REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*

2. REPORT DATE

05/00/83

3. REPORT TYPE AND DATES COVERED

4. TITLE AND SUBTITLE

RCRA PART B PERMIT APPLICATION, SELECTED FACILITIES, ROCKY MOUNTAIN ARSENAL, COMMERCE CITY, COLORADO, FINAL REPORT

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

D'APPOLONIA CONSULTING ENGINEERS
ENGLEWOOD, CO

8. PERFORMING ORGANIZATION REPORT NUMBER

84124R01

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

ARMY CORPS OF ENGINEERS. HUNTSVILLE DIVISION
HUNTSVILLE, AL

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

THIS DOCUMENT REPRESENTS RMA'S FORMAL APPLICATION FOR RCRA PART B PERMIT STATUS WITH THE EPA REGION VIII AND WILL REMAIN IN EFFECT 'NTIL AMENDED BY RMA LATER IN 1984. THE COMPLETE PART A PPLICATION IS INCLUDED AND WAS REVISED FROM THE ORIGINAL PART A OF NOVEMBER 980 AND SUBMITTED TO EPA ON JANUARY 28, 1983. MUCH OF THIS APPLICATION WAS REPARED USING EXISTING DOCUMENTATION AND ROCEDURES AT RMA. IN MANY CASES, INFORMATION WAS EXTRACTED FROM OP'S AND OTHER SOURCES SUCH AS RMA'S DISASTER CONTROL PLAN. URVEYS WERE CONDUCTED SPECIFICALLY FOR WASTE CONTAINER STORAGE ACILITIES. NEW INFORMATION SUCH AS CLOSURE AND WASTE ANALYSIS LANS WERE DEVELOPED. TABLES, MAPS AND SUPPORTING REFERENCE ATERIALS ARE INCLUDED. THIS AN INTERIM REPORT. SEE UPDATE RIC 85002R01: RCRA PART B PERMIT APPLICATION, SELECTED FACILITIES, MA, COMMERCE CITY, CO, FINAL REPORT; VOL. I - TEXT, TABLES AND

. SUBJECT TERMS

EQUIPMENT, GROUNDWATER, DISPOSAL, INCINERATION

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT

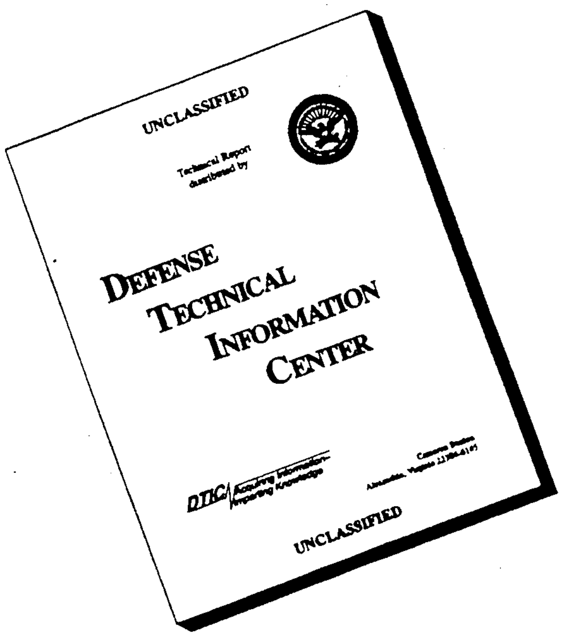
UNCLASSIFIED

18. SECURITY CLASSIFICATION OF THIS PAGE

19. SECURITY CLASSIFICATION OF ABSTRACT

20. LIMITATION OF ABSTRACT

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

DISPOSITION FORM

84124R01
VOLUME 1
2ND COPY

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
RM-TOE-C	Distribution of RMA RCRA Part B Permit Application

THRU Chief, Environmental Division

TO Director, Technical Operations

FROM Chief, Compliance and Resources Branch

DATE 2 May 1984

CMT 1

E. Berry/vi/120

1. This office has recently received adequate number of copies of subject application to make distribution of this document.

2. This document represents RMA's formal application for RCRA Part B permit status with the EPA Region VIII and will remain in effect until amended by RMA later in 1984.

E.W. Berry
EDWIN W. BERRY
Chief, Compliance and
Resources Branch

CF:
Commander
Attorney-Advisor
Transportation Officer
Director, Installation Services
Chief, Facilities Engineering Division
Chief, Industrial Division
Chief, Plant Operations Branch
Rocky Mountain Arsenal Information Center
Defense Property Disposal Office

[redacted]

RCRA PART B PERMIT APPLICATION

Selected Facilities
Rocky Mountain Arsenal
Commerce City, Colorado

Prepared For

Department of the Army
Rocky Mountain Arsenal
Directorate of Technical Operations
Management Systems Control Office

Under Contract With

Department of the Army
Huntsvill Division, Corps of Engineers
Huntsville, Alabama

Technical assistance and site support provided by

Edwin W. Berry and Ronald Gregg

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

PAGE

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

PAGE

TABLE OF CONTENTS
(Continued)

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF FIGURES

LIST OF FIGURES
(Continued)

LIST OF APPENDICES

1.0 INTRODUCTION AND PART A APPLICATION

1.1 INTRODUCTION

This application was prepared in response to the Environmental Protection Agency's (EPA) request dated July 21, 1982 to Rocky Mountain Arsenal (RMA) for submittal of a Resource Conservation and Recovery Act (RCRA) Part B Permit Application. The EPA call letter is provided as Appendix 1A. The format of the application follows an outline provided by and reviewed with EPA and includes the requirements in 40 CFR §122, §261 and §264. An outline of this application with citations of the regulations covered by each section is provided as Appendix 1B.

Much of this application was prepared using existing documentation and procedures at RMA. As part of the U.S. Army's policies, Standing Operating Procedures (SOPs) exist for all major operations at RMA. In many cases, information was extracted from these SOPs and other available sources such as RMA's Disaster Control Plan to meet the information requirements of this permit application. Surveys were also conducted, specifically for the waste container storage facilities. New information such as closure and waste analysis plans was developed. Where appropriate, important reference materials from available documentation are attached in supporting appendices. In some cases when this documentation is particularly voluminous, it is included only by reference. This referenced material is available to the EPA at RMA.

1.2 REVISED RCRA PART A APPLICATION

The complete RCRA Part A Application is included in the following pages. This application was revised from the original Part A submittal in November of 1980 and submitted to EPA on January 28, 1983. The thermal demolition area included in the Part A Application is not included in the Part B Application because final regulations have not been promulgated. An amendment will be submitted for this facility. Quantities of some wastes on Page 3 of 5 have been modified slightly since January 28. These changes are included.

Please print or type in the unshaded areas only
(fill—in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-R0175

FORM 1 GENERAL

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

GENERAL INFORMATION

Consolidated Permits Program

(Read the "General Instructions" before starting.)

I. EPA I.D. NUMBER

F C052100207690 D

LABEL ITEMS

I. EPA I.D. NUMBER

III. FACILITY NAME

V. FACILITY MAILING ADDRESS

VI. FACILITY LOCATION

PLEASE PLACE LABEL IN THIS SPACE

GENERAL INSTRUCTIONS

If a preprinted label has been provided, affix it in the designated space. Review the information carefully; if any of it is incorrect, cross through it and enter the correct data in the appropriate fill—in area below. Also, if any of the preprinted data is absent *(the area to the left of the label space lists the information that should appear)*, please provide it in the proper fill—in area*(s)* below. If the label is complete and correct, you need not complete Items I, III, V, and VI *(except VI-B which must be completed regardless)*. Complete all items if no label has been provided. Refer to the instructions for detailed item descriptions and for the legal authorizations under which this data is collected.

II. POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold—faced terms.

SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	YES	NO	FORM ATTACHED
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X		B. Does or will this facility *(either existing or proposed)* include a **concentrated animal feeding operation** or **aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X	
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)		X		D. Is this a proposed facility *(other than those described in A or B above)* which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)		X	
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)	X			F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		X	
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)		X		H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		X	
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X		J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		X	

III. NAME OF FACILITY

1 SKIP ROCKY MOUNTAIN ARSENAL

IV. FACILITY CONTACT

A. NAME & TITLE (last, first, & title)	B. PHONE (area code & no.)
2 BERRY E W PROG ANAL OFFICER	303 289 0120

V. FACILITY MAILING ADDRESS

A. STREET OR P.O. BOX

3 NORTH OF STAPLETON INT AIRPORT

B. CITY OR TOWN	C. STATE	D. ZIP CODE
4 COMMERCE CITY	CO	80022

VI. FACILITY LOCATION

A. STREET, ROUTE NO. OR OTHER SPECIFIC IDENTIFIER

5 NORTH OF STAPLETON INT AIRPORT

B. COUNTY NAME

ADAMS

C. CITY OR TOWN	D. STATE	E. ZIP CODE	F. COUNTY CODE (if known)
6 COMMERCE CITY	CO	80022	

CONTINUED FROM THE FRONT

VII. SIC CODES (4-digit, in order of priority)

A. FIRST	B. SECOND
C 7 — 9711 (specify) U.S. Army National Security Area	C 7 — (specify)
C. THIRD	**D. FOURTH**
C 7 — (specify)	C 7 — (specify)

VIII. OPERATOR INFORMATION

A. NAME

C 8 UNITED STATES ARMY

B. Is the name listed in Item VIII-A also the owner? [X] YES [ ] NO

C. STATUS OF OPERATOR (Enter the appropriate letter into the answer box; if "Other", specify.)

F = FEDERAL
S = STATE
P = PRIVATE
M = PUBLIC (other than federal or state)
O = OTHER (specify)

(specify)

D. PHONE (area code & no.)

C A 303 289 0120

E. STREET OR P.O. BOX

NORTH OF STAPLETON INT AIRPORT

F. CITY OR TOWN	G. STATE	H. ZIP CODE
C 8 COMMERCE CITY	CO	80022

IX. INDIAN LAND

Is the facility located on Indian lands?

[ ] YES [X] NO

X. EXISTING ENVIRONMENTAL PERMITS

A. NPDES (Discharges to Surface Water)	D. PSD (Air Emissions from Proposed Sources)	
9 N CO 0030061	9 P	NPDES CO-0021202
B. UIC (Underground Injection of Fluids)	**E. OTHER (specify)**	
9 U	9 C-12,103-1	(specify) Air Emission Permit Colorado Department of Health
C. RCRA (Hazardous Wastes)	**E. OTHER (specify)**	
9 R	9 C-12,103-2	(specify) Air Emission Permit Colorado Department of Health

XI. MAP

Attach to this application a topographic map of the area extending to at least one mile beyond property bounderies. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in the map area. See instructions for precise requirements.

XII. NATURE OF BUSINESS (provide a brief description)

Rocky Mountain Arsenal (RMA) is a U.S. Army installation responsible for the demilitarization (detoxification) of chemical munitions and agents, and other hazardous materials. Processes involve incineration or neutralization and tank treatment. By-products of demilitarization operations are stored in containers within storage buildings. Small quantities of laboratory waste are generated and treated via carbon treatment process. An area of RMA is used for thermal demolition of munitions. RMA also blends hydrazine missile fuel for the U.S. Air Force and stores the resulting waste. The Defense Property Disposal Office, a tenant at RMA, stores small quantities of hazardous wastes prior to disposal via service contracts.

XIII. CERTIFICATION (see instructions)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attachments and that, based on my inquiry of those persons immediately responsible for obtaining the information contained in the application, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME & OFFICIAL TITLE (type or print)	B. SIGNATURE	C. DATE SIGNED
Lieutenant Colonel Richard W. Smith	Richard W. Smith	28 Jan 83

COMMENTS FOR OFFICIAL USE ONLY

C

Please print or type in the unshaded areas only
(fill–in areas are spaced for elite type, i.e., 12 characters/inch).

Form Approved OMB No. 158-S80004

FORM 3 RCRA — EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE PERMIT APPLICATION
Consolidated Permits Program
(This information is required under Section 3005 of RCRA.)

I. EPA I.D. NUMBER

S		T/A	C
F	C052100207 69		1

FOR OFFICIAL USE ONLY

APPLICATION APPROVED	DATE RECEIVED (yr., mo., & day)	COMMENTS

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below *(mark one box only)* to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA I.D. Number, or if this is a revised application, enter your facility's EPA I.D. Number in Item I above.

A. FIRST APPLICATION *(place an "X" below and provide the appropriate date)*

☐ 1. EXISTING FACILITY *(See instructions for definition of "existing" facility. Complete item below.)*

☐ 2. NEW FACILITY *(Complete item below.)*

C: 8 — YR. ___ MO. ___ DAY ___ FOR EXISTING FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR THE DATE CONSTRUCTION COMMENCED *(use the boxes to the left)*

YR. ___ MO. ___ DAY ___ FOR NEW FACILITIES, PROVIDE THE DATE *(yr., mo., & day)* OPERATION BEGAN OR IS EXPECTED TO BEGIN

B. REVISED APPLICATION *(place an "X" below and complete Item I above)*

☒ 1. FACILITY HAS INTERIM STATUS

☐ 2. FACILITY HAS A RCRA PERMIT

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. **PROCESS CODE** – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process *(including its design capacity)* in the space provided on the form *(Item III-C)*.

B. **PROCESS DESIGN CAPACITY** – For each code entered in column A enter the capacity of the process.
1. AMOUNT – Enter the amount.
2. UNIT OF MEASURE – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
Storage:		
CONTAINER *(barrel, drum, etc.)*	S01	GALLONS OR LITERS
TANK	S02	GALLONS OR LITERS
WASTE PILE	S03	CUBIC YARDS OR CUBIC METERS
SURFACE IMPOUNDMENT	S04	GALLONS OR LITERS
Disposal:		
INJECTION WELL	D79	GALLONS OR LITERS
LANDFILL	D80	ACRE-FEET *(the volume that would cover one acre to a depth of one foot)* OR HECTARE-METER
LAND APPLICATION	D81	ACRES OR HECTARES
OCEAN DISPOSAL	D82	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	D83	GALLONS OR LITERS
Treatment:		
TANK	T01	GALLONS PER DAY OR LITERS PER DAY
SURFACE IMPOUNDMENT	T02	GALLONS PER DAY OR LITERS PER DAY
INCINERATOR	T03	TONS PER HOUR OR METRIC TONS PER HOUR; GALLONS PER HOUR OR LITERS PER HOUR
OTHER *(Use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Item III-C.)*	T04	GALLONS PER DAY OR LITERS PER DAY

UNIT OF MEASURE	UNIT OF MEASURE CODE
GALLONS	G
LITERS	L
CUBIC YARDS	Y
CUBIC METERS	C
GALLONS PER DAY	U
LITERS PER DAY	V
TONS PER HOUR	D
METRIC TONS PER HOUR	W
GALLONS PER HOUR	E
LITERS PER HOUR	H
ACRE-FEET	A
HECTARE-METER	F
ACRES	B
HECTARES	Q

EXAMPLE FOR COMPLETING ITEM III *(shown in line numbers X-1 and X-2 below)*: A facility has two storage tanks, one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

S		T/A	C
C	DUP		1

LINE NUMBER	A. PROCESS CODE (from list above)	B. PROCESS DESIGN CAPACITY 1. AMOUNT (specify)	2. UNIT OF MEASURE (enter code)	FOR OFFICIAL USE ONLY
X-1	S 0 2	600	G	
X-2	T 0 3	20	E	
1	S 0 1	4,200,000*	G	
2	S 0 1	600*	G	
3	S 0 2	294,000	G	
4	S 0 2	170,000	G	
5	S 0 4	250,000,000	G	
6	T 0 1	44,000	U	
7	T 0 1	43,200	U	
8	T 0 1	3,000	U	
9	T 0 3	0.65	D	
10	T 0 4	1	D	

*See explanation under III.C

Continued from the front.

III. PROCESSES *(continued)*

C. SPACE FOR ADDITIONAL PROCESS CODES OR FOR DESCRIBING OTHER PROCESSES *(code "T04")*. FOR EACH PROCESS ENTERED HERE INCLUDE DESIGN CAPACITY.

The following is a more detailed description of the processes listed by line on Page 1 of 5. The amounts of waste currently stored in containers at RMA and the tenant Defense Property Disposal Office (DPDO) are listed in Lines 1 and 2 rather than a design capacity. Capacity at a large facility such as RMA would be much greater. Process design capacities are, however, listed for tank treatment, incinerator, thermal demolition and surface impoundment.

LINE	DESCRIPTION
1	4,200,000 gallons of demilitarization waste salts and residues currently in storage.
2	600 gallons of various hazardous wastes currently stored at the DPDO.
3	294,000 gallon capacity for hydrazine waste storage (tank).
4	170,000 gallon capacity for laboratory waste storage (tank).
5	250,000,000 gallon capacity in Basin F surface impoundment.
6	44,400 GPD treatment capacity for hydrazine waste.
7	43,200 GPD treatment capacity at the South Plants spray dryer.
8	3,000 GPD treatment capacity for laboratory waste.
9	0.65 ton per hour capacity at the North Plants incinerator.
10	1 ton per hour maximum capacity at the thermal demolition area (detonation of bombs).

IV. DESCRIPTION OF HAZARDOUS WASTES

A. EPA HAZARDOUS WASTE NUMBER — Enter the four-digit number from 40 CFR, Subpart D for each listed hazardous waste you will handle. If you handle hazardous wastes which are not listed in 40 CFR, Subpart D, enter the four-digit number*(s)* from 40 CFR, Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.

B. ESTIMATED ANNUAL QUANTITY — For each **listed waste** entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each **characteristic** or **toxic contaminant** entered in column A estimate the total annual quantity of all the non-listed waste*(s)* that will be handled which possess that characteristic or contaminant.

C. UNIT OF MEASURE — For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. PROCESSES

1. PROCESS CODES:
For listed hazardous waste: For each **listed** hazardous waste entered in column A select the code*(s)* from the list of process codes contained in Item III to indicate how the waste will be stored, treated, and/or disposed of at the facility.
For non-listed hazardous wastes: For each characteristic or toxic contaminant entered in column A, select the code*(s)* from the list of process codes contained in Item III to indicate **all** the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.
Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of Item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code*(s)*.

2. PROCESS DESCRIPTION: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER — Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B,C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.
3. Repeat step 2 for each other EPA Hazardous Waste Number that can be used to describe the hazardous waste.

EXAMPLE FOR COMPLETING ITEM IV *(shown in line numbers X-1, X-2, X-3, and X-4 below)* — A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

LINE NO.	A. EPA HAZARD. WASTE NO *(enter code)*	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE *(enter code)*	D. PROCESSES 1. PROCESS CODES *(enter)*				D. PROCESSES 2. PROCESS DESCRIPTION *(if a code is not entered in D(1))*
X-1	*K 0 5 4*	*900*	*P*	*T 0 3*	*D 8 0*			
X-2	*D 0 0 2*	*400*	*P*	*T 0 3*	*D 8 0*			
X-3	*D 0 0 1*	*100*	*P*	*T 0 3*	*D 8 0*			
X-4	*D 0 0 2*							*included with above*

CONTINUE ON PAGE 3

Continued from page 2.
NOTE: Photocopy this page before completing if you have more than 26 wastes to list.

Form Approved OMB No. 158-S80004

EPA I.D. NUMBER (enter from page 1)	T/A	C	FOR OFFICIAL USE ONLY	T/A	C	
W C 0 5 2 1 0 0 2 0 7 6 9		1	W DUP		2	DUP

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

LINE NO.	A. EPA HAZARD. WASTE NO. (enter code)	B. ESTIMATED ~~ANNUAL~~ QUANTITY OF WASTE	C. UNIT OF MEASURE (enter code)	D. PROCESSES 1. PROCESS CODES (enter)				D. PROCESSES 2. PROCESS DESCRIPTION (if a code is not entered in D(1))
1								The following are total amounts of waste (not annual). See
2								further explanation on Page 4 of 5 under IV E.
3	D 0 0 9	42	T	S 0 1				Ceresan-contaminated wheat stored in containers.
4	D 0 0 8	125	T	S 0 1				Phosgene neutralization waste stored in containers.
5	X 0 0 3	5,465	T	S 0 1				Mustard incineration salts and residues stored in containers.
6	X 0 0 3	470	T	S 0 1				Chemical Agent Identification Set incineration salts and residues stored in containers.
7	D 0 0 4							Included with above.
8	D 0 0 6							Included with above.
9	D 0 0 8							Included with above.
10	X 0 0 3	9,415	T	S 0 1				Nerve agent sarin (GB) neutralization waste stored in containers.
11	D 0 0 3	450	T	T 0 1	S 0 2			Hydrazine waste treated and stored in tanks.
12	D 0 0 3	851	T	S 0 1	T 0 3	S 0 1		DDT-contaminated munitions which will be incinerated.
13	D 0 0 4	600	T	S 0 1	T 0 3	S 0 1		Adamsite in bulk which will be incinerated.
14	D 0 0 4	11	T	S 0 1	T 0 3	S 0 1		Adamsite grenades which will be incinerated.
15	D 0 0 3							Included with above.
16	D 0 0 8							Included with above.
17	D 0 1 2	200,280	T	S 0 4				Waste stored in Basin F.
18								The following items are stored in containers at the DPDO.
19	F 0 0 5	2,590	P	S 0 1				Used methyl ethyl ketone solvents.
20	D 0 0 9	200	P	S 0 1				Mercury-contaminated waste.
21	U 0 8 0	600	P	S 0 1				Paint stripper.
22								
23								
24								
25								
26								

EPA Form 3510-3 (6-80)

CONTINUE ON REVERSE

Continued from the front.

IV. DESCRIPTION OF HAZARDOUS WASTES *(continued)*

E. USE THIS SPACE TO LIST ADDITIONAL PROCESS CODES FROM ITEM D(1) ON PAGE 3.

Section IV of Form 3 asks for a description of the hazardous wastes in terms of annual quantities. Programs at RMA are based upon an amount of material which must be incinerated or neutralized (demilitarized). These programs generate a certain amount of waste. Therefore, wastes are described in terms of the total amount present rather than annual quantities.

The waste Code X003 is used to designate residues from demilitarization of chemical agents and munitions that are managed as hazardous waste under Army policy. The mustard, sarin (GB), and portions of CAIS residue are listed as X003 and managed as hazardous waste although limited sampling does not qualify them as RCRA hazardous waste. Hydrazine waste, which results from the production of missile fuel, is listed as D003 (reactive) because nitrosamines exceeding OSHA air standards are produced.

The wastes in Lines 19 to 22 are those which are stored at DPDO. The DPDO receives surplus items, including hazardous wastes, from defense facilities in the region. These materials and wastes are stored until they can be disposed of via service contracts. Amounts and types of stored wastes are variable. The listed types and amounts are what is currently stored at DPDO and are representative of what is stored at DPDO at any given time.

EPA I.D. NO. *(enter from page 1)*

S		T/A	C
F	C052100207 69		6

V. FACILITY DRAWING

All **existing** facilities must include in the space provided on page 5 a scale drawing of the facility *(see instructions for more detail).*

VI. PHOTOGRAPHS

All existing facilities must include photographs *(aerial or ground–level)* that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas *(see instructions for more detail).*

VII. FACILITY GEOGRAPHIC LOCATION

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*
39 49 56	104 51 02

VIII. FACILITY OWNER

[X] A. If the facility owner is also the facility operator as listed in Section VIII on Form 1, "General Information", place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VIII on Form 1, complete the following items:

1. NAME OF FACILITY'S LEGAL OWNER	2. PHONE NO. *(area code & no.)*
E	

3. STREET OR P.O. BOX	4. CITY OR TOWN	5. ST.	6. ZIP CODE
F	G		

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Lieutenant Colonel Richard W. Smith	Richard W. Smith	28 Jan 83

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

A. NAME *(print or type)*	B. SIGNATURE	C. DATE SIGNED
Lieutenant Colonel Richard W. Smith	Richard W. Smith	28 Jan 83

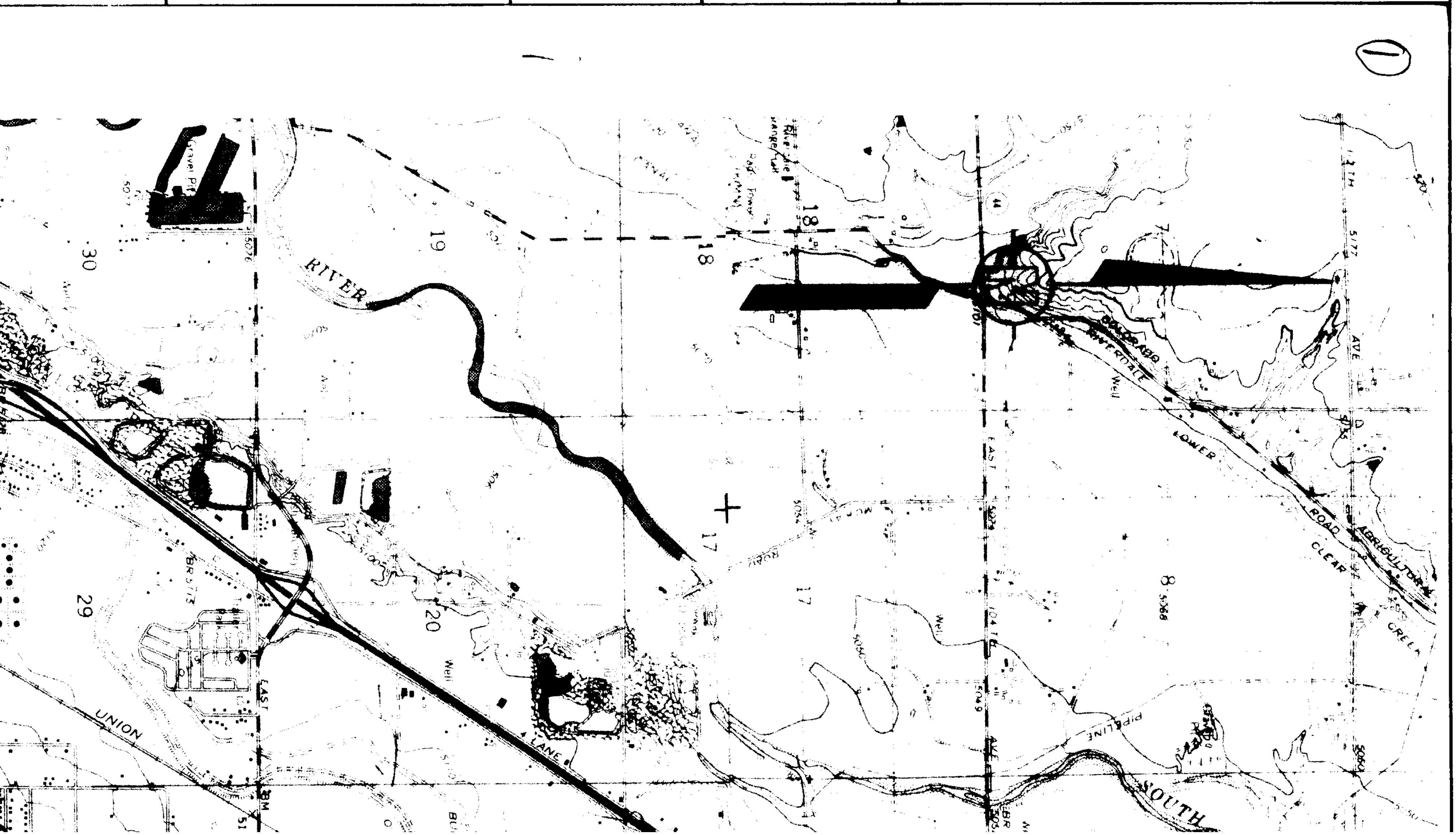
CONTINUE ON PAGE 5

Continued from page 4.

