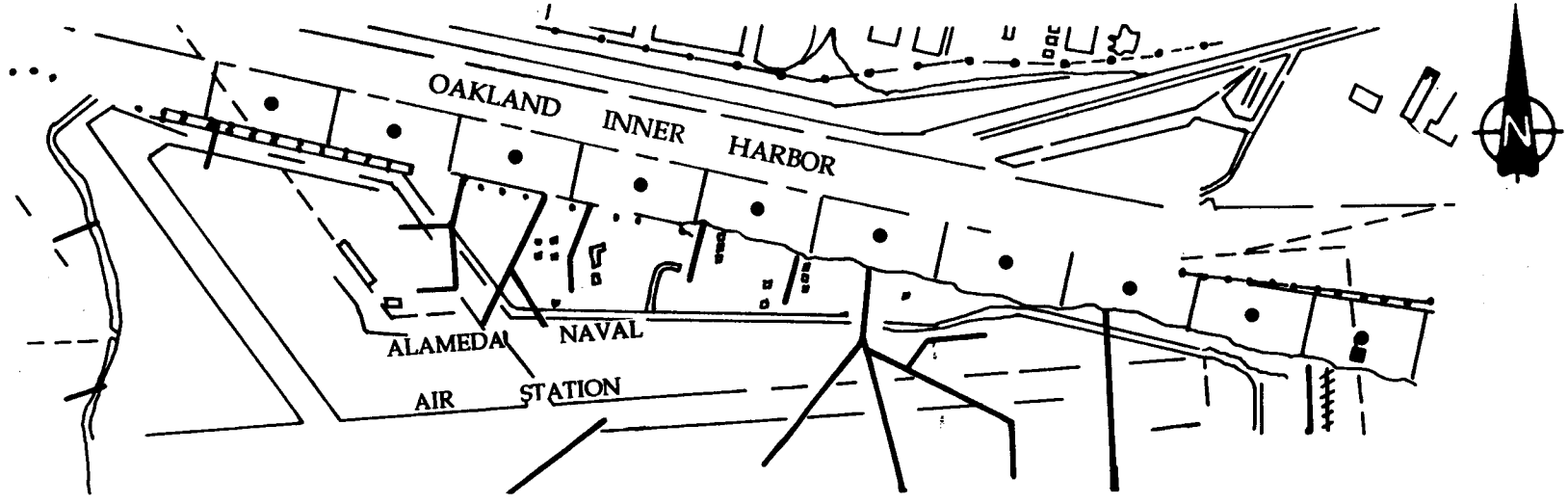

LEGEND

- • Sediment Sample
- ■ Bioassay Sediment Sample
- ▬ Storm Sewer
- +++ Sanitary Sewer

NOTE: Three additional bioassay sediment samples will be collected at locations chosen after areas of high chemical concentrations have been determined.

Figure 2.23.1. Estuary sampling locations.

SOURCE:

- BEST AVAILABLE U.S. NAVY BLUEPRINT

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