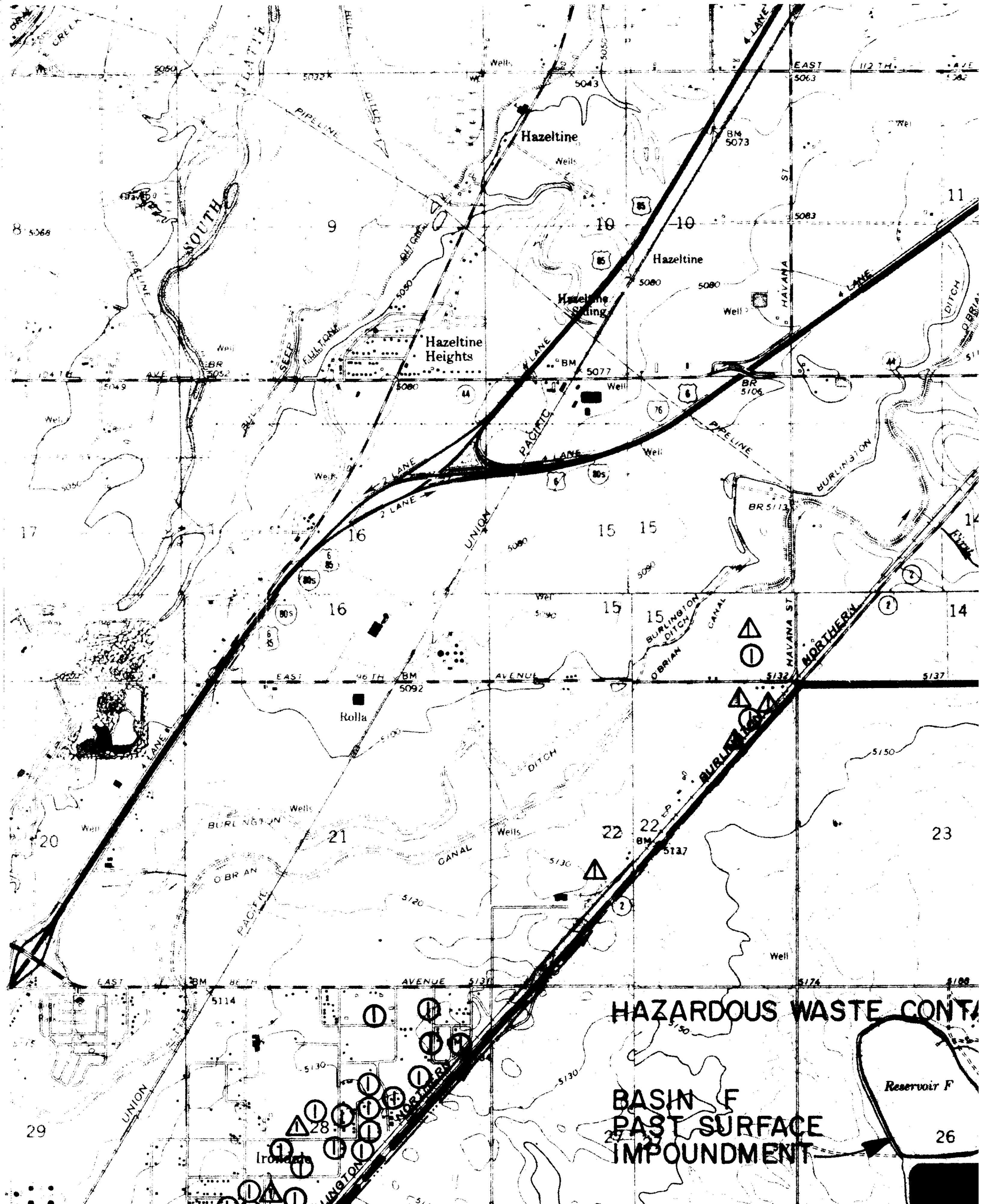
V. FACILITY DRAWING *(see page 4)*

See Attached Figures 1, 2 and 3.

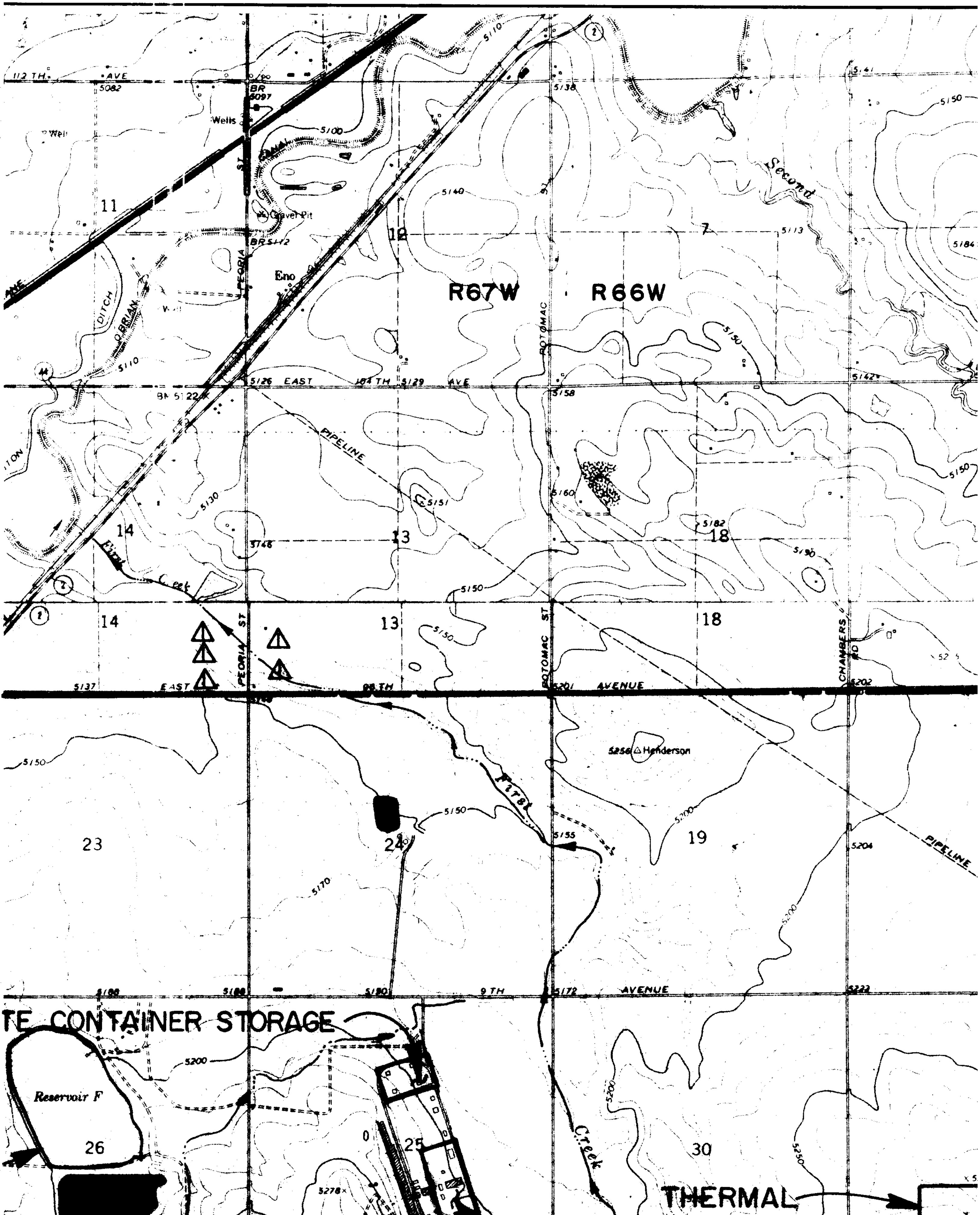
G.W.J.	CHECKED BY	CJH	11/21/80	DRAWING NUMBER RM 82-1981-E6
10-28-80	APPROVED BY	RPH	11/21/80	



(2)

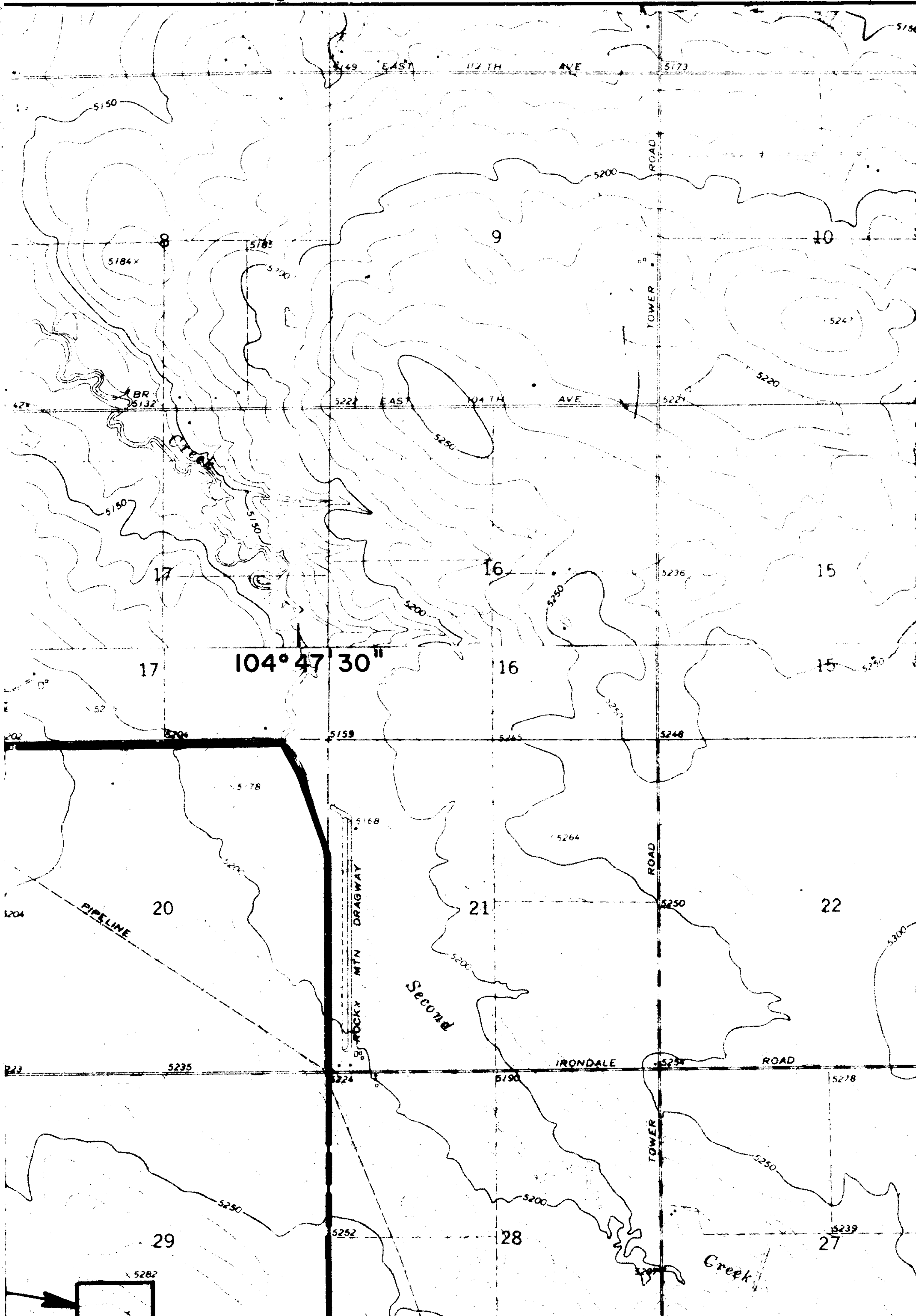

Hazeltine
Hazeltine
Hazeltine Siding
Hazeltine Heights
Rolla
Ironton
SOUTH PLATTE
PIPELINE
UNION PACIFIC
BURLINGTON NORTHERN
BURLINGTON DITCH
O'BRIAN CANAL
HAVANA ST
EAST 112 TH AVE
104 TH AVE
EAST 96 TH AVENUE
EAST 88 TH AVENUE
4 LANE
2 LANE
Well
Wells
BM 5073
BM 5077
BM 5092
BM 5137
BR 5052
BR 5106
BR 5113
HAZARDOUS WASTE CONTA
BASIN F
PAST SURFACE
IMPOUNDMENT
Reservoir F

③



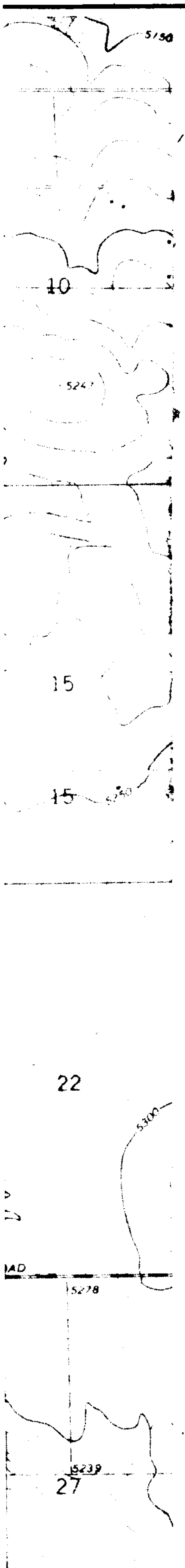
112 TH. AVE
BR 5097
Wells
Gravel Pit
BR 5112
Eno
PEORIA ST
DITCH
O'BRIAN
R67W
R66W
POTOMAC ST
EAST 104 TH AVE
PIPELINE
Second
First Creek
EAST 96 TH AVENUE
CHAMBERS RD
5256 △ Henderson
9 TH AVENUE
TE CONTAINER STORAGE
Reservoir F
Creek
THERMAL
11
12
7
14
13
18
23
24
19
26
25
30

④



EAST 112 TH AVE
5149
5173
5150
5200
ROAD
TOWER
8
9
10
5184
5185
5242
5220
EAST 104 TH AVE
5222
5227
5132
BR
Creek
5250
5150
17
16
15
5236
104° 47' 30"
5159
5204
5265
5248
5178
5168
5264
DRAGWAY
MTN
ROCKY
PIPELINE
20
21
22
5250
5300
Second
IRONDALE ROAD
5235
5224
5190
5254
5278
29
28
27
5252
5239
5282
Creek

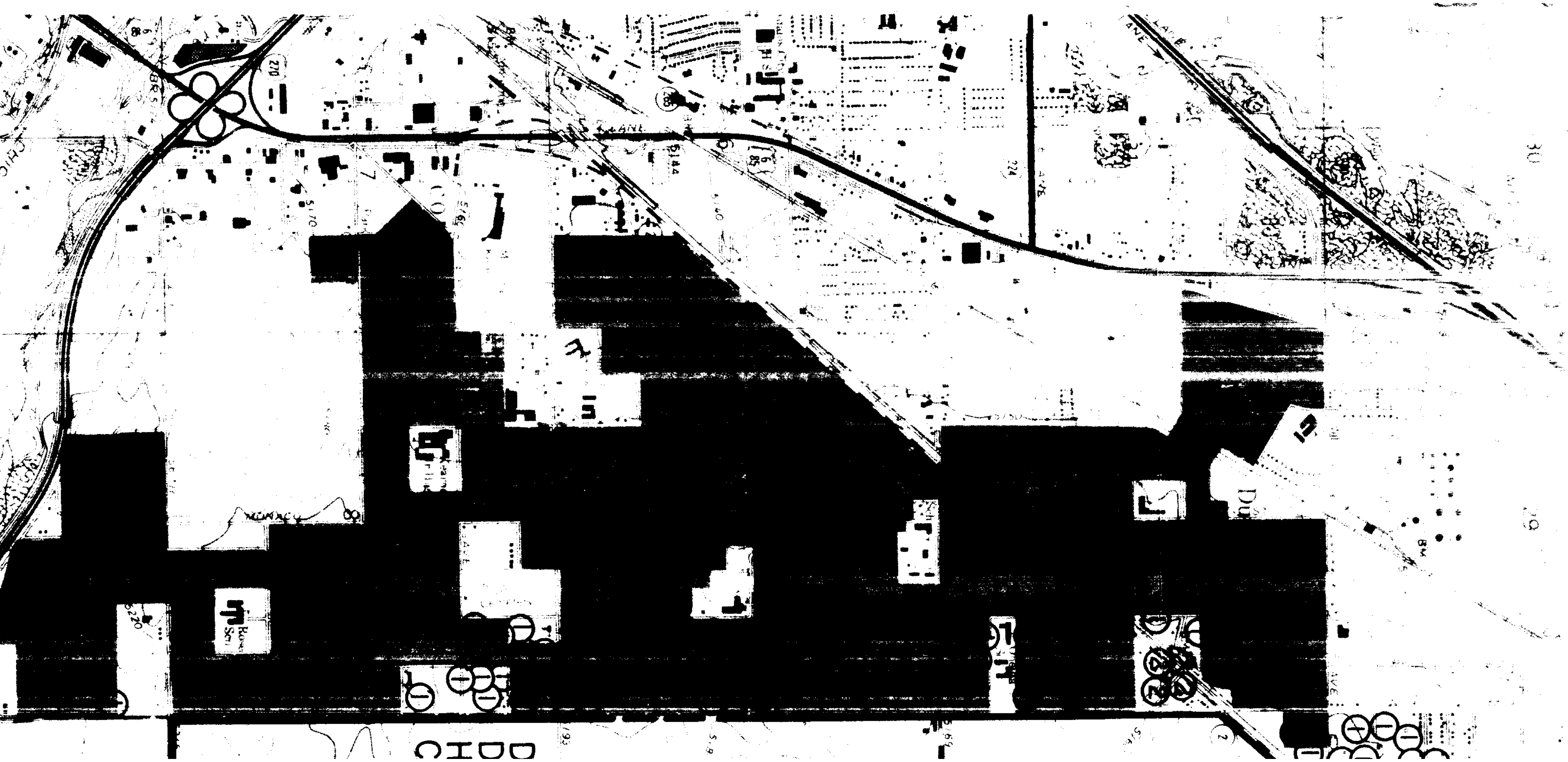
5

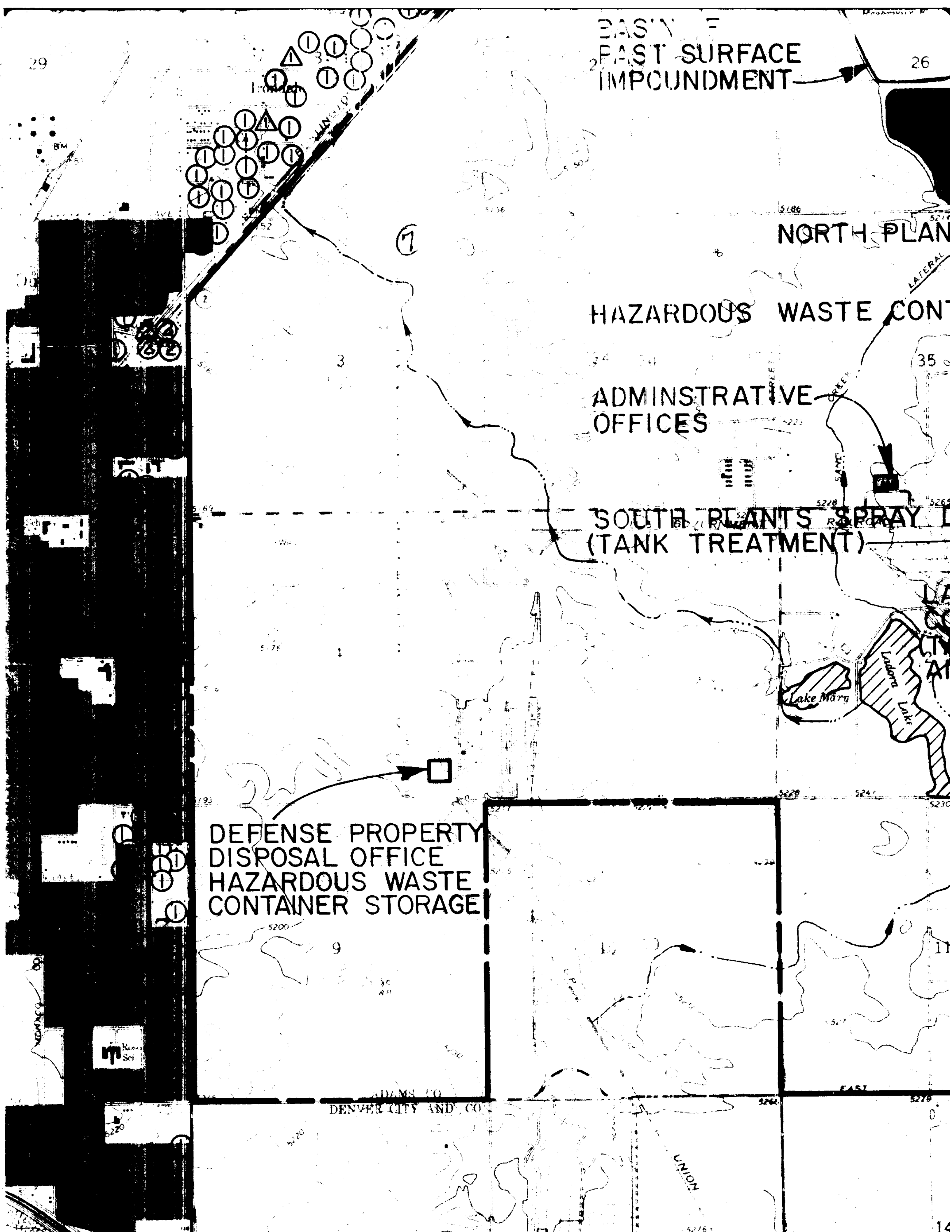


LEGEND:

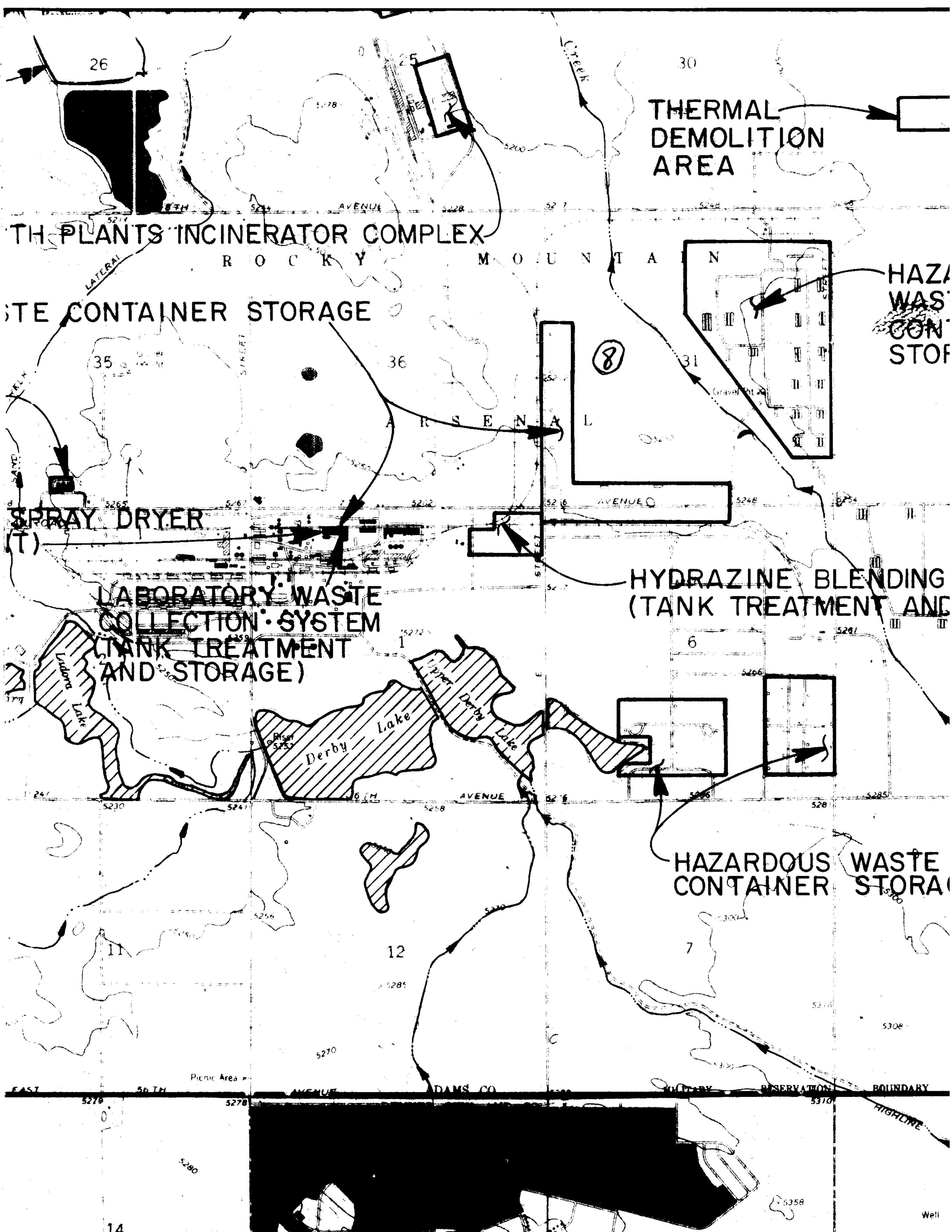
DRAWN BY | G.W.J. 10-28-80

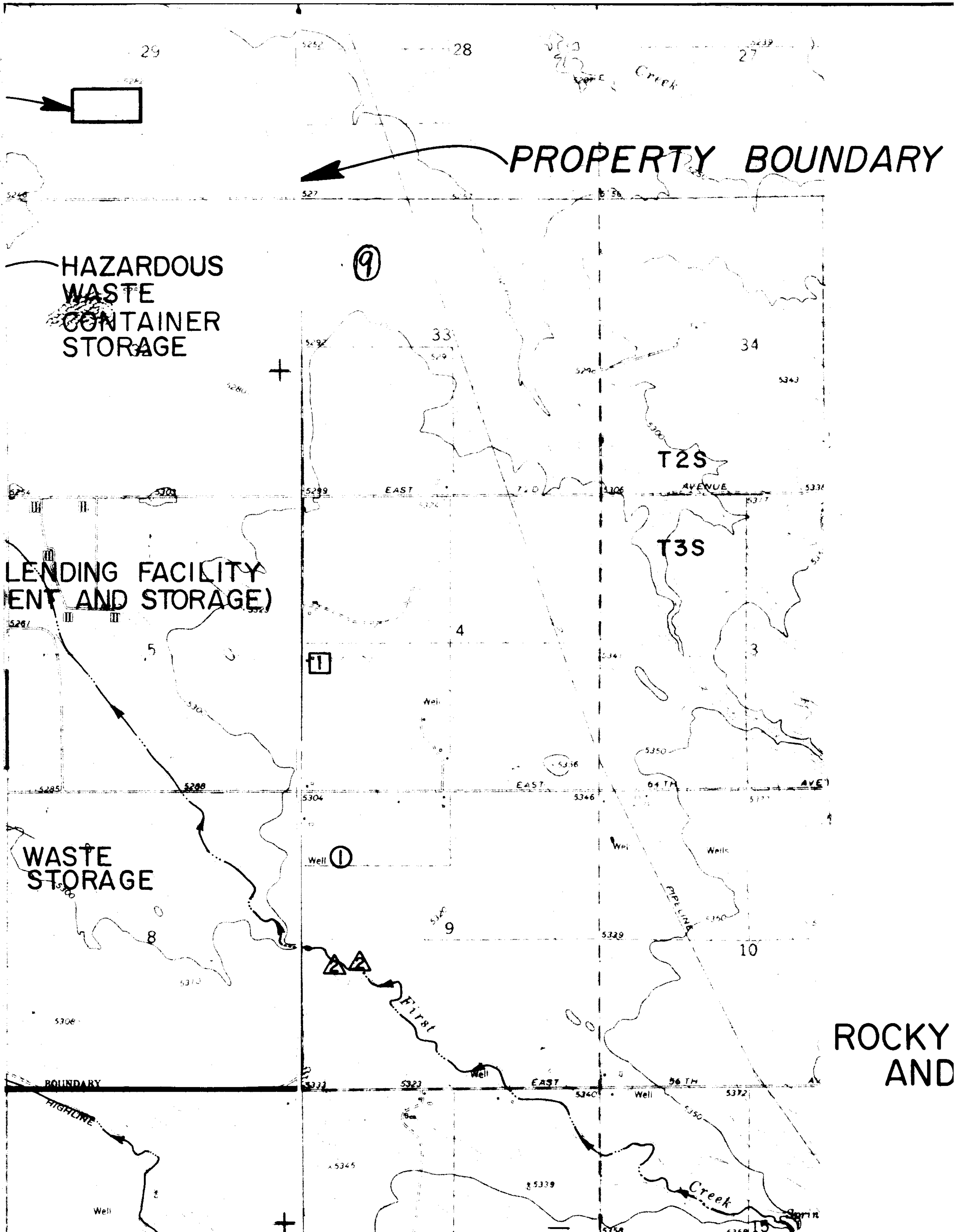
(6)





EAST SURFACE
IMPOUNDMENT
NORTH PLAN
HAZARDOUS WASTE CONT
ADMINSTRATIVE
OFFICES
SOUTH PLANTS SPRAY
(TANK TREATMENT)
Lake Mary
Ladora Lake
DEFENSE PROPERTY
DISPOSAL OFFICE
HAZARDOUS WASTE
CONTAINER STORAGE
ADAMS CO
DENVER CITY AND CO
UNION


THERMAL DEMOLITION AREA
TH PLANTS INCINERATOR COMPLEX
ROCKY MOUNTAIN ARSENAL
STE CONTAINER STORAGE
HAZA WAST CONT STOR
SPRAY DRYER (T)
HYDRAZINE BLENDING (TANK TREATMENT AND
LABORATORY WASTE COLLECTION SYSTEM (TANK TREATMENT AND STORAGE)
HAZARDOUS WASTE CONTAINER STORA
Ladora Lake
Derby Lake
Upper Derby Lake
AVENUE
56TH AVENUE
ADAMS CO
MILITARY RESERVATION BOUNDARY
HIGHLINE
Picnic Area
Gravel Pit
Well
(8)
26
25
30
35
36
31
1
6
11
12
7
14



PROPERTY BOUNDARY
HAZARDOUS
WASTE
CONTAINER
STORAGE
LENDING FACILITY
ENT AND STORAGE)
WASTE
STORAGE
ROCKY
AND
T2S
T3S
29
28
27
33
34
5
4
3
8
9
10
Creek
EAST
AVENUE
EAST
64 TH
AVE
EAST
56 TH
BOUNDARY
HIGHLINE
PIPELINE
First
Creek
Well
Well 1
1
2
2
9

NDARY

LEGEND:

LAKES

10

INTERMITTENT OR
EPHEMERAL STREAM WITH
DIRECTION OF FLOW

DRINKING WATER WELL SYMBOLS:

DEPTH

△ 200' OR MORE

○ 199' OR LESS

□ DEPTH UNKNOWN

USE

1 DOMESTIC HOUSEHOLD USE AND IRRIGATION, < 1 ACRE

2 MUNICIPAL

NOTE:

THE FACILITIES SHOWN IN THIS FIGURE ARE THOSE WHICH ARE INCLUDED IN THE PART A APPLICATION AND WILL BE INCLUDED IN THE PART B APPLICATION.

SCALE

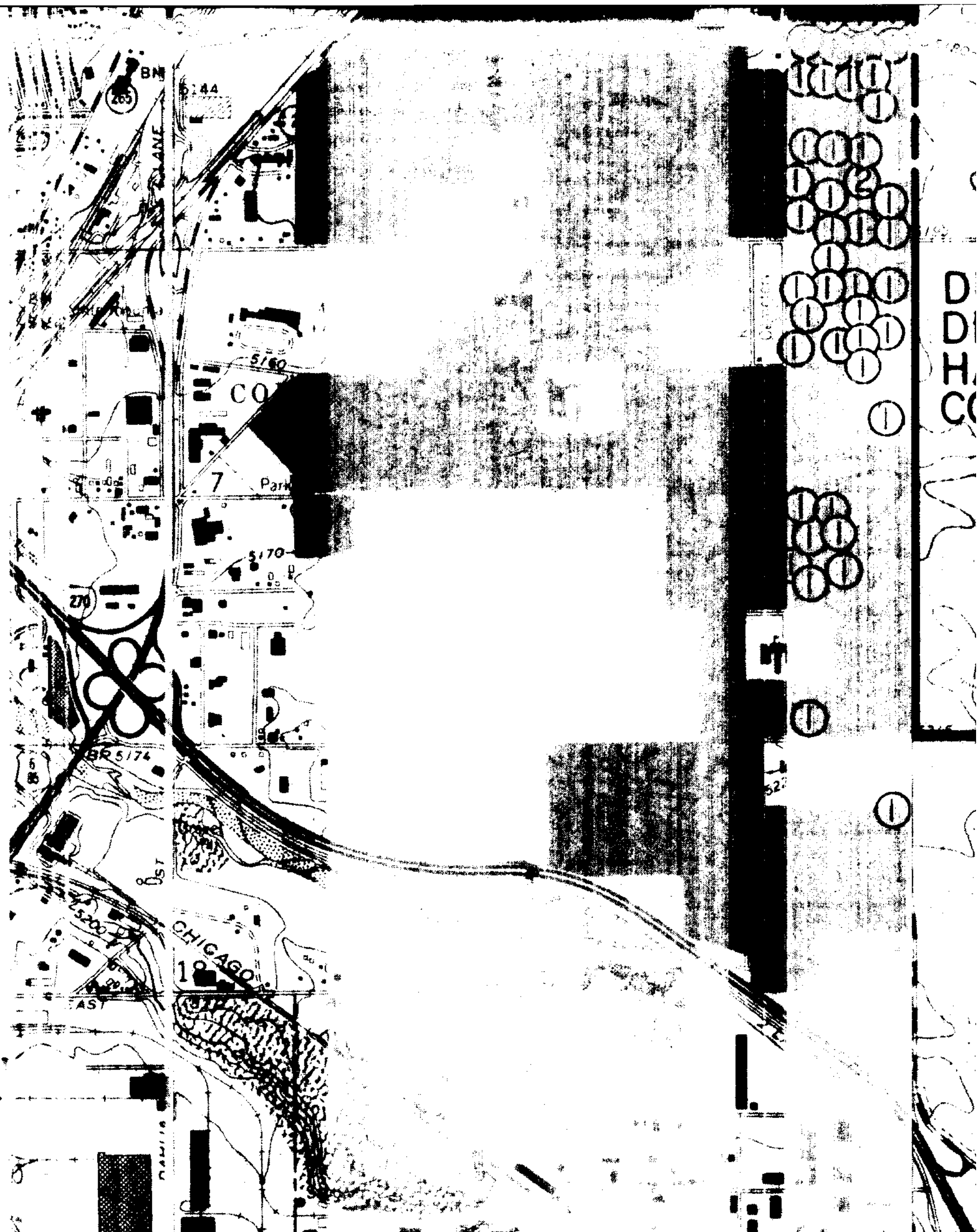
2000 0 2000 4000 FEET

FIGURE 1

ROCKY MOUNTAIN ARSENAL FACILITIES AND DRINKING WATER WELLS WITHIN 1/4 MILE OF BOUNDARY

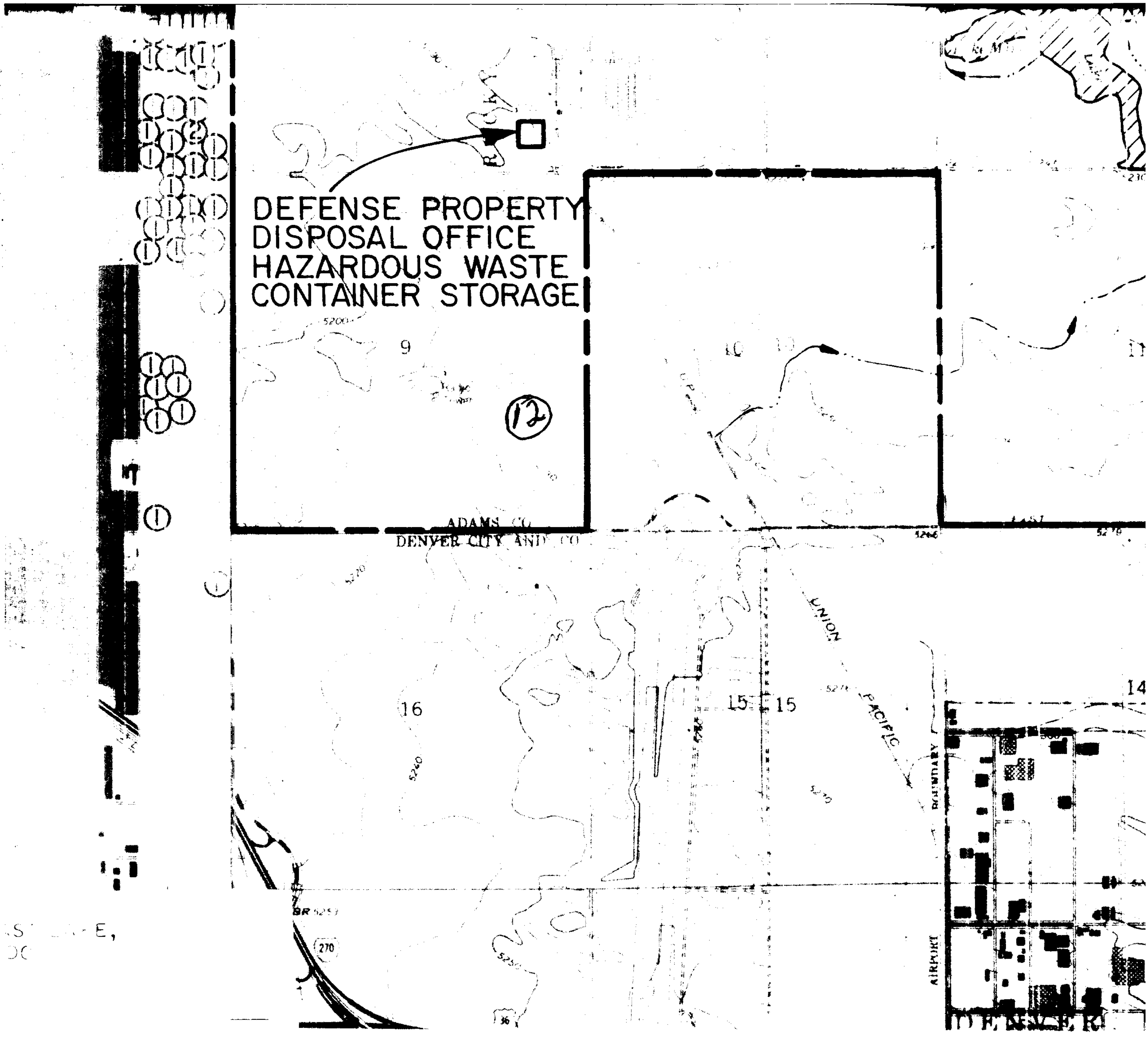
PREPARED FOR

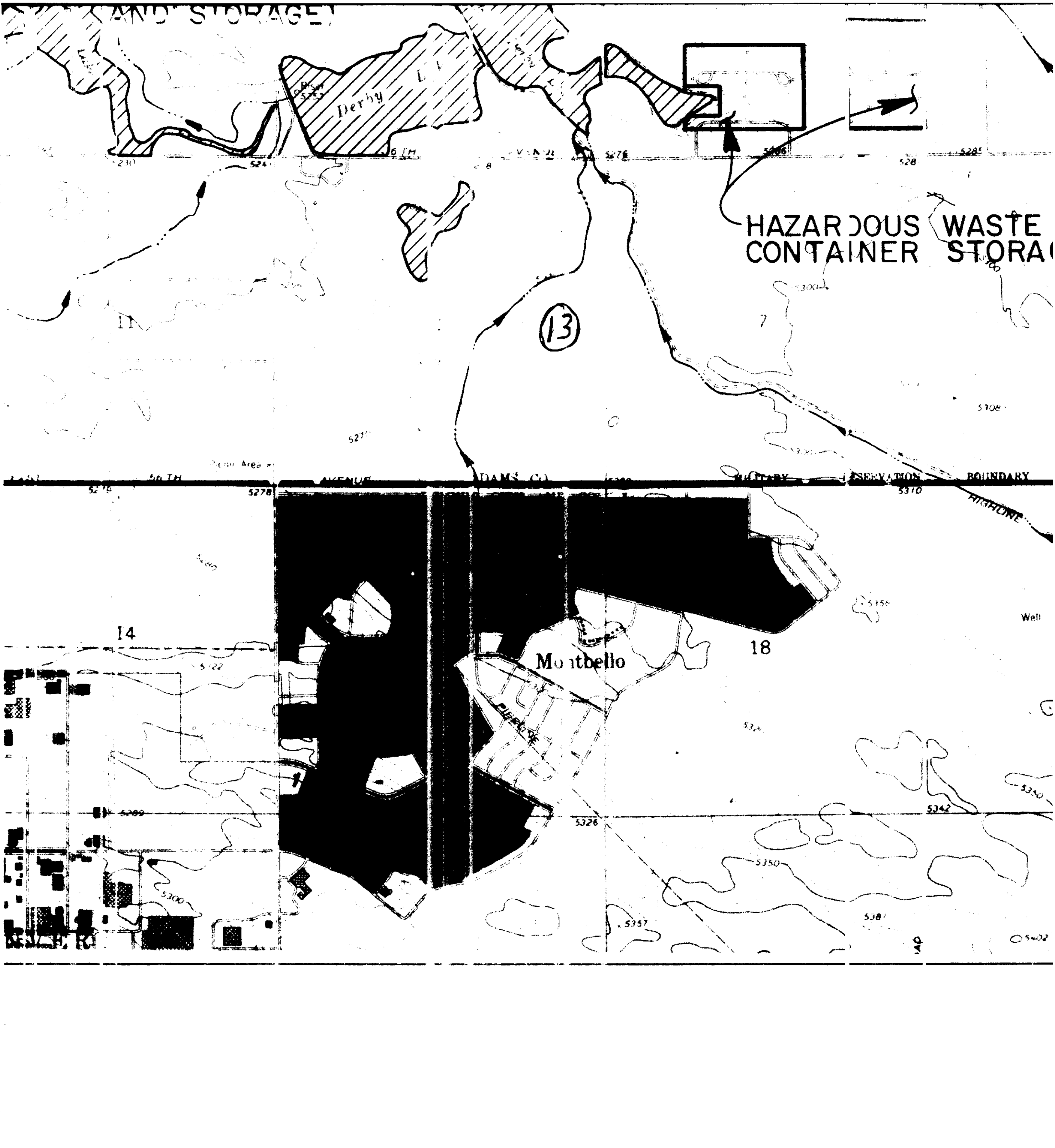
11



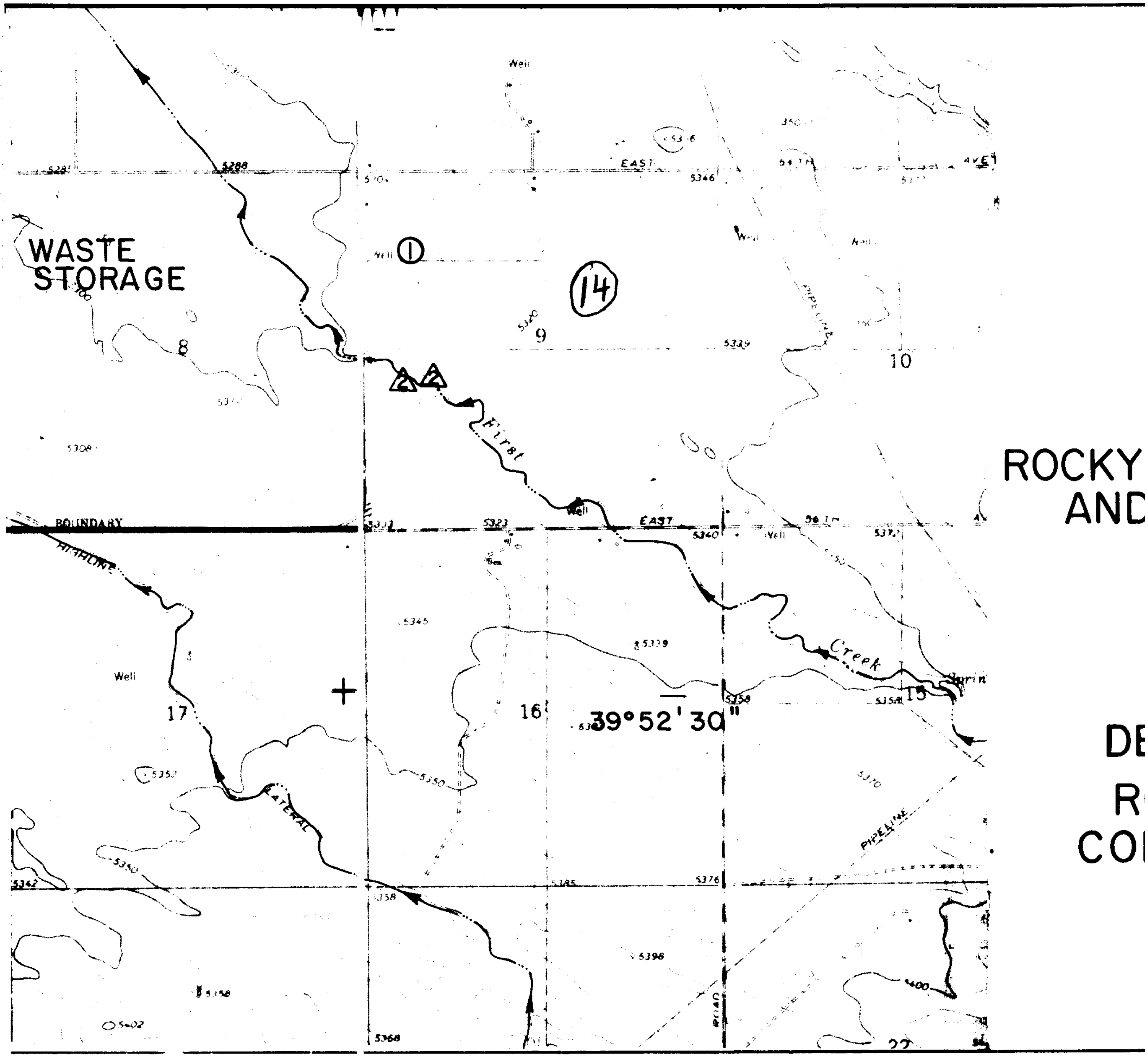
REFERENCE: 7.5' USGS TOPOGRAPHIC MAP OF EAST LAKE, BRIGHTON, COMMERCE CITY, AND SABLE, COLORADO
DATED: 1971, SCALE = 1 24000

REVISIONS
REVISED
1/20/83


DEFENSE PROPERTY
DISPOSAL OFFICE
HAZARDOUS WASTE
CONTAINER STORAGE
12
9
10
16
15
14
ADAMS CO
DENVER CITY AND CO
UNION
PACIFIC
BOUNDARY
AIRPORT
5200
5240
270
36



HAZARDOUS WASTE
CONTAINER STORAG
Derby
13
11
7
14
18
Montbello
Well
BOUNDARY
5230
5276
5306
5278
5310
5308
5326
5342
5350
5357
5387
5300



WASTE STORAGE
Well
EAST
64TH
AVE
BOUNDARY
HIGHLINE
LATERAL
First
Creek
PIPELINE
ROAD
39°52'30"
8
9
10
14
15
16
17
22
5288
5346
5323
5340
5345
5339
5350
5352
5358
5376
5385
5398
5400
5402
5342
5368
5308
ROCKY
AND
DE
R
CO

INCLUDED IN THE PART B APPLICATION.

SCALE

2000 0 2000 4000 FEET

FIGURE 1

15

ROCKY MOUNTAIN ARSENAL FACILITIES AND DRINKING WATER WELLS WITHIN 1/4 MILE OF BOUNDARY

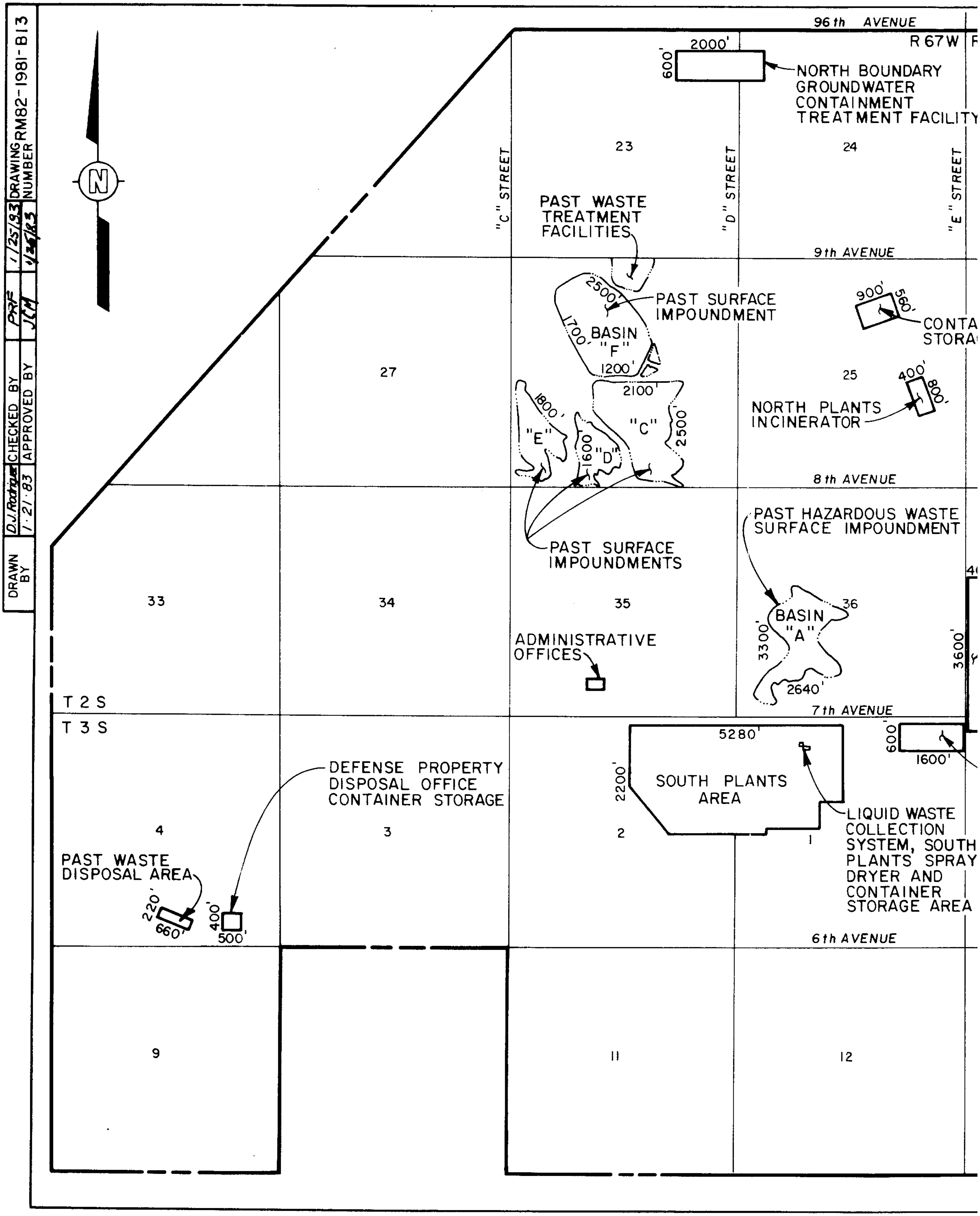
PREPARED FOR

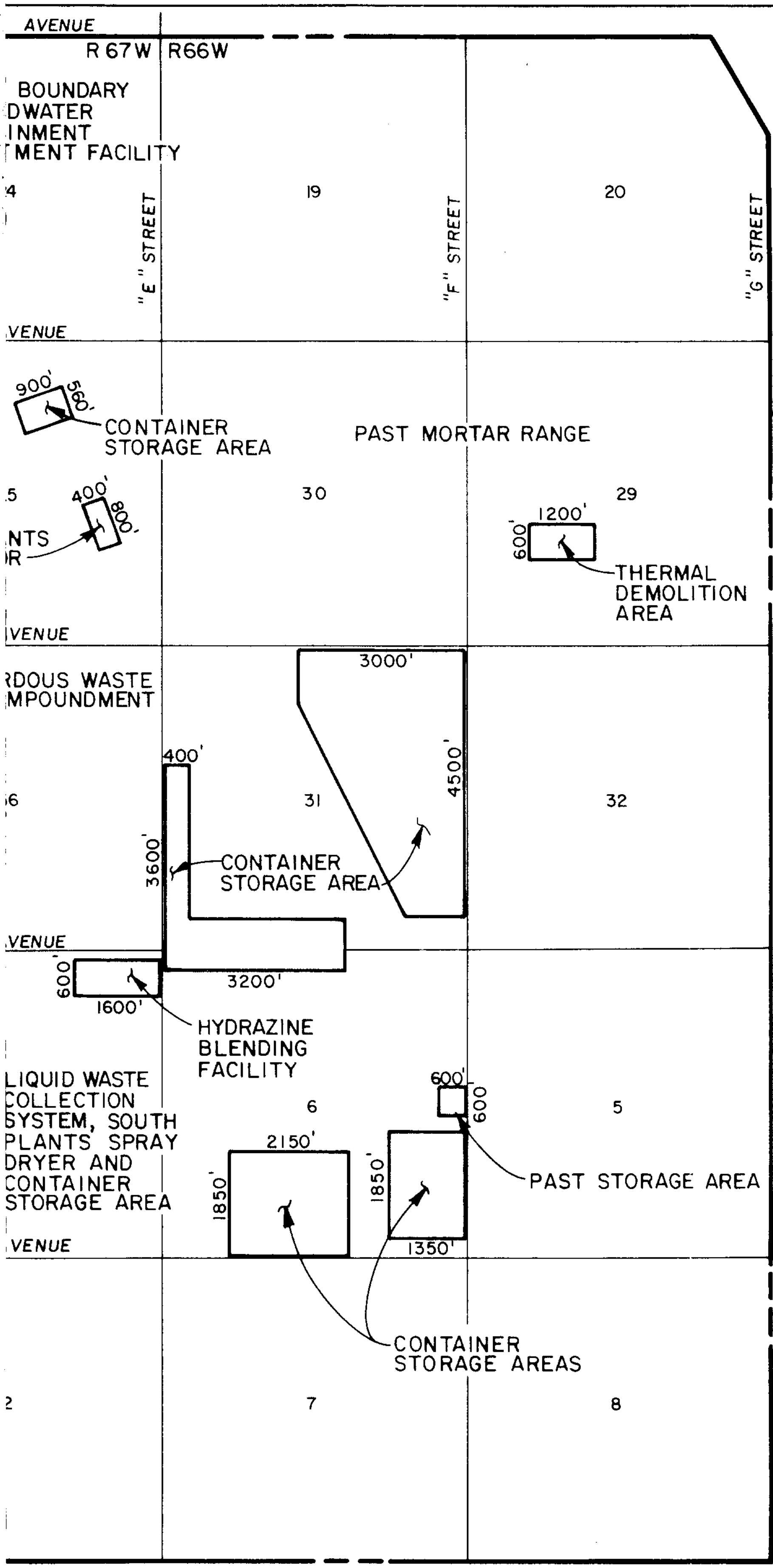
DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

1

1


DRAWING NUMBER RM82-1981-B13
DRAWN BY D.J. Rodriguez 1-21-83
CHECKED BY PRF 1/25/83
APPROVED BY JCM
N
96th AVENUE
R 67 W
2000'
600'
NORTH BOUNDARY GROUNDWATER CONTAINMENT TREATMENT FACILITY
23
24
"C" STREET
"D" STREET
"E" STREET
PAST WASTE TREATMENT FACILITIES
9th AVENUE
2500'
PAST SURFACE IMPOUNDMENT
1700'
BASIN "F"
1200'
900'
560'
CONTA
STORA
27
25
400'
800'
2100'
1800'
"E"
1600'
"D"
"C"
2500'
NORTH PLANTS INCINERATOR
8th AVENUE
PAST HAZARDOUS WASTE SURFACE IMPOUNDMENT
PAST SURFACE IMPOUNDMENTS
33
34
35
36
BASIN "A"
3300'
2640'
3600'
ADMINISTRATIVE OFFICES
T 2 S
T 3 S
7th AVENUE
5280'
600'
1600'
2200'
SOUTH PLANTS AREA
DEFENSE PROPERTY DISPOSAL OFFICE CONTAINER STORAGE
4
3
2
1
LIQUID WASTE COLLECTION SYSTEM, SOUTH PLANTS SPRAY DRYER AND CONTAINER STORAGE AREA
PAST WASTE DISPOSAL AREA
220'
660'
400'
500'
6th AVENUE
9
11
12



NOTES:

1. THE GEOGRAPHICAL CENTER OF THE ARSENAL IS 39°49'56" N. LATITUDE, 104° 51' 02" W. LONGITUDE. (APPROXIMATE)
2. THIS DRAWING IS NOT TO SCALE.

FIGURE 2

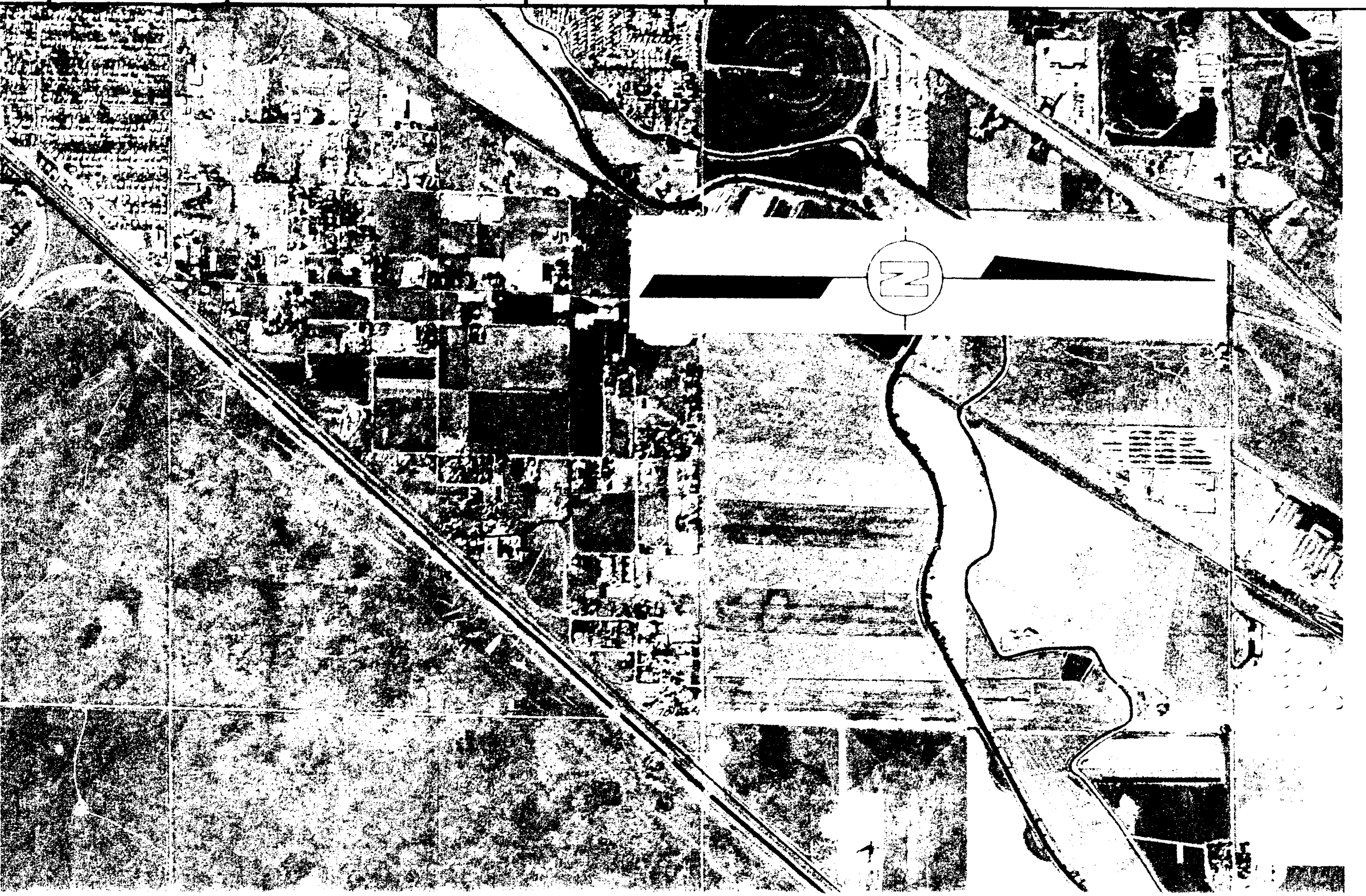
FACILITY DRAWING

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

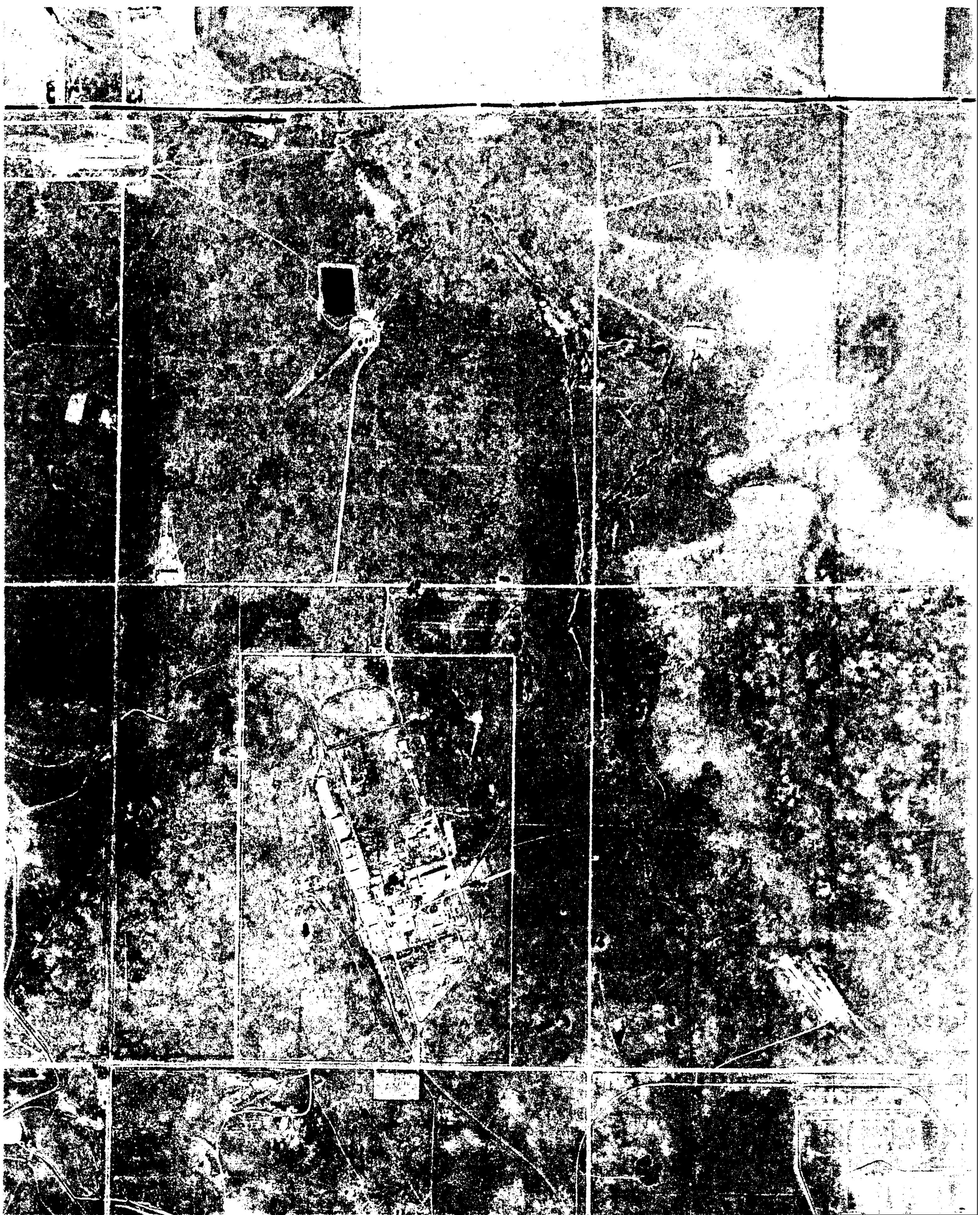
WN	G.W.J.	CHECKED BY			DRAWING NUMBER RM82-1981-E7
	11-14-80	APPROVED BY			



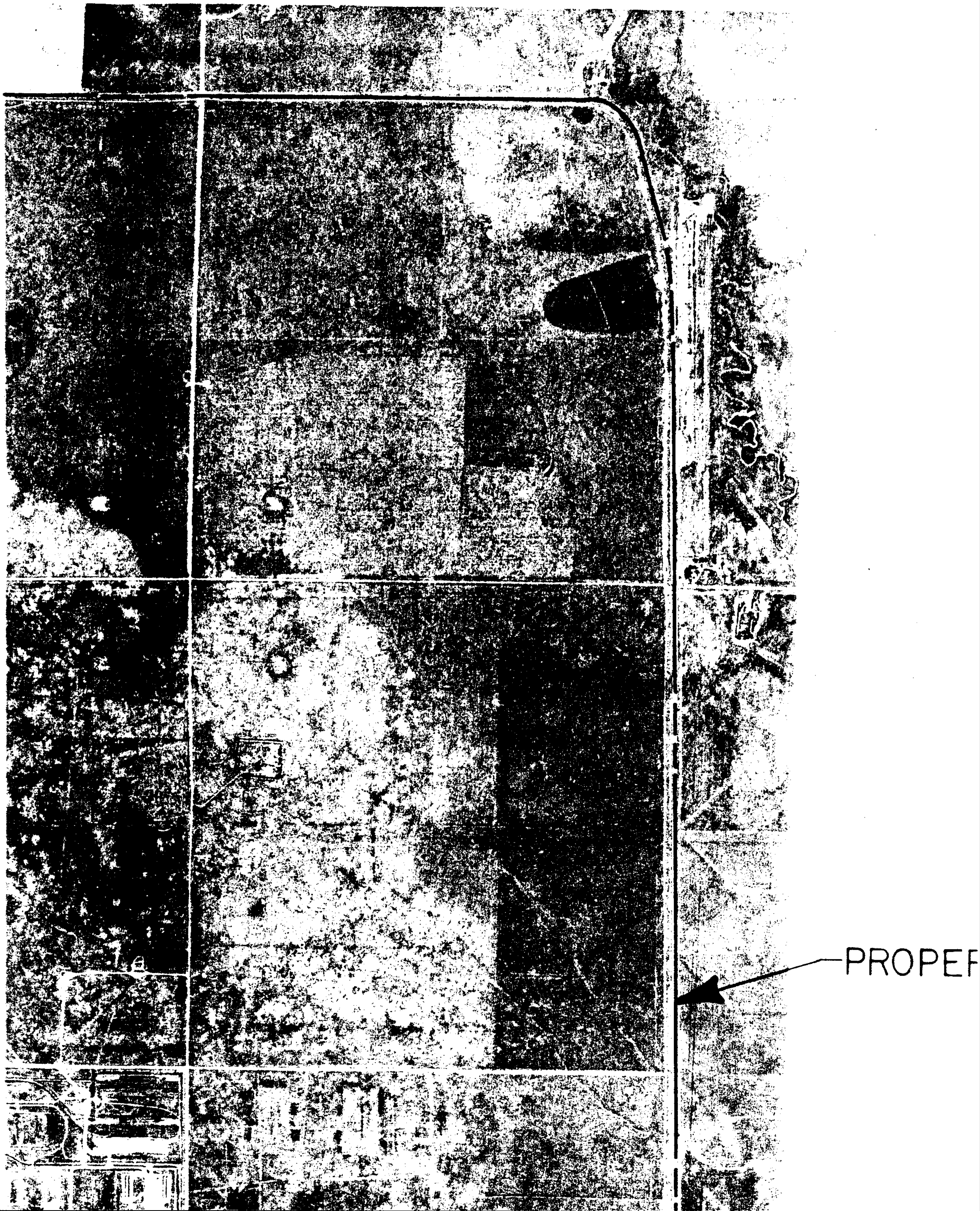
(1)

(2)

(3)



(4)

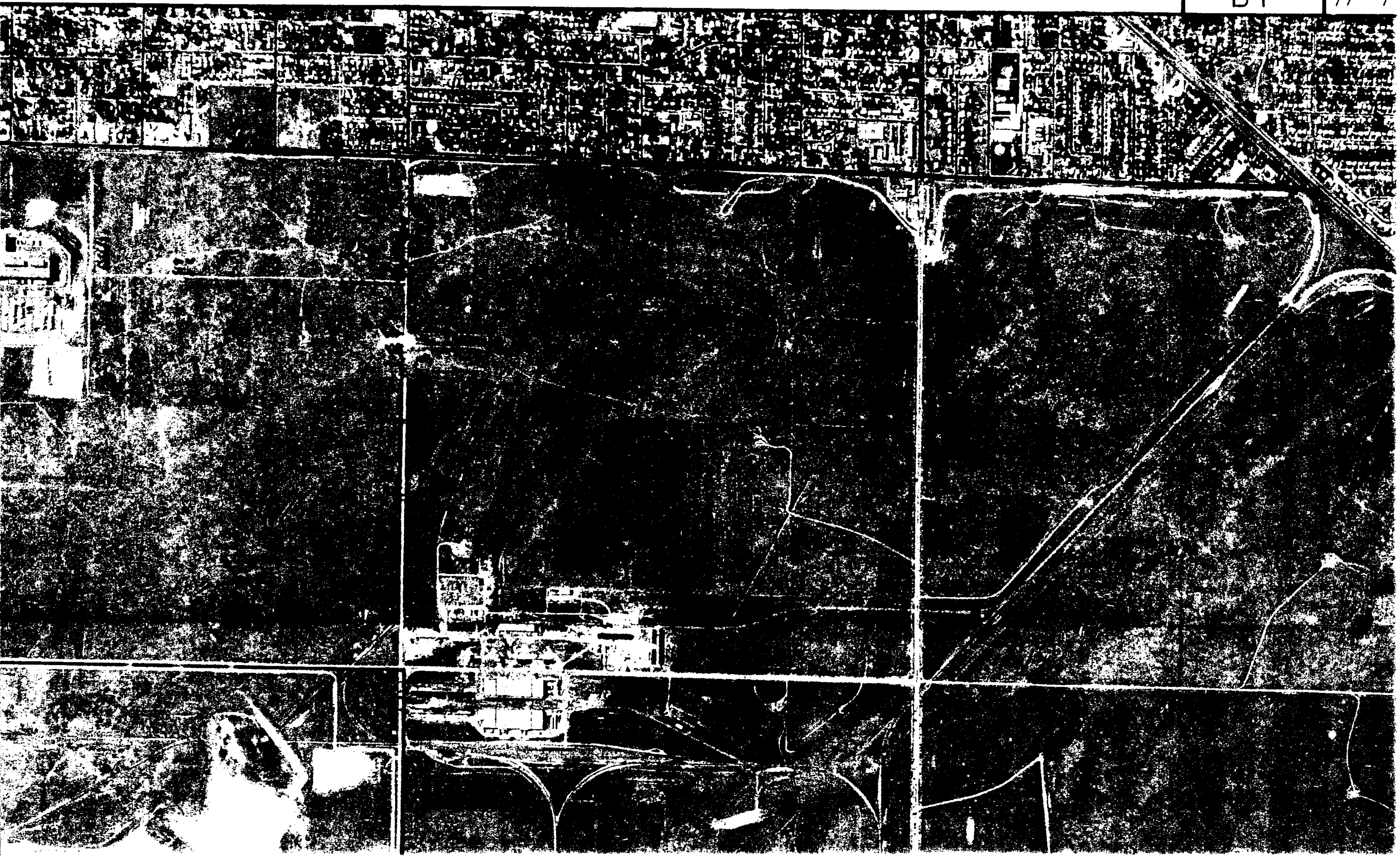


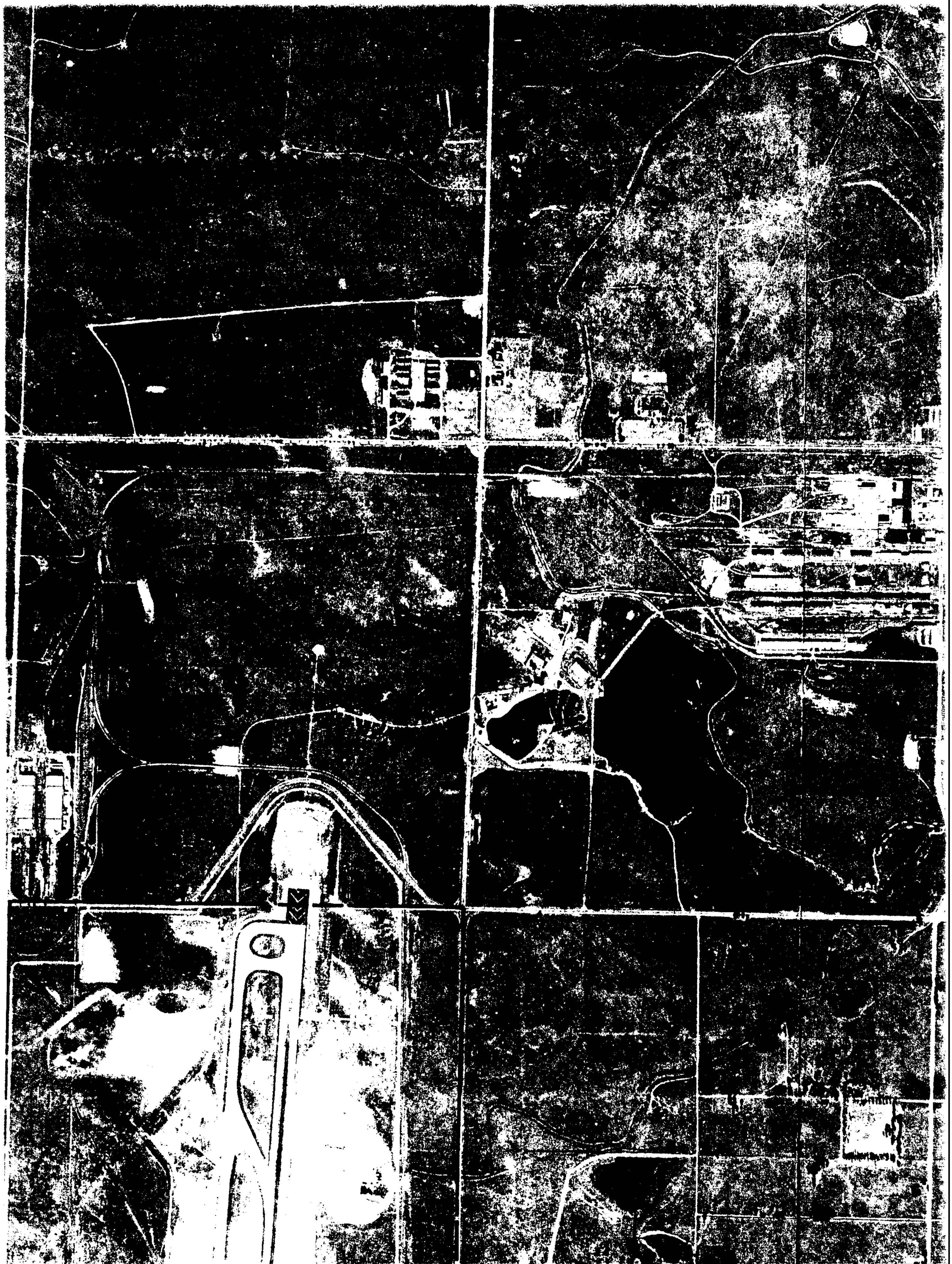
5

ROPERTY BOUNDARY

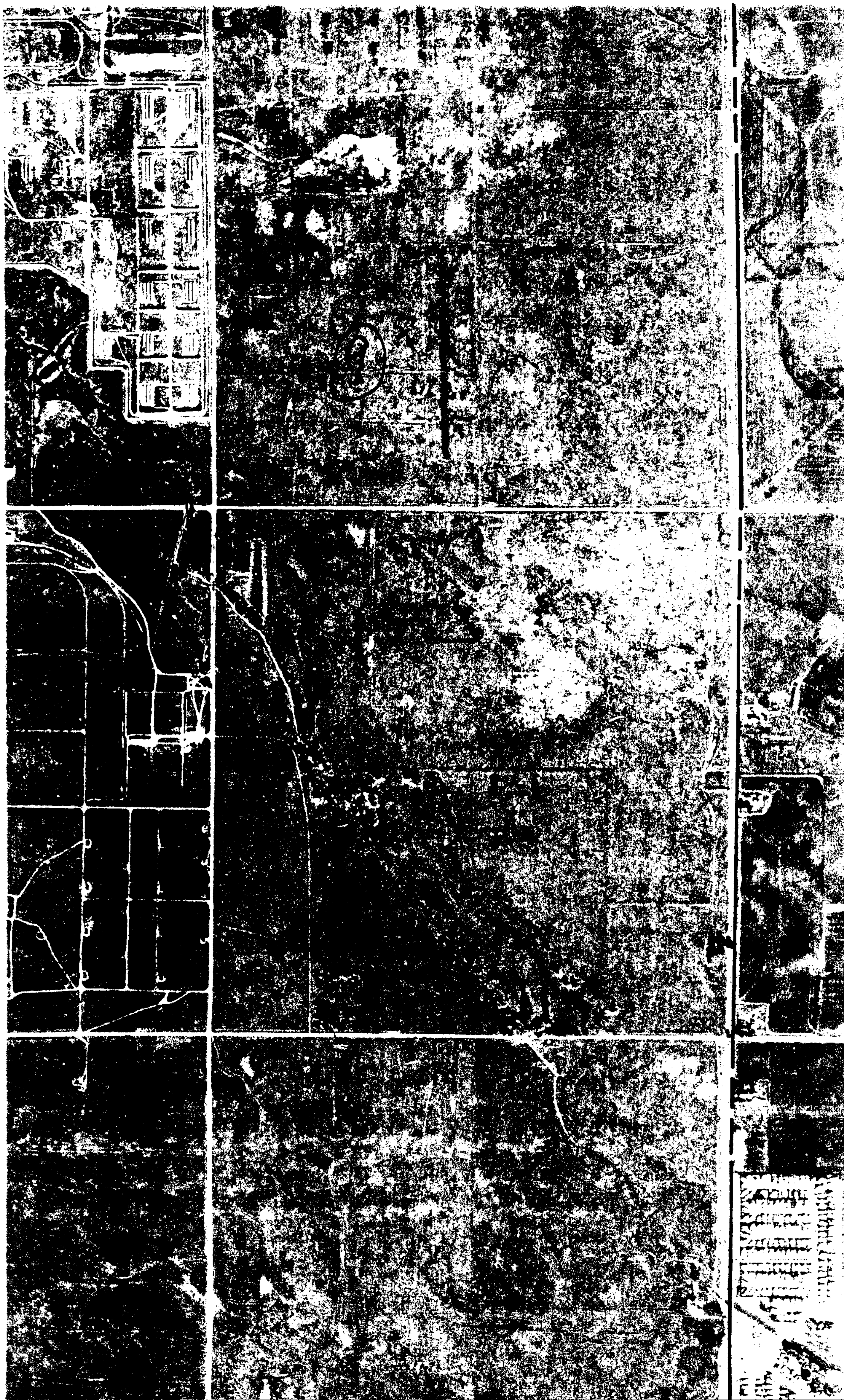
6

DRAWN BY	G.W
	11-1






8



A
RO

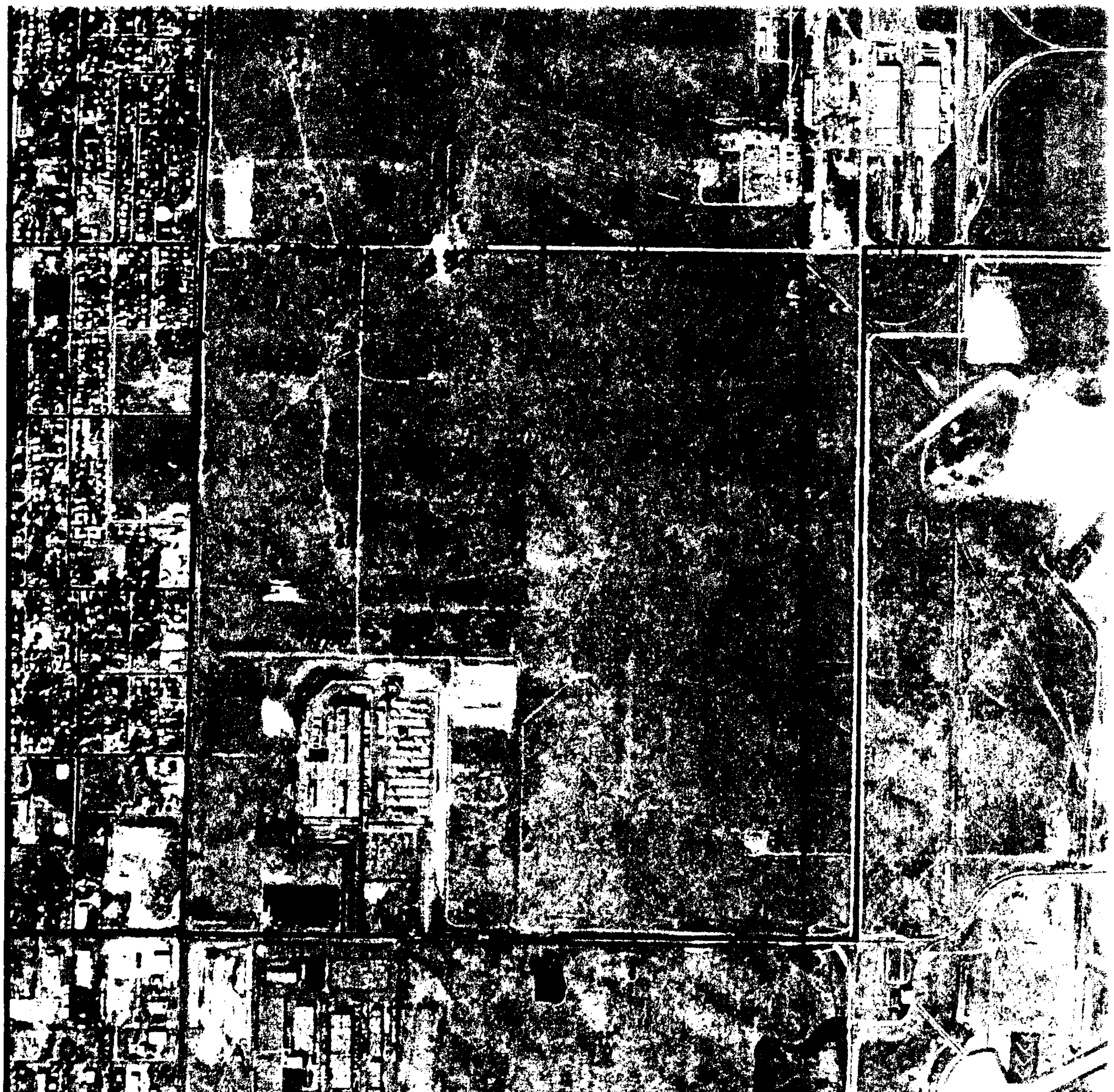
10

SCALE

FIGURE 3

AERIAL PHOTOGRAPH OF ROCKY MOUNTAIN ARSENAL

PREPARED FOR



REFERENCE: PHOTO FURNISHED BY COLORADO AERIAL PHOTO SERVICE
OCTOBER 19, 1980

11

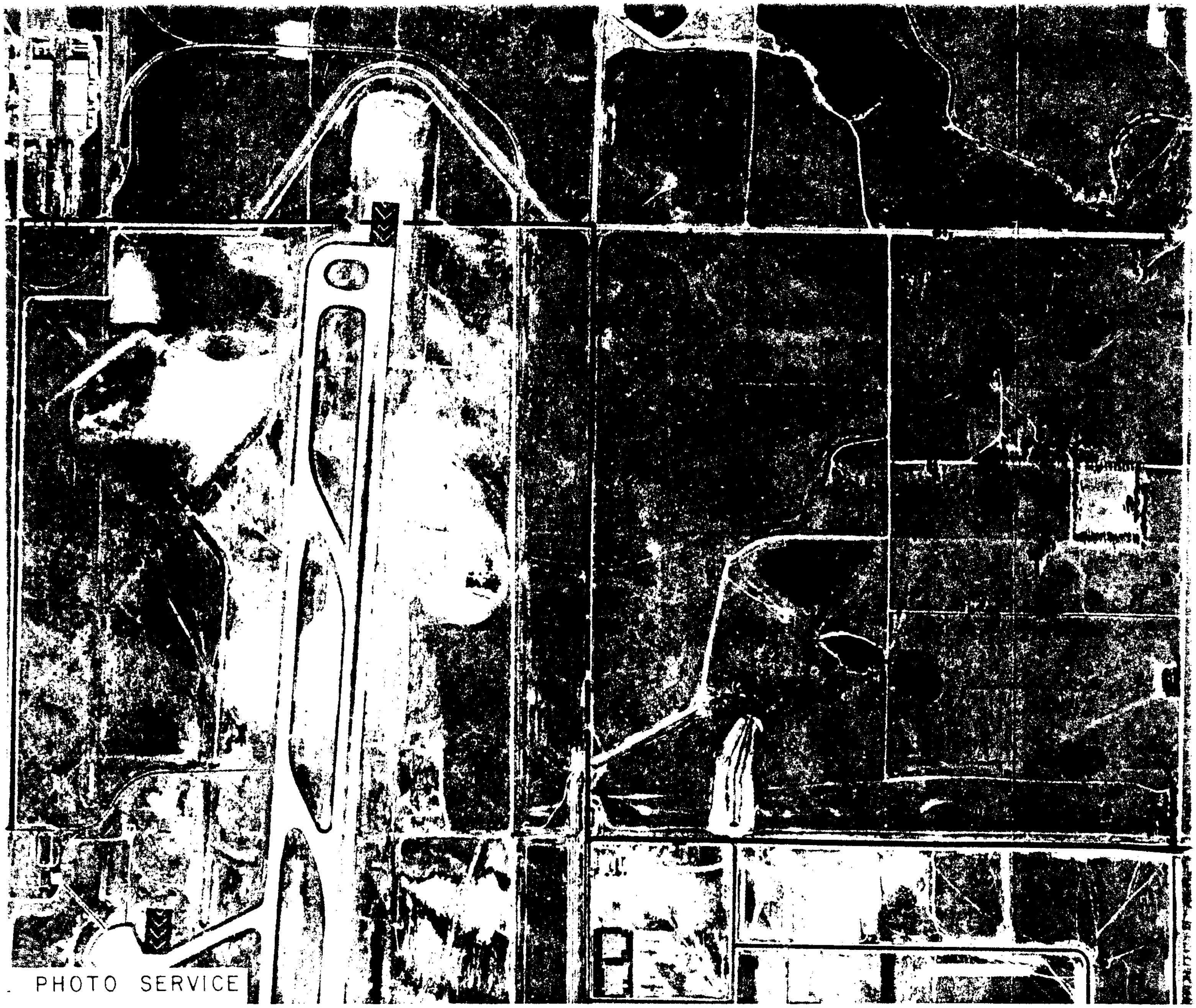
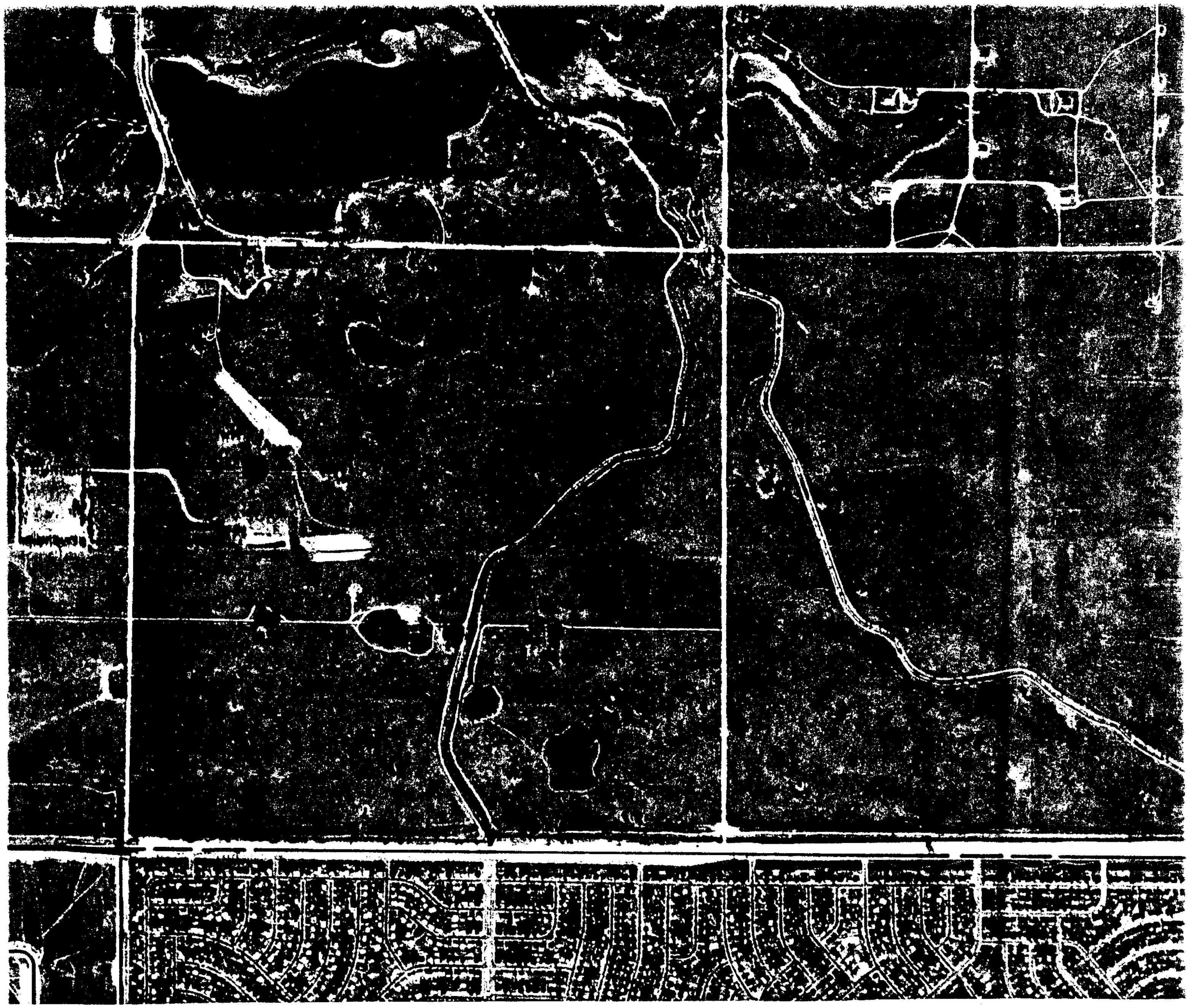
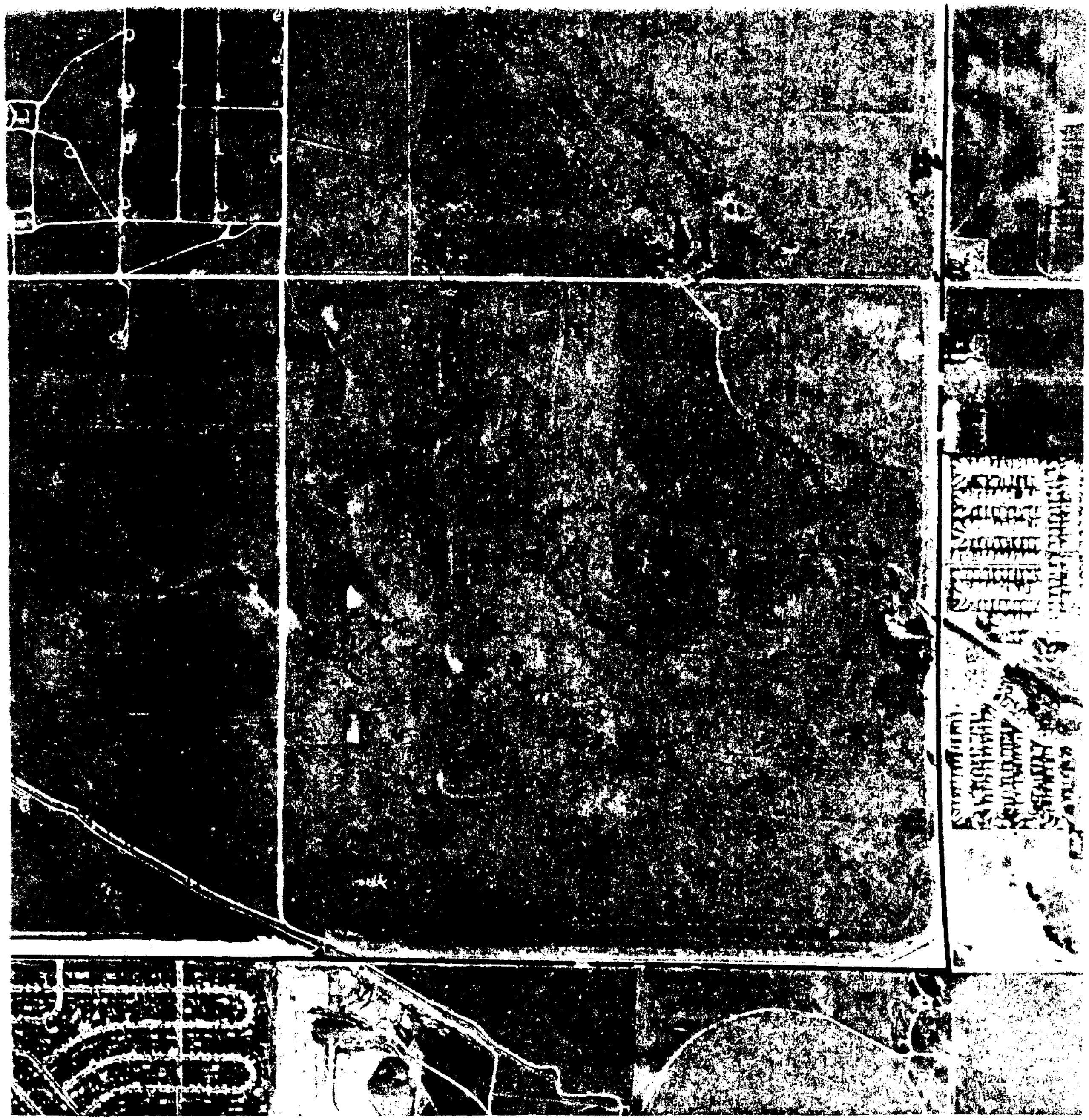


PHOTO SERVICE





REVISIONS

△ REVISED 1/19/83

A
RO

DE
R(
C(

15

FIGURE 3

AERIAL PHOTOGRAPH OF ROCKY MOUNTAIN ARSENAL

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

1

2.0 FACILITY DESCRIPTION

2.1 GENERAL DESCRIPTION

Rocky Mountain Arsenal (RMA) is located in Adams County, Colorado about 10 miles northeast of the central business district of Denver. RMA includes 17,238 acres, of which portions are occupied by inactive and active waste storage and treatment facilities. Many of the buildings at RMA are occupied by activities which are not directly involved with hazardous waste management, such as the health facility, administration, and grounds maintenance. However, in some of the buildings at RMA hazardous waste is stored in containers, treated and/or stored in tanks, or incinerated. This chapter specifically identifies those facilities included in the revised Part A and Part B applications. Currently, the facilities at RMA are involved only with hazardous waste management and not disposal.

Various areas and facilities at RMA as well as the topography are shown in Figure 2-1. Because of the large size of this installation, the general location information and the boundaries are presented on a topographic map with a scale of 1 inch = 800 feet and with five foot contour intervals. Each of the specific facilities included within this permit application, such as the North Plants Incinerator, is highlighted in Figure 2-1. For the figures of the individual facilities, a variance is sought from the scale requirement of 1 inch = 200 feet [40 CFR 122.25(a)(19)] in accordance with 40 CFR 122.25 (a)(19) NOTE. Each of the specific facilities at RMA included in this permit application is presented at 1 inch = 400 feet, showing topography with 5 foot contour intervals, drainage, and 1000 feet around the facility. Figures 2-2 through 2-8 show these individual facilities. Because of the large size and complexity of RMA, the specific facilities are highlighted in red on these figures.

2.2 HISTORICAL PERSPECTIVE

Rocky Mountain Arsenal (RMA) was established in 1942 by the Department of the Army as a defense installation for the purpose of producing toxic chemicals, and chemical-filled and incendiary munitions for the armed services. At the end of the war, the Arsenal was placed in a standby status. Following this time, portions of RMA were leased to various other federal agencies and to private industry for the production of commercial products.

RMA was reactivated as a defense installation just after the beginning of the Korean War for the purpose of producing incendiary and chemical munitions to meet supply requirements for the Army, Navy and Air Force. A major new facility was constructed during the period between 1951 and 1953 for the manufacture of nerve agent GB and related munitions. After the Korean War, RMA underwent a series of significant changes in mission assignment. These changes resulted in RMA providing the following:

- o Pilot production, preproduction and limited production runs for various munitions.
- o Testing services and technical assistance to industry in the production of various munitions.
- o Research, development and engineering activities support to the higher command levels.

During the period 1959 through 1962, RMA was assigned responsibility for the production of a biological anti-crop agent. In conjunction with the Air Force, RMA also developed, engineered and built a facility for blending rocket fuel for both the Titan Missile and Space Programs. During the period 1965 through 1969, RMA's operations were primarily in support of military requirements in southeast Asia and included the manufacture and modification of various munitions.

In the early 1970's, RMA began demilitarization programs for various munitions including chemical agents and biological anti-crop agents. Demilitarization includes neutralization or incineration of the munitions in order to render them nonlethal. These demilitarization programs are still ongoing. In addition, RMA has undertaken a contamination control program.

As previously identified, portions of RMA have been leased to various tenants. Of specific note for this permit application are the facilities under lease to the Defense Property Disposal Office (DPDO) of the Defense Logistics Agency and to the U.S. Air Force. The DPDO stores nonhazardous and hazardous materials and wastes from various military installations in the region in a small complex in the southwestern part of RMA. The RMA uses an area to the east of the South Plants for the blending of hydrazine propellant fuel for the U.S. Air Force. Both of these facilities are included in this application. With the exception of Shell Chemical Company's operations in the South Plants area, which are not covered in this application, the other tenants at RMA do not generate, manage, or dispose of hazardous wastes.

2.3 FACILITIES INCLUDED IN PART B APPLICATION

Specific facilities included within this application are as follows:

- DPDO container storage area.
- Salt and residue container storage in several areas (73 buildings).
- Hydrazine blending facility - tank treatment and storage.
- South Plants spray dryer - tank treatment.
- Laboratory wastewater facility - tank storage and treatment.
- North Plants incinerator.

These facilities are located in Figure 2-1 (scale 1" = 800') and presented in Figures 2-2 through 2-8 (scale 1" = 400'). The following sections briefly summarize each of the facilities.

2.3.1 DPDO Container Storage

The Defense Property Disposal Office (DPDO) is a tenant at RMA. DPDO receives surplus materials, including hazardous materials and hazardous wastes, from five defense facilities in the Denver area. The majority of the chemicals received are in unused, unopened containers that have commercial value and are sold. DPDO's mission is to attempt to sell all materials that it receives. The hazardous materials are regarded as raw materials or products and are thus not included in this permit application.

DPDO also receives hazardous wastes such as used solvents. DPDO also attempts to sell these wastes. Hazardous wastes, including those with free liquids, are included in the permit application. These wastes have been identified and characterized prior to acceptance by DPDO. Containers of hazardous wastes are labelled and stored in an asphalt paved storage yard (Figure 2-2). If hazardous wastes cannot be sold, DPDO contracts with a service company for treatment and disposal consistent with RCRA regulations.

2.3.2 RMA Container Storage

The various buildings identified as container storage in Figure 2-1 are used to store salts and residues (that resulted from several demilitarization programs), contaminated munitions, contaminated wheat and miscellaneous items. The containers of waste in these buildings do not contain free liquids. The specific buildings and areas include:

- Building 354 in the South Plants area (Figure 2-6).
- Warehouse Buildings 785-788, 791 and 793-798 (Figure 2-3).
- Concrete Storage Bunkers 881-886 (Figure 2-4).
- Concrete Storage Huts 871A-D, 872A-D, 873A-C, and 874A-D (Figure 2-4).
- Thirty-six Storage Sheds in 14 plots (2 or 3 sheds per plot) in the former Toxic Yard (Figure 2-3).
- Concrete Magazine Igloos 1605 and 1608-1610 (Figure 2-5).

Some of the structures listed above are empty but are included in the permit application because waste may be stored in them in the future. Brief discussions of the types of waste in the buildings are presented in the following paragraphs.

During the 1970s, major chemical demilitarization/neutralization programs undertaken by RMA included incineration of obsolete mustard agent stocks and the neutralization of bulk nerve agent GB and GB munitions. As a result of these operations, various salts and residues were generated. These wastes were placed in 55-gallon steel drums and 55- and 47-gallon fiberboard drums. The drums of mustard salts and residues are stored in Warehouse Buildings 788, 791 and 794-796. The GB salts are stored in Warehouse Buildings 786, 787, 797 and 798 and sheds in Plots 3-11, 27 and 28, The sheds in Plots 1, 2, 4 and 12 do not currently contain waste.

From the late 1970s through December 1982, the North Plants Incinerator (Figure 2-8) was used to incinerate the Chemical Agent Identification Sets (CAIS). The CAIS contained bottles or ampoules of chemical agents or simulants such as GB, mustard compounds, adamsite, lewisite, phosgene, chloropicrin, chloroform and others which were formerly used for training purposes in the military services. The CAIS program waste materials, which were generated as a result of the incineration, are stored in Warehouse Buildings 785 and 794.

The North Plants Incinerator is currently being used to incinerate DDT-contaminated ammunition. Prior to incineration, the ammunition is stored in Bunkers 881, 884 and 885. Waste generated by the incineration process is put in drums and stored in the warehouse buildings or storage sheds. Adamsite, a non-lethal crowd control chemical agent, in bulk and grenades will be incinerated following the DDT-contaminated ammunition. The adamsite is stored in Bunkers 882, 885 and 886. Bunker 883 does not currently contain hazardous waste.

Drums of phosgene salts resulting from the neutralization of waste generated during transfer operations were previously stored in Buildings 538 and 540. In early February 1983, after preparation of the revised Part A Application, the drums of phosgene salts were moved to Warehouse Building 793. Contaminated wheat, which is stored in drums in Building 354, resulted from treatment with Ceresan, a fungicide that contains mercury.

The Concrete Storage Huts (Buildings 871A-D, 872A-D, 873A-C, and 874A-D) are currently empty but may be used for storage in the future. The Concrete Magazine Igloos (Buildings 1605 and 1608-1610) are currently used to store munitions and some classified items, which are not hazardous waste. However, the igloos may also be used to store hazardous waste in the future.

2.3.3 Hydrazine Blending Waste Storage (Tank Treatment and Storage)

The hydrazine blending facility (Figure 2-7) was built in 1959 in conjunction with and for the U.S. Air Force. Hydrazine and unsymmetrical dimethylhydrazine (UDMH) are mixed to produce Aerozine 50 rocket fuel. During blending operations, a water scrubber generates the majority of wastewater which is collected in a sump and treated with calcium hypochlorite to reduce the levels of residual hydrazine and/or UDMH. Consequently, the contents of the sump are considered to be hazardous waste. The treated residue is transferred to tanks for long term storage. The sump is classified as tank treatment for hazardous waste and the associated tanks are classified as storage facilities for hazardous waste.

2.3.4 South Plants Spray Dryer (Tank Treatment)

The South Plants spray dryer (Building 540 in Figure 2-7) is included in this application as a tank treatment facility for hazardous wastes. This facility is maintained in a standby status. The South Plants spray dryer was originally constructed as part of an incinerator complex. The incinerator is not included in this application.

2.3.5 Laboratory Wastewater Treatment Facility

RMA operates testing laboratories in Buildings 313, 741 and 743 in the South Plants area. Water is collected through drains in the laboratories and conveyed to a storage tank. The water contains trace amounts of various organic compounds and thus is treated as hazardous waste. The waste flows by hydrostatic pressure head to a carbon-column treatment facility in Building 540. Treated waste is discharged to the sanitary sewer system. The tank is included in this permit application as a tank storage facility and the carbon column as a tank treatment facility.

2.3.6 North Plants Incinerator

The North Plants incinerator in Building 1611 and spray dryer in Building 1703 (Figure 2-8) are considered jointly in this permit application as an incineration complex. The incineration complex was recently used to incinerate the Chemical Agent Identification Sets (CAIS). This process was completed in December 1982. In January 1983, following cleanup and modification, RMA began an incineration program for DDT-contaminated ammunition. An incineration program for adamsite (DM) bulk and grenades is planned to start in July 1983.

2.4 FACILITIES NOT INCLUDED IN PART B APPLICATION

Shell Chemical Company leases and operates the majority of the South Plants area (Figure 2-1). Shell's facilities are not included in this permit application.

Basin F (Figure 2-1) was an operating surface impoundment on May 19, 1980 and was included in both the original and revised Part A Permit Applications. Since 1980, the Army has halted operations associated with that basin and is planning to close it by 1986 or 1987. Investigations are currently in progress to determine the most effective means of closure. Consequently, Basin F is not included in the Part B Permit Application. A closure plan for Basin F will be submitted separately to EPA in April 1983.

In addition, a number of sites at RMA were not in operation on May 19, 1980 and thus are not subject to RCRA regulations. Brief descriptions of these sites follow. Basin A (Figure 2-1) was not in operation on May 19, 1980 and has not been operated since.

The deep injection well (Figure 2-1) was not in operation on or since May 19, 1980 and therefore, is not subject to RCRA regulations.

The Lower Lakes are proposed for future cleanup. A lake bottom sediment removal project has been proposed. As part of the planning for that future program, RMA has tested the sediments that will be removed from the lake bottom. These sediments passed the EP toxicity tests and are not subject to RCRA regulations.

An on-site hazardous waste landfill is planned at RMA. This proposed facility is an integral part of several of the closure plans in this application. Detailed information on this proposed landfill is being developed and will be provided in a future permit application to EPA for that facility.

2.5 REGIONAL CONSIDERATIONS

2.5.1 Location and Land Use

Boundaries of RMA are indicated in Figure 2-1. Stapleton International Airport, various business and warehouse districts including some city office buildings, and the residential subdivision of Montbello occupy the area adjacent to the southern boundary of RMA. The residential areas of Commerce City, DuPont and Irondale adjoin the western edge of RMA. Agricultural land with scattered residences is adjacent to RMA on the northwestern, northern and eastern boundaries. One residential trailer park subdivision also adjoins the eastern boundary. Land use within RMA is evident in Figure 3 (aerial photo) within the Part A Application and in Figure 2-1. In addition to the various facilities identified in Figure 2-1, a considerable area of RMA is unoccupied by specific facilities. Natural and altered grassland vegetation with some shrubs and trees occupies these areas.

2.5.2 Wind Speed and Direction

Figure 2-9 presents an annual wind rose showing the occurrences of wind speed and direction for the ten year period 1963 through 1972 at Stapleton International Airport. Stapleton Airport is located adjacent to the southern boundary of Rocky Mountain Arsenal. This monitoring location is operated by the National Weather Service. The data on annual occurrences of wind speed and direction are representative of the conditions at RMA.

As shown in Figure 2-9, the major wind component (36.1 percent of the occurrences) is from the south through south-southwest direction. In addition, there are three secondary components including (1) a north through north-northeast component which accounts for 16.9 percent of occurrences; (2) a west-northwest component, 8.3 percent of occurrences; and (3) an east-southeast component, 8.0 percent of occurrences. The occurrence of calms in the region is seven percent of the time.

The predominant south through south-southwest component is primarily associated with the nocturnal, south to north pressure/temperature gradient. This gradient is frequently established along the Front Range in late afternoon when the higher temperatures to the south begin to interact with lower temperatures to the north. In addition, cold air drainage from the mountain valleys contributes to this southerly component because the cold air is channeled down the Platte River Valley.

A portion of the occurrences from the north through north-northeast are associated with the late morning gradient which forms when the eastern facing mountain slopes warm more rapidly than the flat terrain to the east. This rising air over the mountains causes a pressure void resulting in air movement up the Platte River Valley (from north to south). Also contributing to this north through north-northeast component is the passage of cold air fronts from Canada.

The west-northwest occurrences are typically associated with the tracking of Pacific low pressure across the continent. After the low pressure has passed through the Denver area, the east-southeast component is established. This wind direction often causes an "upslope condition" which results in precipitation to the area.

The high occurrence of calms is a result of the topographic barriers that exist in the Denver area. Cold, shallow air masses and cold air drainage from the mountain valleys move down from the north to the Denver area and stagnate in the topographic basin formed by the higher terrain which exists to the west, south and east of Denver.

2.5.3 Seismic Considerations

Consistent with criteria presented in 40 CFR 122.25(11)(i) and 40 CFR 264.18, RMA is an existing facility and thus seismic design standards are not applicable.

2.5.4 Floodplain Considerations

The Omaha district of the U.S. Army Corps of Engineers provided a determination of the 100-year floodplain for First Creek for both existing and future urbanized conditions. Studies were also conducted on other drainages at RMA, but First Creek is the only one that has the potential to effect the facilities included in this permit application. The following sections provide (1) descriptions of the methodology, (2) results of the floodplain determination provided by the Corps, and (3) an evaluation of the potential effects on the storage buildings within the floodplain.

Methodology

The Corps used well established hydrologic and hydraulic techniques to determine the 100-year floodplain. Specifically, the peak discharges used in the flood routing program were determined from rainfall-runoff relationships calculated with the EPA's Stormwater Management Model. The model was calibrated with data obtained from the particularly intense storm of May 5 and 6,

1973. The model results were also compared with regional studies and calibrated accordingly. Following the determination of peak discharge with existing conditions, the model was used to predict the peak discharge from future urbanized conditions. This approach assumed that the basin upstream from RMA would become 40 percent impervious.

The Corps used their HEC-2 computer program to calculate the water surface profile of First Creek during the 100-year flood. This program was developed for use in preparing floodplain maps for the National Flood Insurance Program which is administered by the Federal Insurance Administration.

The HEC-2 program applies Bernoulli's equation for the total energy of the river at each cross section and Manning's equation for the friction head loss between cross sections. The average slope for a reach between two cross sections is determined in terms of the average of the conveyance at the two ends of the reach. This method takes into account backwater effects caused by channel restrictions or obstructions.

The information needed to use this program includes:

- o Cross sections at representative locations throughout the river reach.
- o Representative roughness coefficients (Manning's 'n') for the channel and overbank areas.
- o The discharge of the river in cubic feet per second (cfs).
- o Distance between cross sections in feet.

To obtain the floodplain location information, the Corps of Engineers prepared a total of 95 cross sections along First Creek. The horizontal distances and elevations along these cross sections as well as the distance between cross sections were determined from the topographic map and entered into the program. The roughness coefficients were determined by Corps of Engineers personnel from on-site surveys.

Results

The 100-year peak discharge for First Creek in the vicinity of the storage warehouses and huts was calculated to be 3900 cfs for existing conditions and 9200 cfs for future urbanized conditions. Using this information, the HEC-2 program provided the depths of the floodflow, the computed water surface elevation, the total flow, and a breakdown of the flow and its velocities into the channel and overbank areas for each cross section. It also provided the width of the computed water surface at each cross section. These limits along with the topographic features and channel characteristics of the area provide the basis for delineating the floodplain boundary.

Figures 2-10 and 2-11 identify the estimated 100-year floodplain in the area of interest. Review of these figures shows that several warehouse buildings along December 7th Avenue and one storage hut are within the 100-year floodplain. The section of the floodplain that encompasses of the storage warehouses occurs because of the impounding effect that December 7th Avenue has on the stream valley. However, the flood waters in these areas would be shallow and possess low current velocities.

Effects

Although Warehouse Buildings 786, 787, 788, 791, and 793 (Figure 2-10) and Concrete Storage Hut 871B (Figure 2-11) are within the 100-year floodplain, the floor elevations of most of the buildings are sufficiently high to keep water from entering the buildings. Table 2.1 provides the floor elevations of the buildings and the water surface elevations of the 100-year flood at the building locations. Building 788 is the only building into which water would enter. The depth of water associated with the 100-year flood at Building 788 would be, at most, about 0.12 feet (1.44 inches) higher than the floor elevation. Because the building is located in a shallow backwater area, the velocity of the water (thus the hydrodynamic forces) will be low.

Based on a recent survey (Section 4.2.2), the drums in Building 788 are steel and are stored placed on pallets. Their composition and distance above the building floor (because of the pallets) should keep them out of contact with flood waters if the 100-year flood occurred. Therefore no problems are expected from the 100-year flood.

2.6 ACCESS CONTROL AND TRAFFIC PATTERNS

RMA is surrounded by a 4-stand barbed wire fence. Access is via two gates with continuously-manned guard houses (open 24 hours a day). The South Gate is open only to personnel working at RMA or with long-term passes. The West Gate is open to the same personnel as the South Gate but is also open to visitors, who must register and obtain security passes. Roads are indicated in Figure 2-1. Roads from these two gates as well as other main interior roads are typically two-way asphalt-surfaced (indicated by solid lines in Figure 2-1). Other two-way roads with gravel surfaces follow section lines within RMA and lead to various facilities (indicated by dashed lines in Figure 2-1). About 70 total miles of roads are present, 20 of which are paved.

No specific information is available on load-bearing capacity. However, the majority of the roads at RMA were designed and built using the engineering and construction practices of the time. These roads are adequate for existing uses and needs at RMA. In those cases where a particular operation may require a more competent road design (as was the case with North Boundary Containment system construction), it is typically accommodated as a part of that operation.

A rail line, which is not currently maintained, connects to Shell's South Plant facilities. The line also has a spur to the hydrazine blending facilities. However, hydrazine and UDMH are usually delivered to RMA by tanker trucks. In addition, the aerozine fuel product is also transported by truck.

Traffic on RMA is controlled by stop signs. No operating traffic lights are present on RMA except for flashing traffic lights in the vicinity of the administration building and fire station.

Traffic volumes at RMA are relatively low compared to times when the facilities were at peak employment. Currently, about 350 people are employed by RMA. Shell phased out their operations at RMA during 1982 and their work force currently is three persons. During an average business day at RMA, about 250 cars and trucks pass through the West Gate and 150-200 through the South Gate. Vehicles are primarily cars, vans and pick-up trucks with few large trucks. The majority of the traffic consists of employees driving to work.

Movement of vehicles containing waste within the arsenal is limited. Most of this traffic is between the container storage areas and the North Plants incinerator on restricted access roads. As discussed in Section 6.2 the eastern part of RMA is classified and patrolled as controlled access. Privately owned vehicles are not allowed in this area.

3.0 WASTE CHARACTERISTICS

3.1 INTRODUCTION

This chapter addresses the chemical and physical characteristics of the waste and the waste analysis plans for each of the facilities included in the RCRA Part B Application. The chapter is organized by type of facility: containers, tanks and incinerator. Records of the waste analyses are maintained at RMA.

3.2 CONTAINERS

Two basic facilities at RMA store wastes in containers. These include (1) the Defense Property Disposal Office (DPDO) which stores relatively small amounts of hazardous waste in steel 55 gallon drums, and (2) storage buildings located throughout the Arsenal which house a large number of salt, residue, and waste containers. The salts and residues are by-products of several demilitarization/neutralization programs performed at RMA. Waste includes items which will be incinerated. Discussions of each follow.

3.2.1 Defense Property Disposal Office (DPDO)

The DPDO at RMA receives surplus materials including hazardous waste from RMA, Lowry Air Force Base, Fitzsimons Army Medical Center, Buckley Air National Guard Base and Camp George West National Guard Base. These facilities are the generators of the waste. DPDO acts as an intermediary storage facility for the waste while trying to sell it. If the waste cannot be sold, DPDO contracts with a service company to have the waste removed. The contracted company is responsible for transporting and disposing the waste in conformance with RCRA standards.

For hazardous materials and wastes, DPDO has specific "Turn-In Requirements." These requirements comprise the waste analysis plan for all DPDO's across the country.

Chemical and Physical Properties

The hazardous waste currently in storage at the DPDO is listed in Table 3.1. DPDO is in the process of contracting with a service company to have these wastes removed.

Waste Analysis Plan (Turn-In Requirements)

DPDO requires that the information discussed below be provided by the generator before it will accept any waste. The material or waste must be identified by a DPDO computer-listed stock number or by a nonlisted stock number. The amount and type of contaminant must be identified. Except for wastes containing PCBs, laboratory analyses are not required. However, adequate information must be provided to permit valid identification of the material and any contaminant being turned in. This information is required to preclude more costly identification measures and provide for environmentally acceptable disposal of hazardous waste. Because of the small quantities of waste accepted and the lack of facilities, DPDO does not conduct any analyses on the waste.

Eight categories of property are not accepted by DPDO. These categories include:

- Toxicological, biological, radiological and lethal chemical warfare materials.
- Materials which cannot be disposed of in present form due to military regulations, such as consecrated religious items or cryptographic material.
- Municipal type garbage, trash, and refuse resulting from residential, institutional, commercial, agricultural, and community activities.
- Contractor-generated materials which are the contractor's responsibility for disposal.
- Sludges resulting from municipal type wastewater treatment facilities.
- Sludges and residues generated as a result of industrial plant processes or operations.

- o Refuse and other discarded materials which result from mining, dredging, construction and demolition operations.
- o Unique wastes and residues of a nonrecurring nature generated by research and development programs.

3.2.2 RMA Container Storage

Seventy-three buildings at RMA are used for the container storage of various salts and stable residues. The salts and residues were produced during the demilitarization and neutralization programs conducted on various chemical agents and munitions. Chemical agents and munitions scheduled for incineration are also stored. The storage buildings include Warehouse Buildings 354, 785-788, 791, 793-798; Bunkers 881-886; Concrete Storage Huts 871A-D, 872A-D, 873A-C, 874A-D; Concrete Magazine Igloos 1605 and 1608-1610; and 36 Storage Sheds in 14 plots. The buildings are located in Figure 2-1 and shown in Figures 2-2 through 2-6. Discussions concerning the types and amounts of waste in each building are presented in Section 4.2.2.

Most of the salts and residue wastes resulted from the incineration of mustard stocks and from the neutralization of GB bulk and munitions. Other stored waste includes salts and residues resulting from incineration of Chemical Agent Identification Sets (CAIS) and produced during phosgene transfer operations. In addition, containers of contaminated wheat which resulted from treatment with the fungicide Ceresan are in storage. DDT-contaminated ammunition and adamsite in bulk and grenades, which will be incinerated, are also stored.

Specific chemical and physical properties for mustard, GB, phosgene and contaminated wheat are discussed below. The chemical and physical properties of the residues associated with the incineration or neutralization of these chemicals are also included along with their waste analysis plans. Properties of DDT-contaminated ammunition, adamsite and CAIS components are described under Section 3.4, North Plants Incinerator. The chemical and physical properties of the various agents were summarized from Chapter 3, "Specific Chemical Agents and Their Properties" of the U.S. Army's and U.S. Air Force's publication TM3-215 and AFM355-7 (U.S. Army and U.S. Air Force, 1963). Chapters 2 and 3 are included as Appendix 3A.

3.2.2.1 Mustard Residue and Salts

Chemical and Physical Properties

Disposal of obsolete mustard agent stocks was the first major chemical demilitarization/neutralization program at RMA. The program began in August 1972 and was completed in March 1974. Containers of Levinstein mustard and distilled mustard agent were incinerated in the South Plants incinerator. Chemical and physical properties of distilled mustard (H) prior to incineration are as follows (U.S. Army and U.S. Air Force, 1963, and Windholz, 1976):

Chemical name	2,2' dichlorodiethyl sulfide
Chemical formula	$(ClCH_2CH_2)_2S$
Molecular weight	159.08
Melting point (°C)	14.4
Boiling point (°C @ 1 atm.)	228
Flash point (°C)	105
Vapor pressure (mm Hg @20°C)	0.072
Heat of vaporization (kcal/mole)	15.0
Viscosity (poises @ 20°C)	0.046
Liquid density (g/cm^3 @ 20°C)	1.27
Specific heat, liquid (cal/g°C)	0.330
Merck Index No.(9th ed., 1976)	6142

Levinstein mustard (mustard produced by the Levinstein process) has properties essentially the same as distilled mustard except that it contains about 30 percent sulfur impurities.

During the mustard incineration process, the following types of solid waste were produced:

- o Residues from the deactivation and decontamination furnaces. These include metal parts from scrapped and sectioned ton containers and residues from the interior of containers.

- o Spray dried residues from the quench exhaust and scrubber solutions.
- o Residues from the electrostatic precipitator.

The quench solution resulted from the quench of the furnace exhaust with sodium hydroxide and sodium carbonate solution. The scrubber brines were produced during scrubbing of the exhaust gases with sodium hydroxide and sodium carbonate solution. These solutions were then processed in the spray dryer to remove the water and produce a dry salt. The physical and chemical characteristics of the salts produced from the quench and scrubber are very similar. Therefore, both products from the spray dryer are called mustard spray dried salts. The vast majority of the mustard wastes were produced from the spray dryer. Minor amounts of residue were produced from the furnace and electrostatic precipitator. In all, the salts and residues produced during demilitarization of the mustard comprise about 35 percent of the total waste materials stored in containers at RMA. A total of 25,513 drums are in storage.

Typically, the composition of the spray dried salts from the scrubber are as follows (Ursillo, et al., 1975):

COMPOUND	FORMULA	PERCENT
Sodium Chloride	$NaCl$	44.3
Sodium Sulfite	Na_2SO_3	23.6
Sodium Bicarbonate	$NaHCO_3$	5.9
Sodium Sulfate	Na_2SO_4	15.7
Sodium Carbonate	Na_2CO_3	11.9
Iron (III) Oxide	Fe_2O_3	0.2

ELEMENT	ppm (mg/kg)
Mercury	1.03
Cadmium	1.60
Copper	5.30
Zinc	3.50
Lead	<5
Chromium	<25
Manganese	<0.03

ELEMENT	ppm (mg/kg)
Silver	<2.5
Molybdenum	<0.1
Potassium	0.7
Soluble iron	147
Insoluble iron	2315

The Environmental Engineering Division (EED) of the Environmental Laboratory at the U.S. Army Engineers, Waterways Experiment Station conducted EP toxicity tests on the stored mustard salts (as well as other salts) in 1980. Samples were collected using a hollow tube in accordance with EPA guidelines from randomly selected storage drums. Samples were subjected in duplicate to EP toxicity and corrosivity tests. Toxicity testing procedures were conducted in accordance with 40 CFR § 261, Appendix II and metal and organic analytical procedures in accordance with 40 CFR § 261, Appendix III. The results of the testing are shown on Table 3.2. These data indicate that the mustard salts are not toxic or corrosive. However, because of the potential variability among these salts, the limited sampling and the fact that they resulted from demilitarization of a toxic chemical agent, they are treated as hazardous waste at RMA. In the Part A Application (Chapter 1.0), the mustard salts and residues were listed as EPA Hazardous Waste No. X003 because they do not fit the listed classification numbers.

Waste Analysis Plan

Currently, no further testing of the stored mustard salts is planned. However, prior to their final disposal, the following waste analysis plan will be implemented to confirm previous analyses:

- Sampling Methods - Barrels will be selected at regular intervals and sampled with a hollow tube (similar to a grain sampler). All sampling and handling procedures will be in accordance with Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846).

- Parameters and Test Methods - EP toxicity and corrosivity tests will be performed. These tests will be conducted in accordance with 40 CFR § 261, Appendices II and III. The overall composition of the salts (percentages of NaCl, Na_2SO_3, $NaSO_4$, etc.) will be determined by standard methods (40 CFR § 136). The samples will also be tested for free liquids as required by 40 CFR 122.25(b)(1)(ii) in accordance with procedures documented in 46 Fed. Reg. 8311, February 25, 1982.

- Frequency - Sampling will be conducted only once prior to final disposal. Because of the high costs of analyzing a representative number of samples, only a limited number of samples will be analyzed. Preliminary estimates are that approximately 50 samples (one every 500 barrels) will be analyzed. The exact number of analyses will depend upon final disposal location and method, and the uniformity of test results.

3.2.2.2 GB Salts

From 1973 to 1976, RMA was responsible for the demilitarization of M34 cluster bombs containing the nerve agent GB (sarin) and tetryl explosives. Additional GB, which was contained in large underground tanks, ton containers, and Honest John warheads was also chemically neutralized. The Weteye bombs, which also contained GB, were transferred to Utah in 1981. The waste materials currently in storage resulted from detoxification/neutralization of GB with sodium hydroxide (caustic) solution plus washdown and decontamination operations associated with the separation of the agent from the munitions. The resulting solutions were sprayed dried in the North Plants spray dryer to remove the water. The resulting salts were drummed and stored. About 58 percent of the wastes stored in containers at RMA are GB salts (see Section 4.2.2). A total of 42,797 drums are in storage.

Chemical and Physical Properties

GB chemical and physical properties (prior to neutralization) are as follows (U.S. Army and U.S. Air Force, 1963, and Windholz, 1976):

Chemical name	Methylisopropoxyfluorophosphine oxide
Chemical formula	$CH_3P(O)(F)C_3H_7$
Molecular weight	140.10
Boiling point (°C @ 1 atm.)	147

Freezing point (°C)	-56
Flash point	Nonflammable
Vapor pressure (mm Hg @ 25°C)	2.2
Heat of vaporization (kcal/mole)	11.9
Liquid density (g/cm^3 @ 25°)	1.0887
Merck Index No.(9th ed., 1976)	8127

Detoxification of GB occurs according to the following reaction (Rinehart et al., 1977):

$$\underset{\text{(GB)}}{CH_3P(O)(F)OC_3H_7} + 2NaOH \rightarrow NaF + H_2O + \underset{\text{(SIMP)}}{CH_3P(O)(ONa)OC_3H_7}$$

The resulting brine consists of sodium isopropylmethylphosphonate (SIMP), sodium fluoride (NaF), sodium carbonate (Na_2CO_3), sodium hydroxide (NaOH) and water. The sodium carbonate results from the reaction of sodium hydroxide and the carbon dioxide in the atmosphere. Na_2MP may also result. The brine solution is dewatered in the spray dryer, which results in a fine powder composed of SIMP, NaF, NaOH, Na_2CO_3 and possibly Na_2MP.

Typically, the chemical composition of the resulting salts is as follows (Davis et al., 1977):

COMPONENT	FORMULA	PERCENT
Sodium Carbonate	Na_2CO_3	8.3-34.4
Sodium Hydroxide	NaOH	0-7.2
Sodium Fluoride	NaF	11.7-25.5
SIMP	$CH_3P(O)(ONa)OC_3H_7$	32.5-59.6
Na_2MP	$CH_3P(O)(ONa)_2$	0-32.0

ELEMENT	ppm(mg/kg)
Mercury	<0.1
Cadmium	1.25
Copper	13.20
Zinc	145
Lead	<0.5
Chromium	<1
Manganese	1.90
Silver	1
Molybdenum	<50

The exact composition of the salts varies depending upon the feed rates and operating conditions. Detailed analyses are presented in Table 3.3. The GB salts were also tested by the Analytical Laboratory Group, Waterways Experiment Station for EP toxicity in accordance with 40 CFR §261, Appendices II and III. The results are provided in Table 3.4 and indicate that the GB salts passed the EP toxicity tests. However, the salts are currently treated as a hazardous waste by RMA due to their organic components (SIMP and Na_2MP) and because they resulted from demilitarization of a lethal chemical agent. The GB salts were listed as EPA Hazardous Waste No. X003 in the Part A Application (Chapter 1.0) because they do not fit the listed classification numbers.

Waste Analyses Plan

No further testing of the GB salts is currently planned. However, as part of final disposal, some additional analyses will be performed. These analyses will be performed in accordance with the following procedures:

- Sampling Methods - Sampling will be performed with a hollow tube similar to a grain sampler. All sampling and handling (transportation, chain of custody, health and safety considerations etc.) procedures will be in accordance with Test Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846).
- Parameter and Test Methods - The toxicity and corrosivity of the samples should be documented. Therefore, EP toxicity and corrosivity tests will be performed in accordance with 40 CFR § 261, Appendices II and III. The extract will also be analyzed for selected organic components known to exist in the salts (i.e. isopropylmethylphosphonate and methylphosphonate). The overall composition of the salts (percentages of Na_2CO_3, NaF, etc.) will be determined by standard methods (40 CFR § 136). The samples will also be tested for free liquids (46 Fed. Reg. 8311, February 25, 1982).
- Frequency - The sampling will occur only once prior to final disposal. Because of the high costs of analyzing a representative number of samples, only a limited number of waste samples will be analyzed.

Preliminary estimates are that approximately 85 samples (1 drum in every 500) will be analyzed. The exact number of analyses will depend on the final disposal method and location, and the uniformity of test results.

3.2.2.3 Phosgene (CG) Salts

Phosgene gas was transferred from storage containers at RMA into DOT-approved containers for shipment off-site. During transfer of phosgene, which ended in January 1981, the off-gases were neutralized with a caustic solution. The associated wastewater stream was dried in the South Plants spray dryer. The salts that resulted were placed in containers and stored. Overall, these salts represent about two percent of the hazardous waste material stored in containers at RMA.

Physical and Chemical Properties

Properties of phosgene prior to neutralization follow (U.S. Army and U.S. Air Force, 1963 and Windholz, 1976):

Chemical name	carbonyl chloride
Formula	$COCl_2$
Molecular weight	98.92
Vapor density (compared to air)	3.4
Freezing point (°C)	-128
Boiling point (°C @ 1 atm.)	7
Vapor pressure (mm Hg @ 20°)	1,173
Flash point	None
Decomposition temperature (°C)	800
Heat of vaporization (kcal/mole	5.9
Merck Index No.(9th ed., 1976)	7146

Currently, little information exists concerning the physical and chemical properties of the spray dried salts. However, based on the chemistry of phosgene, the salts are believed to be predominantly composed of sodium carbonates and chlorides.

EP toxicity and corrosivity tests have been conducted on samples of phosgene salts in accordance with 40 CFR § 261. These results are presented in Table

3.2. The phosgene salts are not corrosive, however, they are toxic due to large concentrations of lead and thus are handled as hazardous waste. Because of the lead, they were listed as EPA Hazardous Waste No. D008 in the Part A Application (Chapter 1.0).

Waste Analysis Plan

No further analyses of the phosgene salts are currently planned. However, as part of the final disposal analyses will be performed. These analyses will be performed in accordance with the following procedures:

- Sampling Methods - Sampling will be performed with a hollow tube similar to a grain sampler. All sampling and handling procedures will be performed in accordance with Test Methods for Evaluating Solid Wastes, (U.S. EPA, 1982, Report No. SW-846).

- Parameters and Test Methods - Based on previous analyses, the toxicity and corrosivity of the samples will be tested. Corrosivity and EP toxicity tests will be conducted in accordance with 40 CRF § 261, Appendices II and III. The samples will also be tested for free liquids (46 Fed. Reg. 8311, February 25, 1982).

- Frequency - The salts will be sampled only once before final disposal. Due to the high costs of analyzing a truly representative number of samples, only a limited number of samples will be analyzed. Preliminary estimates are that approximately 10 samples (1 drum in every 150) will be analyzed. The exact number of analyses will depend on the final disposal location and method, and the uniformity of test results.

3.2.2.4 Chemical Agent Identification Sets (CAIS) Salts and Residues

Waste products from the incineration of the CAIS are also stored at RMA. These wastes consist of spray dried salts, furnace residue, solid quench residue and electrostatic precipitator residue. About four percent of the waste stored at RMA resulted from incineration of the CAIS. The incineration of the CAIS was recently completed in December 1982. Therefore, the chemical characteristics of the waste are described more fully in Section 3.4, North Plants Incinerator.

3.2.2.5 Contaminated Wheat

In addition to the salts and residues produced from the demilitarization/neutralization of chemical agents, "mercury-contaminated" wheat is stored at RMA in Building 354 in the South Plants area (see Figures 2-1 and 2-6). Wheat was formerly grown at RMA to test the effect of rust spores (TX agent). Approximately 84,000 pounds (stored in 257 steel and fiber drums) of wheat were treated with Ceresan to disinfect the seeds and protect against soil-borne plant diseases.

Chemical and Physical Properties

Some of the chemical properties of Ceresan follow (Windholz, 1976):

Chemical name	ethylmercuric chloride
Chemical formula	C_2H_5ClHg
Molecular weight	265.13
Melting point (°C)	192
Boiling point	Sublimes at 40°C
Solid density (g/cm^3)	3.48
Merck Index No.(9th ed., 1976)	3764

Ceresan is typically applied at two percent strength in a solution or mixed with solids.

The wheat has been tested for EP toxicity by the Analytical Laboratory Group, Waterways Experiment Station in accordance with 40 CFR § 261 and the results are provided in Table 3.4. The data indicate that the wheat passed the EP toxicity tests. However, due to the potential of mercury contamination, the wheat is treated as hazardous by RMA. The wheat was listed as EPA Hazardous Waste No. D009 because of the potential mercury contamination.

Waste Analysis Plan

No further analyses are planned. However, as part of the final disposal in the landfill, further analyses will be performed. The following procedure will be implemented:

- Sampling Methods - Barrels will be sampled with a hollow tube (similar to a grain sampler). All sampling and handling procedures will be in accordance with Test Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846).

- Parameters to be Analyzed - The wheat will be analyzed by the EP toxicity test as documented in 40 CFR § 261, Appendices II and III. The waste will also be tested for free liquids (46 Fed. Reg. 8311, February 25, 1982).

- Frequency - Sampling will occur only once before disposal. Because of the suspected homogeneous nature of the waste and high cost of analyzing a representative number of samples, only 5 samples (1 drum in every 50) will be analyzed. The exact number of analyses will depend on final disposal method and location, and test results.

3.3 TANKS

3.3.1 Hydrazine Blending Facility

The blending facility is designed for the purpose of receiving and blending hydrazine and unsymmetrical dimethylhydrazine (UDMH) to form Aerozine 50 missile fuel (approximately 50 percent hydrazine and 50 percent UDMH). Blending operations are not continuous, rather they occur in response to requests by the U.S. Air Force. Hydrazine, UDMH and aerozine are liquids and under normal conditions are ignitable, corrosive and toxic. UDMH when exposed to air reacts to form small quantities of N-Nitrosodimethylamine (NDMA).

Chemical and Physical Properties

Important properties of the raw materials and reactants include the following (Windholz, 1976):

	HYDRAZINE	UDMH	NDMA
Chemical Formula	H_4N_2	C_2H_8N	$C_2H_6N_2O$
Molecular Weight	32.05	60.10	74.08
Density (g/cm^3 @ 20°C)	1.004	0.795	1.0048

	HYDRAZINE	UDMH	NDMA
Boiling Point (°C)	113	63	151-153
Freezing Point (°C)	3	-57	-
Vapor Pressure (mm Hg @ 20°C)	20	98	-
Flash Point (°C)	52	-	-
Heat of Vaporization (kcal/mole)	9760	-	-
Merck Index No.(9th ed., 1976)	4653	3237	6458

Incoming hydrazine and UDMH are sampled according to a specific Standing Operating Procedure (SOP). During the blending operation, the off-gases are scrubbed with water. This wastewater is transferred to a 44,000 gallon sump (for a more detailed description of the facility see Section 4.3.1). Any wastes generated in the storage area catch basins, waste drains and steam expansion line are also gravity fed into the sump. Precipitation and any associated runoff that falls within the enclosed area also drain to the sump.

The contents of the sump are treated with calcium hypochlorite to reduce concentrations and associated emissions of hydrazine, UDMH and NDMA. The materials are then pumped to two storage tanks with capacities of 50,000 and 200,000 gallons. About 44,000 gallons of waste are currently in the sump. The 50,000-gallon tank is currently full and the 200,000 gallon tank is empty.

The waters in the sump have been analyzed for hydrazine, UDMH and NDMA concentrations by the Analytical System Branch Laboratory of the Environmental Division at RMA. Results indicate the following concentrations:

pH (s.u.)	7.1
Hydrazine (μg/1)	0.69-0.73
UDMH (μg/1)	1.81-2.40
NDMA (μg/1)	<0.3

The sump water has also been analyzed for EP toxicity. These data are provided in Table 3.4 and indicate no concentration of the selected parameters in excess of the RCRA criteria. GC/MS analyses were also performed and indicated the presence of dimethylcyanamide, N,N-dimethylformamide, tetrachloroethane, and 1-ethyl-1H-1,2,4-Trizole. However, the concentration of these organic compounds were very small (less than 20 μg/l) and, therefore, they were not quantified. The waste was listed as EPA Hazardous Waste No. D003 in the Part A Application (Chapter 1.0) because it is considered reactive.

Waste Analysis Plan

No further analyses are planned. However, when more aerozine fuel is blended or when the waste is transferred, analyses as described below will be performed.

- Sampling Methods - Samples from the sump will be collected using a pond sampler. All sampling and handling procedures will be performed in accordance with Test Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846).

- Parameter and Test Methods - The waters will be analyzed for pH, hydrazine, UDMH and DMNA. EPA Method 607 is currently being used for analyses of NDMA. Analyses for hydrazine and UDMH are being performed in accordance with Army Environmental Hygiene Agency (AEHA) procedures (Mazur, et al., 1980). These procedures are currently being updated.

- Frequency - Samples will be collected after blending, treatment or transfer of liquids. At least two samples will be collected from the sump.

3.3.2 South Plants Spray Dryer

The South Plants spray dryer is maintained in standby status. Chemical and physical data on materials which are or will be incinerated in the North Plants complex are presented in Section 3.4. The South Plants spray dryer was also used to treat the wastewater associated with the neutralization of off-gases during phosgene transfer (see Section 3.2.2.3). When the facility is used, the salts which are generated will be analyzed according to the following plan:

- Sampling Methods - All sampling and handling procedures will be in accordance with Test Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846).

- o <u>Parameters and Test Methods</u> - Salts will be tested for corrosivity and toxicity (both metals and organics) in accordance with 40 CFR § 261. The samples will also be tested for free liquids (46 Fed. Reg. 8311, February 25, 1982). Depending upon the source compound, other parameters may also be analyzed.

- o <u>Frequency</u> - At a minimum two samples will be analyzed from each waste generated. The exact number of analyses and test parameters will depend upon the composition and quantity of the source materials.

Salts produced from the South Plants spray dryer will be placed in 55-gallon drums and stored in the storage buildings.

3.3.3 Laboratory Wastewater Treatment Facility

Liquid wastes from the analytical laboratory in Building 313, 741 and 743 are transferred and stored in a 170,000 gallon tank prior to being treated and discharged to the sanitary sewer. Chemical analysis of the laboratory waste in the tank before treatment typically indicates the following concentrations (Analytical System Branch Laboratory, Environmental Division, RMA):

	RANGE	AVERAGE
pH (s.u.)	6.03-6.58	6.37
Total Organic Carbon (mg/l)	14-59	35
Arsenic (mg/l)	<0.050	<0.050
Copper (mg/l)	<0.04	<0.04
Cadmium (mg/l)	<0.01	<0.01
Mercury (mg/l)	<0.002	<0.002
Silver (mg/l)	<0.1	<0.1

GC/MS (gas chromotography/mass spectometry) analyses also indicated the presence of diethylphthalate, p-nonyl phenol, 1-hexen-3-one, and Indole. Currently, the laboratory waste is being treated before discharge in the sanitary sewer. After treatment, only trace quantities of several phthalates are present. The laboratory waste discharge is presently regulated under RMA's NPDES permits and, therefore, the liquid waste discharge will be analyzed monthly for selected parameters such as BOD, pH, TSS, oil and grease, etc. These analyses will be submitted as part of the NPDES permit. Because of frequency of these analyses, no waste analysis plan or additional analyses are planned as part of this application.

3.4 NORTH PLANTS INCINERATOR

The incinerator complex in Buildings 1611 and 1703 (Figure 2-5) was recently used to incinerate Chemical Agent Identification Sets (CAIS) which were manufactured by the Department of the Army from the 1930s through the 1970s. Engineering feasibility studies on incineration of the CAIS were begun in 1976. A simulant test was conducted in November 1976 and further engineering studies were conducted in November and December 1976. A second simulant test was conducted in September 1977. Following modifications to the facility, a pilot test burn was conducted from April 28 to December 7, 1979, after which further modifications were made. Final incineration of the CAIS began in 1981 and was completed in December 1982. Since that time, the incineration facilities have been cleaned and modified. In February 1983, a program began to incinerate DDT-contaminated ammunition. Adamsite (DM) bulk and grenades will be incinerated as part of a planned program that will begin in mid-1983.

Data are presented in this section and Section 4.4.2 on the CAIS in support of the DDT-contaminated ammunition and adamsite incineration programs and in lieu of a test burn [40 CFR § 122.25(b)(5)(iii)]. Data are also presented on the DDT-contaminated ammunition and adamsite in Section 3.4.2.

3.4.1 CAIS Salts and Residue

The CAIS contained bottles or ampoules of chemical agent or simulants which were used in the laboratory or field to produce agent vapors for instructional identification tests. Approximately 21,000 CAIS were incinerated. Seven basic types of sets were incinerated. The amounts of the various agents in each type of set are provided in Tables 3.5, 3.6 and 3.7. The amounts of other materials in the sets are provided in Table 3.8. The basic chemical and physical properties of these agents are presented in Appendix 3A.

During the incineration process, the following four types of solid waste were produced:

- o Residues from the furnaces.
- o Solid residues from the quench cleanout operations.
- o Residues from the electrostatic precipitator.
- o Spray dried residues from the process waste scrubber system.

The exact composition and quantities of these wastes depend upon the type of sets being incinerated. For example, one furnace residue may contain large quantities of wood ash while another may contain mostly glass and metal.

Limited data exist concerning the chemical composition of the wastes. However, some typical analyses of the waste resulting during the incineration of K945, K951 and X458 CAIS are provided in Table 3.9. This table provides the chemical composition of quench residue, electrostatic precipitation residue and spray dried process waste. No quantitative analyses of the furnace residue were performed. However, the samples were described as containing charred metal caps and lids, box hardware, glass, charred wood and iron oxides.

All four waste products have been analyzed for corrosivity and toxicity by the U.S. Army Environmental Hygiene Agency using procedures presented in 40 CFR § 261. The following number of analyses have been performed:

RESIDUE	NO. OF ANALYSES
Spray dried process waste	17
Electrostatic precipitation residue	14
Furnace residue	11
Quench residue	6

The results of these tests and the testing laboratories are summarized in Tables 3.10, 3.11, 3.12 and 3.13. Overall, only a few samples failed the EP toxicity test due to high levels of lead, cadmium or arsenic. These were as follows:

- o Lead concentrations above the RCRA criteria (40 CFR § 261.24):

  - Four samples of furnace residue.
  - One sample of spray dried process waste.

- o Arsenic concentrations above the RCRA criteria (40 CFR § 261.24):

  - Four samples electrostatic precipitator residue.
  - Two samples of spray dried process waste.
  - One sample of quench residue.

- o Cadmium concentrations above the RCRA criteria (40 CFR § 261.24):

  - Three samples of spray dried process waste.
  - One sample of electrostatic precipitator residue.
  - One sample of furnace residue.

Results of the EP toxicity tests indicate that at least one sample of all four types of waste can be considered toxic. Because of the results discussed above, the CAIS waste was listed as EPA Hazardous Waste Nos. X003, D004, D006 and D008 in the Part A Application (Chapter 1.0). No. X003 was included to represent the waste which passed the EP toxicity tests and thus did not fit any EPA classification criteria.

Five of the extracts from the EP toxicity test were also scanned by GC/MS techniques for organic compounds. These five samples included one spray dried process waste, two electrostatic precipitator residues, one furnace residue and one quench residue. The results are summarized in Tables 3.10 through 3.13. Small quantities of organic compounds were found in some of the residues. These five samples were also evaluated for corrosivity by analyzing a deionized water extract for pH. All five samples had pH values less than 12.0 and greater than 2.0; therefore, none of the samples were corrosive.

Waste Analysis Plan

Currently, EP tests are being conducted on approximately 25 more samples of waste associated with incineration of CAIS. This data will be submitted to

EPA when it becomes available. After this testing is completed, no further analyses are planned. However, as part of final disposal operations, analyses will be necessary. These analyses will be performed according to the following plan:

- Sampling Method - All samples and handling procedures will be in accordance with Test Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846).

- Parameters and Test Methods - Previous testing has indicated that the waste may be toxic. EP toxicity tests and corrosivity tests will be performed in accordance with 40 CFR § 261. All extracts will be analyzed for metals content while only extracts previously showing organic compounds will be analyzed for organics. The overall composition of the residues (Na_2CO_3, NaCl, Na_2SO_4, etc.) will be determined in accordance with approved methods (40 CFR § 136). The samples will also be tested for free liquids (46 Fed. Reg. 8311, February 25, 1982).

- Frequency - Sampling will occur only once before final disposal. Because many analyses have already been performed, only approximately 30 more samples (1 drum every 100) will be analyzed. The exact number of analyses will depend on the final disposal location and method.

3.4.2 DDT-Contaminated Ammunition and Adamsite

DDT-contaminated ammunition is currently being incinerated in the North Plants incineration complex. A program to incinerate and neutralize adamsite (DM) bulk and grenades will follow. These programs will produce the four types of residues that are similar to those previously discussed under the CAIS incineration program. The residues derived from the DDT and adamsite are expected to be similar in composition to the residues produced from incineration of the CAIS because the sets also contained chlorinated hydrocarbons and adamsite. Some of the chemical and physical properties of DDT-contaminated ammunition and the adamsite are summarized in the following paragraphs.

Chemical and Physical Analyses

DDT-Contaminated Ammunition - The bulk of the actual material to be incinerated is ammunition (a variety of small caliber ammunition including M14, M16 and M60 bullets). The typical constituents of M60 bullets are provided in Table 3.14. The rounds of ammunition are contained in wooden crates which will also be incinerated. To determine the quantity of organic contamination associated with the ammunition, a number of M-16 (11.5 gm each) and M-14 (24.1 gm each) bullets were washed with methylene chloride. The extracts were then analyzed by GC/MS techniques and found to contain DDT and pentachlorophenol. The extractions and analyses were performed by the Analytical System Branch Laboratory of the Environmental Division at RMA. The average concentrations of five extracts follow:

PARAMETER	CONCENTRATION AVERAGE (μg/bullet)	CONCENTRATION RANGE (μg/bullet)
DDT	19.1	1-46[1]
Pentachlorophenol (PCP)	14.3	0-28.5[1]

Other compounds detected in some of the extracts included long chain saturated hydrocarbons (about 2 μg/bullet), hexamethylene tetramine (HMT - about 20 μg/bullet), and 1,1-dichloro-2,2-bis-p-chlorophenylethene (DDE - about 3 μg/bullet), and possibly chlorinated furan diones and alkyl benzenes. HMT was detected in only one sample.

The chemical and physical properties of the major organic compounds associated with the ammunition prior to incineration follow (Windholz, 1976):

[1] One set of bullets contained a crusty material that was not all removed by washing. Estimates are that DDT and PCP could range up to 150 and 40 ug/bullet in this case.

CHEMICAL NAME	DDT	PCP
Chemical Formula	1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane	pentachlorophenol
Chemical Formula	$(ClC_6H_4)_2CHCCl_3$	C_6Cl_5OH
Molecular Weight	354.5	266.35
Melting Point (°C)	108.5-109	190-191
Boiling Point (°C @ 1 atm)	185	309-310 (decomposes)
Vapor Pressure (mm Hg @ 20°C)	1.5×10^{-7}	--
Merck Index No. (9th ed., 1976)	2822	6901

The DDT-contaminated ammunition was listed as EPA Hazardous Waste No. D003 in the Part A Application (Chapter 1.0) because it is capable of detonation or explosive reaction if subjected to a strong initiating source or if heated under confinement [40 CFR 261.23(a)(b)].

During the incineration process, the following four types of solid waste are produced:

- o Residue from the furnace.
- o Solid residues from the quench.
- o Residues from the electrostatic precipitator.
- o Spray dried residues from the process scrubber system.

Ten samples of the electrostatic precipitator residue have been analyzed for toxicity by the Analytical System Branch, Environmental Divison, RMA according to 40 CFR § 261. Only lead was analyzed giving the following results:

Parameter	Average (mg/1)	Range (mg/1)
Pb	395	74-1020

Two samples of the quench have also been analyzed. These results follow:

Parameter	Average (mg/1)	Range (mg/1)
Pb	1506	1392-1620

These results indicate that the residue from the quench and electrostatic precipitator failed the EP toxicity test due to the large concentration of lead. Samples of the furnace residue and spray dried process residue have not been analyzed.

Adamsite (DM) - Chemical and physical properties of adamsite prior to incineration follow (U.S. Army and U.S. Air Force, 1963 and Windholz, 1976):

Chemical name	Diphenylaminochlorarsine
Chemical formula	$NH(C_6H_4)_2AsCl$
Molecular weight	277.57
Melting point (°C)	195
Boiling point (°C @ 1 atm.)	410 (decomposes)
Flash point	None under usual conditions
Vapor pressure (mm Hg @ 20°C)	Negligible
Heat of vaporization (kcal/mole)	15.2
Solid density (g/cm^3 @ 20°C)	1.65
Merck Index No.(9th ed., 1976)	6999

The items to be incinerated also include filler material consisting of nitrocellulose, potassium nitrate, starch, sugar, potassium chlorate, chloroacetophenone (CN) and heavy metals such as lead and titanium. Table 3.15 shows the chemical compounds in the three types of adamsite grenades. The bulk adamsite was listed as EPA Hazardous Waste No. D004 in the Part A Application (Chapter 1.0) because of arsenic concentrations. The adamsite grenades were listed as D003, D004, and D008 because they are reactive and contain arsenic and lead. The grenades qualify as reactive (D003) because they are a Class A explosive [40 CFR 261.23(a)(8) and 49 CFR 173.53].

Waste Analyses Plan

During the incineration process, all four types of waste generated (furnace, quench, electrostatic precipitator and scrubber residues) will be analyzed in accordance with the following procedure:

- Sampling Method - All sampling and handling will be in accordance with Test Methods for Evaluating Solid Wastes (U.S. EPA, 1982, Report No. SW-846). In particular, samples will be taken during drum packing and composited to give a representative sample.

- Parameters and Test Methods - The samples will be analyzed for both corrosivity and toxicity according to 40 CFR § 261. The extract from the EP toxicity testing will be analyzed for the listed elements and compounds. In addition, the extract will be scanned by GC/MS techniques to identify the presence of other organic chemicals. The overall composition of the salts and residues will be determined. The samples will also be tested for free liquids (46 Fed. Reg. 8311, February 25, 1982).

- Frequency - At least two analyses will be made of each of the four types of waste during a particular run. For example, four basic types of DM materials (three types of grenades and bulk) will be incinerated. Two composite samples will be collected during the incineration of each of these basic feed materials. All waste materials will be analyzed. Therefore, 32 samples will be collected and analyzed during incineration of DM. During incineration of DDT-contaminated ammunition, samples will be collected and analyzed approximately eight times during the incineration process. This will result in approximately 32 samples. If operating conditions change substantially during the process, more samples will be collected.

4.0 PHYSICAL DESCRIPTION AND PROCESS INFORMATION

4.1 INTRODUCTION

In this chapter, descriptions of the physical system and processes are presented for each of the facilities. In Section 4.2, information is presented for the two container storage operations, the DPDO and RMA storage. The conditions of the storage containers, buildings and drainage are also discussed. Section 4.3 covers tank treatment and storage at the hydrazine blending facility, the tank treatment at the South Plants spray dryer and the tank storage and treatment at the laboratory wastewater treatment facility. Section 4.4 includes an engineering description of the North Plants incinerator and discussion of the incineration process for the ongoing and near term programs. Because RMA is a defense facility, programs which involve incineration or generate waste for storage are not as predictable, in terms of waste types and quantities, as some industrial facilities.

4.2 CONTAINERS

Container storage of hazardous waste at RMA occurs as part of the following two operations:

- The Defense Property Disposal Office (DPDO).
- RMA storage.

The DPDO typically stores liquid wastes while RMA stores wastes without free liquids.

4.2.1 Containers With Free Liquids - DPDO

As part of DPDO's operations, liquid hazardous materials are stored in Buildings 622 and 633A and hazardous wastes are stored in an open storage yard at the DPDO. The DPDO is responsible for selling or donating the items. If hazardous materials cannot be sold or otherwise salvaged, they are reclassified as hazardous waste for eventual disposal via a service contract. Since the DPDO began operation at RMA, all hazardous materials have been sold or salvaged. The hazardous materials handled to date include paints, enamels, lacquers, adhesives, lubricating oil, cleaning compounds, insecticides, solvents and others. The hazardous wastes that have been received include cleaning solvent, paint remover, ketones and mercury waste. This permit application addresses only the hazardous wastes which are stored in the open yard west of Building 621 (Figure 2-2).

The DPDO facility at RMA has been accepting hazardous waste since October 1981. The waste is catalogued and placed on pallets in the open storage yard. This yard has an area of approximately four acres, is asphalt-covered and is fenced. During working hours (7:30 a.m. to 4:00 p.m.), the gate to the yard is open. During non-working hours, the gate is locked and security patrols check the site once every hour. In addition to hazardous wastes in the storage yard, the DPDO stores stoves, refrigerators, vehicles and other salvageable material for resale.

Table 3.1 lists all the wastes which are in storage at the DPDO facility. These wastes are currently located in the northwest portion of the yard. Copies of the manifests submitted by the generators are kept on file in Building 621 for a minimum of three years.

To date, only one shipment of hazardous waste has been transported from the DPDO. That waste contained PCB-contaminated oil which was shipped to an approved hazardous waste disposal facility in Alabama for disposal. Transportation was handled by a contractor.

A service contract will be signed for the remaining waste in June 1983, resulting in removal of all of the waste from the site. When drums are received in the future, they will be labeled and placed in storage. A program is currently being conducted by the DPDO and RMA to survey the available storage buildings at RMA. The purpose is to select a building which will most closely meet the storage requirements for containers of hazardous waste with free liquids. Following selection, future waste will be placed in this building. Further details will be submitted to EPA following selection of this building.

4.2.2 Containers Without Free Liquids - Salts, Residue and Contaminated Wheat Storage

RMA maintains inventory records on the movement of drums of waste. Surveys were also conducted of the RMA storage buildings in November 1982 and January and February 1983. The objectives of the surveys were to to confirm the total number and types of waste drums as well as other items in each building, to define the conditions of the containers and buildings, and to determine drainage conditions.

A total of 73 storage buildings at RMA are included in this permit application. Results of the surveys are presented in Tables 4.1 and 4.2. Locations of the various buildings and areas are shown in Figure 2-1. Specific buildings are shown in Figures 2-3 through 2-6 and include the following:

- Building 354 in the South Plants area (Figure 2-6). Wheat seed treated with a mercury-based disinfectant is stored in steel and fiber drums in this building.

- Warehouse Buildings 785-788, 791 and 793-798 (Figure 2-3) in the east central part of RMA along 7th Avenue and "E" Street. Steel and fiber drums of salts and residues that resulted from mustard incineration, GB neutralization, CAIS incineration, and phosgene transfer operations are stored in these buildings.

- Concrete Storage Huts 871A-D, 872A-D, 873A-C and 874A-D in the southeast part of RMA north of the 6th Avenue and west of "F" Street (Figure 2-4). These 15 huts are currently empty.

- Concrete Storage Bunkers 881-886 in the southeast part of RMA north of 6th Avenue (Figure 2-4). DDT-contaminated ammunition is stored in Bunkers 881, 884 and 885. Adamsite in bulk and grenades is stored in Bunkers 882, 885 and 886. Bunker 883 is currently empty.

- Concrete Magazine Igloos 1605 and 1608-1610 in the North Plants area (Figure 2-5). Igloos 1605 and 1609 contain ammunition (product). Classified items which are considered to be products are stored in Igloos 1608 and 1610. No waste is currently stored in the igloos.

- Storage Sheds in 14 plots in the former Toxic Yard in the east central part of RMA just west of "F" Street (Figure 2-3). Each plot contains two or three separate sheds resulting in a total of 36 sheds. Salts from the GB demilitarization program are stored in steel or fiber drums in 28 of the sheds in Plots 1-12 and 27-28. Eight sheds are empty or used for storage of miscellaneous nonhazardous materials.

Although some of the buildings are empty, they may be used for storage of hazardous wastes in the future and are included in the permit application. In the following sections, each building's condition and contents are discussed. A program was initiated at RMA in February 1983 to correct any minor problems at the storage buildings. Drainage conditions are mentioned and then discussed separately in Section 4.2.3.

4.2.2.1 Contaminated Wheat Storage - Building 354

Building 354 is one of 10 general supply warehouses in the South Plants area located west of "D" Street between Sixth and Seventh Avenue (Figure 2-6). In addition to general supplies used in association with other operations, this building also houses 257 drums of wheat seed treated with Ceresan disinfectant.

Building Design and Condition

The dimensions of Building 354 are 240 feet 10 inches long and 45 feet 10 inches wide with a 15 foot by 50 foot extension from the west end leading to the next warehouse as shown in Figure 4-1. Storage height within the building is 12 feet 11.5 inches. The storage volume of this building is 152,740 cubic feet. The floor is a six-inch concrete slab reinforced with welded wire mesh. Walls are made of corrugated metal sheets protected by an asbestos finish. Each sheet is nailed to the wooden frame and fastened to adjacent sheets by sheet metal screws. The roof is constructed with wood sheathing covered by asphalt shingles. The slope of the roof is 3:1 on each side. Building 354 is equipped with 10 air terminals on the roof for lightning protection. Ventilation of the building is maintained by five electrically operated, 24-inch roof fans. Twenty windows around the structure also aid in ventilation. Seven sliding overhead garage-type doors are located on the building's north side and are used for transfer of supplies to and from rail cars. The south side of the building has four sliding doors with loading docks for delivery and pick-up of supplies by truck. Four rain downspouts located on the south side of Building 354 control runoff from the roof by leading water away from the building's foundation. Any leakage that might occur from materials within the building is prevented from leaving the building by a concrete curb around the inside of the building except at the doors where there is no curb. The building is equipped with plumbing and electrical connections.

Building 354 is in sound condition. There are no indications of major structural damage or weakened integrity. Other than hairline cracks, the cement floor remains in good condition. No evidence exists of water seepage into the structure through these cracks. The metal wall panels are all in place. No sheets are loose or damaged. A small portion of the protective asbestos covering has begun to peel from the wall but no significant deterioration of these sheets is evident. The roof is in good condition and was reshingled in 1968. All shingles are in place and there is no evidence of leakage of rain water into the facility. All doors are intact and functioning. Each door is equipped with a working lock mechanism. The Supply Division is responsible for the keys to this structure. Plumbing and electrical connections are turned off.

Contents of Building 354

Building 354 is a general supply warehouse containing items used in the South Plants. It is also a storage facility for 257, 55-gallon drums of wheat seed treated with Ceresan. Ceresan is used for disinfecting seeds to protect against soil-borne plant diseases (see Section 3.2.2.5 for chemical composition). Figure 4-1 shows the location of wheat drums within the warehouse. All drums are placed on pallets and are stacked in groups of approximately 24 to 28 drums. No group is stacked higher than three drums. One to three feet of passage exists between groups of drums and the groups extend no more than seven feet from the warehouse wall. Two hundred fifty of the drums are made of fiber material similar to cardboard and seven drums are steel. Both types of drums have locking rings around the top. The drums are all labeled "Wheat Seed Winter, Cercresan (sic) Treated." No standing liquid or material exists on the floor beneath the drums. No Ceresan material has leaked from Building 354. The drums of wheat constitute about three percent of the volume of the warehouse.

Other items stored in Building 354 include boxes of pall rings used in air pollution control equipment at the plant, boxes of mylar tubes, and scrap lumber. There are also 56 drums of polyvinyl alcohol and 94 drums of chlorinated paraffin which are not wastes. These materials were used to treat coveralls to make them impervious to chemicals in the South Plants. None of the polyvinyl alcohol or chlorinated paraffin drums show indications of leaking. All of the stored materials in Building 354 occupy 11 percent of the warehouse storage volume.

4.2.2.2 Storage Warehouses - Buildings 785-788, 791, and 793-798

Eleven storage warehouses are located in the east-central portion of the RMA as shown in Figure 2-3. Six of these warehouses are located on the north and south sides of Seventh Avenue and five are situated on the east side of "E" Street. These warehouses serve as the primary storage facilities within the site and contain 45,369 drums of phosgene (CG) salts, mustard (H) salts and residue, nerve agent (GB) salts and CAIS salts and residue. The number of drums in each warehouse can change within short time periods due to on-going neutralization programs and re-warehousing programs. Inventory records are maintained at Building 1610. Building 792 is leased to the U.S. Air Force for storage of nonhazardous material and is not included in this permit application.

General Warehouse Design

All the warehouses are constructed in basically the same manner except for Building 785 which is a combination of three, single-unit warehouses. Figure 4-2 shows the general design of a single-unit warehouse. Each warehouse is 160 feet long and 60 feet wide. The storage height within each structure is 14 feet. The storage volume of the warehouse is approximately 134,400 cubic feet. Building 785 as identified in Figures 4-3, 4-4, and 4-5 is 480 feet long and 60 feet wide. It also has a storage height of 14 feet resulting in a storage volume of about 403,200 cubic feet. The floor is six-inch concrete slab reinforced with welded wire mesh. Walls on the west, north, and east sides of the warehouses are concrete block and the south walls are corrugated aluminum sheets nailed to wooden frames. The roof of each warehouse is corrugated cement asbestos with a 12:5 slope on each side. Each single-unit warehouse is equipped with eight air terminals for lightning protection. No ventilation devices are present in the single-unit warehouses, but Building 785 does have two electrically operated fans at the east end of the warehouse. None of the warehouses have windows. Each warehouse has at least two sets of swinging aluminum doors on the south side. Building 785 has six swinging aluminum doors on the south side and six garage-type doors on the north side. Buildings 786, 787 and 788, each have two garage-type doors on the north side in addition to the two swinging aluminum doors on the south side. Building 791 has three swinging aluminum doors on the south side. Drainage is directed away from the warehouses by rain gutters which are on the north and south side of the roof and four rain spouts per side of the single-unit warehouse. Building 785 has 24 rain spouts. None of the buildings has plumbing and only the east end of Building 785 has electricity. Each warehouse has signs in English and Spanish posted on the outside warning "DANGER, UNAUTHORIZED PERSONNEL - KEEP OUT."

Condition and Contents -- Building 785

Building 785 is structurally sound. The floors are in good condition with only a few small hairline cracks in the concrete slabs. The concrete block walls are in good condition. The roof is intact and does not show any signs of leakage. Each of the 24 air terminals is in place and connected securely to the electrical ground. Ventilation devices at the east side of the building are not operating since the electricity has been turned off. All doors are functional and are locked. Plant Operations is responsible for the keys to Building 785. The downspouts are in place and each is accompanied by a splash pad to divert water from the building. The ground surface around the building slopes away from the warehouse to prevent run-in to the building. Warning signs are in place and securely fastened to the building.

Figures 4-3, 4-4 and 4-5 show the three warehouse sections of Building 785. The warehouses have been designated as the West, Middle and East Sections. The West Section (Figure 4-3) does not contain any drums of waste. The majority of the items in the West Section are laundry equipment and supplies. Some empty drums, scrap metal, scrap wood, tools and cleaning agents are also in this part of Building 785. The East Section of Building 785 does not contain any salts or residue waste drums. Figure 4-5 shows the general layout of the miscellaneous material in the warehouse. Most of the materials in this section are scrap items and equipment which are no longer used.

The Middle Section of Building 785 is shown in Figure 4-4 and contains 3,577 drums of CAIS residue. 3,324 of these drums are steel and 253 are fiber. The drums in the Middle Section of Building 785 occupy 35 percent of the volume of that section. The drums are stacked on pallets and are stacked no higher than three drums. The drums are all intact and show no signs of leakage. Each drum has a locking ring on its top and all drums are sealed shut. The drums are labeled "DANGER, CONTAINS INORGANIC ARSENIC, CANCER HAZARD, HARMFUL IF INHALED OR SWALLOWED, USE ONLY WITH ADEQUATE VENTILATION" and "ID KITS" (CAIS). The floor is clean of any residue and no leakage out of the building is evident.

Condition and Contents -- Building 786

Building 786 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls as well as the aluminum siding on the south side of the building are in good condition. The roof is intact and does not show signs of leakage. All air terminals are in place and secured to the electrical ground. The two garage doors on the north side of Building 786 are functional and locked. Plant Operations is responsible for the keys to Building 786. The south side doors do not have locks. The downspouts and splash pads are in place. The ground surface around the building has a sufficient slope to prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-6 shows the configuration, contents and storage arrangement of items in Building 786. It contains 1,909 55-gallon drums of GB salts. Of these, 1204 are fiber and 705 are steel. The drums are stacked on pallets, no higher than three drums. The drums occupy 18 percent of the volume of Building 786. All visible drums are intact and show no signs of leakage. The drums are labeled "DRIED SALTS, CORROSIVE". Other items in the building are a few miscellaneous wooden pallets and some scrap lumber. The total volume occupied by the drums and miscellaneous items in the building is 19 percent.

Condition and Contents -- Building 787

Building 787 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and shows no sign of leakage. All air terminals are in place and secured to the electrical ground. The garage doors and the swinging aluminum doors are in place and functional. The garage doors are locked. Plant Operations has keys for this building. The downspouts and the splash pads are in place. The ground surface around the building has a sufficient slope to prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-7 shows the configuration, contents and storage arrangement of items in Building 787. It contains 5,764, 55-gallon drums of GB salts. 3,232 are fiber drums and 2,532 are steel. The drums occupy 61 percent of the volume of the building. All visible drums are sealed shut with locking tops and labeled "DRIED SALTS, CORROSIVE." The floor is clean of any salts and there is no leakage of salts out of the building.

Condition and Contents - Building 788

Building 788 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and shows no sign of leakage. All air terminals are in place and secured to the electrical ground. The garage doors and the swinging aluminum doors are in place and functional. The garage doors are locked. Plant Operations has the keys for these locks. The downspouts and the splash pads are in place. The ground surface around the building has a sufficient slope to prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-8 shows the configuration, contents and storage arrangement of items in Building 788. There are 6,384, 55-gallon steel drums of H salts in this warehouse. The drums are stacked three high on pallets. The drums occupy 63 percent of the volume of the building. All visible drums are sealed shut with locking tops and labeled "Dried Salts" and "H Salts."

Condition and Contents - Building 791

Building 791 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and does not show signs of leakage. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place. The downspouts and the splash pads are in place. No structural damage to the foundation has occurred. The ground surface around the building has a sufficient slope to prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-9 shows the configuration, contents and storage arrangement of items in Building 791. It contains 5,793, 55-gallon fiber drums of H salts. The drums are stacked three high on bare floor. The drums occupy 52 percent of the volume of the building. All visible drums are sealed shut with locking tops and labeled "DRIED SALTS, CORROSIVE" AND "H SALTS."

Condition and Contents - Building 793

Building 793 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and does not show signs of leakage. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place and functional. The downspouts and splash pads are in place. The ground surface around the building has a sufficient slope to prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-10 shows the configuration, contents and storage arrangement of items in Building 793. There are 1,378, 55-gallon fiber drums of CG salts in this warehouse. The drums occupy 30 percent of the volume of the building. No leakage is visible and all drums have secure locking tops. The drums are labeled "DRIED SALTS" and "CG SALTS." Other items in Building 793 include oil drums, pallets, scrap lumber and old laundry tanks. The total volume occupied by items in Building 793 is 26 percent.

Condition and Contents - Building 794

Building 794 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is sound. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place. The downspouts and the splash pads are in place. The foundation appears to be sound. The ground surface around the building has a sufficient slope to prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-11 shows the configuration, contents and storage arrangement of items in Building 794. There are 2,018, 55-gallon drums in this building. Of this, 1,998 are steel drums of H salts and 20 are fiber drums of CAIS residue. The drums are stacked no more than three high on pallets. The drums occupy 20 percent of the volume of the building. All drums have locking tops and are sealed shut. The drums are labeled with the type of material contained within or the placard inside the building describes the contents of a group of drums.

Condition and Contents - Building 795

Building 795 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and shows no sign of leakage. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place and functional. The downspouts and the splash pads are in place. The ground surface around the building has been sloped to drain and prevents run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-12 shows the configuration, contents and storage arrangement of items in Building 794. It contains 5,945, 55-gallon steel drums of H salts. The drums are stacked three high on pallets. The drums occupy 62 percent of the volume of the building. There are no indications of drum leakage. All visible drums are sealed shut with locking tops and labeled "DRIED SALTS."

Condition and Contents - Building 796

Building 796 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and does not show signs of leakage. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place and functional. The downspouts and the splash pads are in place. No structural damage to the foundation was observed. The ground surface around the building is sloped to drain and prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-13 shows the configuration, contents and storage arrangement of items in Building 796. There are 5,924, 55-gallon steel drums of H salts in this warehouse. The drums are stacked three high on pallets. The drums occupy 62 percent of the volume of the building. No visible drums show signs of leakage. All visible drums are sealed shut with locking tops and labeled "DRIED SALTS" and "H SALTS."

Condition and Contents - Building 797

Building 797 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact. No standing water was observed within the building. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place and functional. The downspouts and the splash pads are in place. No structural damage to the foundation was observed. The ground surface around the building is sloped to drain and prevents run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-14 shows the configuration, contents and storage arrangement of items in Building 797. It contains 3,152, 55-gallon drums of GB salts, of which 2,916 are steel drums and 236 are fiber. The drums are stacked three high on pallets. The drums occupy 34 percent of the volume of the building. No visible drums show signs of leakage. All visible drums are sealed shut with locking tops and labeled "DRIED SALTS."

Condition and Contents - Building 798

Building 798 is structurally sound. No significant cracks exist in the cement floor. The concrete block walls and the aluminum siding are in good condition. The roof is intact and shows no sign of leakage. All air terminals are in place and secured to the electrical ground. The swinging aluminum doors are in place and functional. The downspouts and the splash pads are in place. No structural damage to the foundation is observable. The ground surface around the building is sloped to drain and prevent run-in to the structure. Warning signs are in place and securely fastened to the building.

Figure 4-15 shows the configuration, contents and storage arrangement of items in Building 798. There are 4,056, 55-gallon drums of GB salts in this warehouse of which 4,040 drums are steel and 16 are fiber. The drums are stacked three high on pallets. The drums occupy 47 percent of the volume of the building. All visible drums are sealed shut with locking tops and labeled "DRIED SALTS". A placard inside the building identifies all drums as containing GB salts.

4.2.2.3 Concrete Storage Huts - Buildings 871A-D, 872A-D, 873A-C, and 874A-D

Fifteen concrete cinder block structures are located in the southeastern portion of the RMA at the corner of "D" Street and Sixth Avenue (Figure 2-4). These structures were used for the storage of blasting fuses but are now empty.

General Storage Hut Design

Each building number has four storage huts assigned to it except for Building 873 which has three huts. These huts are designated A through D and A through C, respectively. The basic design and dimensions of the huts are the same. The only difference among the huts is the outside grading which depends upon the topography in the vicinity of each hut. Figure 4-16 shows typical plan section and elevation details for a hut. The huts are 20 feet by 30 feet with an inside ceiling of seven feet two inches. The resultant volume of each structure is 4,300 cubic feet. The floors are six-inch reinforced concrete slab. The walls are eight-inch concrete cinder blocks on all sides. The roof is tarred with a slight slope away from the center to the sides. The huts are equipped with two to three air terminals for lightning protection. There are eight-inch turbine vents on the roof of the huts and four wall vents on each side of all huts.

There are no electrical or plumbing connections in the huts. The huts have a three-foot by seven-foot metal covered locking door. There are no windows in any of the huts. Drainage is directed away from the foundation of each structure by building the huts on elevated grades. Some huts have been built-up so that steps are necessary to enter the facility. Each building has signs posted on the front warning " DANGER - NO SMOKING, MATCHES, OR OPEN LIGHT."

Condition and Contents - Buildings 871-874

All of the huts are structurely sound. Despite hairline cracks, the concrete floors and foundation are in good condition with no visible signs of seepage into the structures. No cracks or gaps occur in the concrete block walls. All the roofs are intact and show no signs of deterioration. The air terminals are in place and connected properly to the grounding rod. Ventilation is working and the vent screens at the base of each hut are in place. The doors on each structure are functioning and locked. The Security Force is responsible for the padlocks on the huts. Warning signs are secure and highly visible.

The huts are currently empty but may be used for storage in the future.

4.2.2.4 Earthen Concrete Bunkers - Buildings 881-886

Six concrete bunkers are located in the southeast portion of the site (Figure 2-4). The buildings are situated north of Sixth Avenue and west of Buildings 871 through 874. These bunkers contain DDT-contaminated ammunition, adamsite bulk agent and adamsite grenades. No drums of waste are stored here.

General Bunker Design

The six bunkers are identical in design as shown in Figure 4-17. These structures are protected with earth on the sides and back, up to the roof (the roof is not earthen). The dimensions of the structures are 30 feet wide by 63 feet long and 10 feet tall on the inside. The resultant volume of each bunker is 18,900 cubic feet. The floor is an eight-inch concrete reinforced slab. The inside walls are 12-inch concrete and the outside walls are earth on the sides and back. The slope of the earth walls is 1.5:1. The wall on the front of each bunker is concrete with six-foot by six-foot double steel doors. The doors have double locks on them requiring keys from the Supply Division and the Security Force (Building 883 requires a key from Technical Escort also). Four of the six bunkers are encircled by an eight-foot tall fence which is locked and also requires a key from the Security Force. The bunkers are each equipped with 12 air terminals for lightning protection. Ventilation is maintained by 14-inch turbine vents on the roof. There are no windows in the bunkers. The roofs are made of concrete slabs covered with asphalt. Drainage from the roof is directed to rain gutters on the sides of the bunkers which moves water to the rear of the bunker then through downspouts away from the sloped walls. The bunkers do not have electrical or plumbing connections. Each bunker is posted with signs indicating the degree of explosiveness of the bunker's contents and whether or not some type of hazardous gas is present according to IAW DARCOM 385-100 (safety regulations). Explosiveness is shown with an orange diamond and a number in the center ranging from 1 to 4. The lower the number, the more explosive the material. The presence of hazardous gas is indicated by a blue sign with a yellow figure wearing protective garments and respiratory equipment.

Condition - Buildings 881-886

All of the bunkers are structurally sound. The cement floors are in good condition and show no signs of leakage of moisture into the structure through the floor. The inside concrete walls are intact with no cracking. The outside earthen walls are evenly sloped and stabilized with sod to prevent erosion. All doors on the bunkers are well maintained and have a double locking system. A representative from both the Supply Division and the Security Force must be present in order to open Buildings 881, 882, and 884 through 886. Building 883 requires that a representative from the Supply Division and Technical Escort be present in order to unlock the double steel doors. The Security Force is the only group responsible for the keys to the fence locks around Bunkers 881, 882, 885, and 886. Bunkers 883 and 884 do not have fences around them. All air terminals are in place and securely connected to the ground rod. The ventilation system works properly and there is no noticeable build-up of gases in any of the bunkers. Each roof is intact and shows no signs of deterioration. Rain gutters are in place and are free of obstructions. The downspouts are securely connected to each gutter and direct water away from the earthen walls. Buildings 881, 884, and 885 are posted with an explosive sign of "4". Bunkers 882 and 886 show the explosive sign "4" and the hazardous gas warning sign. There are no signs on Building 883.

Contents - Buildings 881-886

The bunkers do not contain drums of waste salt. The majority of the stored materials are DDT-contaminated small arms ammunition, and adamsite in bulk or grenade form.

Building 881 is approximately 60 percent full of DDT-contaminated ammunition. Two hundred and sixty-six tons of ammunition are stored in wooden crates and placed on pallets to a height of nine feet. All crates are intact and sound.

Bunker 882 contains four tons of adamsite in the form of grenades and bulk adamsite. Approximately three tons of grenades and one ton of bulk adamsite occupy nearly 70 percent of the volume of Bunker 882. The material is stored in wooden crates and stacked on pallets to heights between four and nine feet. All crates are intact.

Bunker 883 is maintained by Technical Escort and contains a small, steel safe for blasting fuses. Nothing else is present in this bunker.

Bunker 884 contains 305 tons of DDT-contaminated small arms ammunition. The ammunition is stored in wooden crates which occupy approximately 80 percent of the bunker's volume. The crates are on pallets and stacked to a height of nine feet. The wooden crates are intact.

Bunker 885 contains both DDT-contaminated ammunition and adamsite grenades. The majority of the material is ammunition (280 tons of ammunition and one ton of adamsite grenades). The contents of Building 885 occupy nearly 95 percent of the facility's volume. Both types of material are contained in wooden crates and placed on pallets to a height of nine feet. The crates are intact.

Bunker 886 houses 606 tons of adamsite materials (bulk and grenade) in wooden crates. Approximately 95 percent of the volume of the building is occupied by the adamsite products. The wooden crates are stacked on pallets and the crates are intact.

4.2.2.5 Concrete Magazine Igloos - Buildings 1605 and 1608-1610

Four concrete igloos are located north of the North Plants area as shown in Figure 2-5. The igloos are north of FW-3 Road and west of NS-2 Road. The majority of the materials stored here are the active stock of ammunition used by the RMA Security Force and by Technical Escort. A small amount of the igloo inventory is classified items. The ammunition and classified items are all considered to be products. There are no drums of waste salts or other hazardous waste stored in the igloos. However, the igloos are included in the permit application because they may be used for storage in the future.

General Igloo Design

The four igloos are identical in design as shown in Figure 4-18. Each structure is covered with earth on all sides except the front. The top is also covered with sodded earth. The inside of the igloos are shaped like half-spheres with a centerline height of 12 feet, nine inches. Each igloo is 40 feet long and has a volume of approximately 10,210 cubic feet. The floors and walls are six-inch reinforced concrete. The top of the structure is capped by two feet of earth and sod with plastic mesh to prevent erosion. The earth slopes from the top at a 1.5:1 grade down the sides and at a 1.2:1 grade down the back. The fronts of the igloos are six-inch thick cement and have a five-foot by 10-foot steel door with double locks. The Security Force and Supply Division have the keys needed to open Building 1605. Security and Plant Operations have the keys for Buildings 1608 and 1610. The keys for Building 1609 are kept by Technical Escort and Security. Each igloo has three air terminals along the top centerline of the structure which are connected to copper cables and ground rods. Roof turbine vents are currently sealed off. There are no windows in the igloos. Posted signs on the front of each igloo state "RESTRICTED AREA - WARNING." Igloos do not have plumbing connections but do have electrical hook-ups.

Condition - Buildings 1605 and 1608-1610

All the igloos are structurally sound. The cement floors are in good condition and show no signs of leakage of moisture into the structures through the floors. The concrete walls and ceilings are also intact. The outside walls of earthen cover and sod are sloped smoothly on each igloo and the plastic mesh is in place. No major erosion problems exist with the earth cover. The doors on the igloos are operating properly and all double locks are present. The three air terminals on each of the igloos are positioned and connected to the copper grounding cable and grounding rod. Posted warning signs are visible and secure at each of the four buildings.

Contents - Buildings 1605, 1608-1610

None of the igloos contain drums of waste salt. The majority of items contained in these buildings are various types of ammunition actively being used by the Security Force and Technical Escort.

Building 1605 is 10 percent full, by volume, with ammunition. Security maintains nine fenced bins with locks in Igloos 1605 containing various types of small arms ammunition. The ammunition is kept in wooden boxes and stored on pallets. The boxes are stacked no more than four feet high. All boxes are intact and the description of the contents are clearly stenciled on the outside of the box. Complete inspection of the inventory is possible.

Building 1608 contains classified items. Plant Operations is responsible for this igloo and its contents. Only five percent of the volume of Building 1608 is occupied. Complete inspection is possible.

Building 1609 is maintained by Technical Escort and contains ammunition, fuses and detonation equipment. Approximately five percent of the volume of the building is used to store this material. All items are sealed in wooden boxes and stacked to a height no more than three feet. All boxes are intact and labeled as to their contents. Complete inspection of the inventory of Igloo 1609 is possible.

Building 1610 is the responsibility of Plant Operations and contains classified items. The contents of Igloo 1610 occupy five percent of the facility's volume. Complete inspection is possible.

4.2.2.6 Storage Sheds - Plot 1-Plot 12, Plot 27 and Plot 28

The old Toxic Storage Area is located between Seventh and Eighth Avenue adjacent to "F" Street (Figure 2-3). There are 14 plots in this storage area, with two or three sheds on each plot. A total of 36 total sheds are present Currently, 28 sheds are used for storage and 8 are empty. All of the waste stored in the sheds is GB salts.

General Plot and Shed Designs

There are 14 plots in the storage area (Figure 2-3). Twelve of these are located within an earth bunker shield and the other two are outside of the bunkers, to the west. The bunkers are 12 feet high, running along the east and west sides of the plots and between each plot (except for the four northern most plots). The entire storage area is surrounded by barbed wire fence with a locking gate. Plant Operations has the key to this lock. On Plots 1, 7 through 12, and 28, there are three sheds each. Plots 2 through 6, and 27 contain two sheds each. Details of a typical shed are shown in Figure 4-19. The basic design of the sheds is the same except for length which ranges from 90 feet to 260 feet. The inside width of all sheds is 10 feet and the ceiling slants from nine feet four inches on one side to eight feet four inches on the other. Storeable volume of the sheds ranges from 7,500 cubic feet to 21,600 cubic feet. The total volume of all the sheds is 546,700 cubic feet. The floor is graded, compacted gravel with no type of spill control surface or impoundment. The walls, roofs and doors are corrugated aluminum siding tacked to four-inch by four-inch posts. Some sheds have doors on the ends while others are open-ended. The doors are six feet by three feet. The roof slants at a 10:1 grade from one side to the other. There is no lightning protection, electrical connections or plumbing connections in the sheds. Ventilation is natural and drainage off the roof is maintained by the slanted roofs.

Condition and Contents - Plot 1

Plot 1 is located in the northeastern most corner of the storage area. Three, 210-foot long sheds are located on this plot. The east and west walls and roof are intact. The south end of each shed is open. The north ends of two of the sheds have doors with locking clasps. One of the three sheds has an open north end. The three sheds on Plot 1 are empty.

Condition and Contents - Plot 2

Plot 2 is located directly west of Plot 1. There are two sheds on Plot 2, each 210 feet long. The east and west walls and the roof are intact and the north and south ends are open. The two sheds on Plot 2 are empty.

Condition and Contents - Plot 3

Plot 3 is located directly south of Plot 1. There are two sheds on Plot 3, each 210 feet long. The east and west walls and the roof are intact. The north and south ends of both sheds have functional doors. The eastern most of the two sheds is locked at both ends. Plant Operations has the keys to these locks. The sheds in Plot 3 contain 1,559 steel drums of GB salts. Approximately 70 percent of the sheds' volumes are occupied by drums. All drums are labeled and there is no indication of leaking drums. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 4

Plot 4 is located directly south of Plot 2. There are two sheds on Plot 4, each 210 feet long. The east and west walls and the roof are intact on both sheds. The north and south ends of both sheds are open. Plot 4 sheds do not contain drums of waste. There is, however, some miscellaneous equipment in the westernmost shed. This equipment occupies about five percent of the shed's volume.

Condition and Contents - Plot 5

Plot 5 is located directly south of Plot 3. There are two, 210-foot long sheds on this plot. The east and west walls and the roof of each shed are intact. Both the north and south ends of the sheds are open. The sheds on Plot 5 contain 3,297 steel drums of GB salts and occupy 70 percent of the volume of each structure. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 6

Plot 6 is located directly south of Plot 4. There are two, 210-foot long sheds on this plot. The east and west walls and the roof of each shed are intact. Both the north and south ends of the sheds are open. The sheds on Plot 6 contain 3,276 steel drums of GB salts. These occupy 70 percent of the volume of each structure. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 7

Plot 7 is located directly south of Plot 5. There are three, 180-foot long sheds on this plot. The east and west walls and the roof of each shed are intact. Both the north and south ends of the sheds are open. The sheds on Plot 7 contain 3,801 steel drums of GB salts and occupy 70 percent of the volume of each structure. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 8

Plot 8 is located directly south of Plot 6. There are two, 180-foot long sheds and one, 120-foot long shed on this plot. The east and west walls and the roof are intact. There are doors on the north and south ends of each shed. The sheds on Plot 8 contain 3,044 fiber drums of GB salts. These drums occupy 60 percent of the volume of each structure. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 9

Plot 9 is located directly south of Plot 7. There are two, 180-foot long sheds and one, 120-foot long shed on this plot. The east and west walls and the roof are intact. There are doors on the north and south ends of each shed. The sheds on Plot 9 contain 3,157 fiber drums of GB saltss. The drums occupy 65 percent of the volume of each structure. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 10

Plot 10 is located directly south of Plot 8. There are two, 180-foot long sheds and one, 120-foot long shed on this plot. The east and west walls and the roof are intact. There are doors on the north and south ends of each shed. The sheds on Plot 10 contain 3,236 fiber drums of GB salts. The drums occupy 70 percent of the volume of each structure. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend for the length of the sheds.

Condition and Contents - Plot 11

Plot 11 is located directly south of Plot 9. There are two, 120-foot long sheds and one, 180-foot long shed on this plot. The east and west walls and the roof are intact. The east and west sheds have doors on the north ends of and are open on the south ends. The middle shed has doors at both ends. The sheds on Plot 11 contain 2,687 drums of waste salt. There are 1,816 steel drums of GB salt and 871 fiber drums of GB salts. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties. The easternmost shed (120 feet long) is two-thirds full; the other two sheds are full.

Condition and Contents - Plot 12

Plot 12 is located directly south of Plot 10. There are two, 180-foot sheds and a 120-foot shed on Plot 12. The east and west walls and the roof are intact. The north and south ends of each shed are open. The sheds on Plot 12 are empty.

Condition and Content - Plot 27

Plot 27 is located on the western part of the storage area. There are two, 180-foot long sheds on this plot. The east and west walls and the roof of each shed are intact. Both sheds have doors on the north and south ends of the structures. There are 2,701 drums of waste salt in the two sheds on Plot 27, occupying 70 percent of the storage volume. Of these, 442 are steel drums with GB salts and 2,259 are fiber drums of GB salts. All drums are labeled and show no signs of leakage. The drums are stacked two high on railroad ties and extend the length of the sheds.

Condition and Contents - Plot 28

Plot 28 is located on the westernmost edge of the storage area. There are three sheds, a 260-foot shed, a 90-foot shed and a 180-foot shed. The east and west walls and roof of each shed are intact. The eastern most shed has doors on the north and south ends. The middle and west shed have open north and south ends. There are 1,158 steel drums of GB salts in the eastern shed of Plot 28. The other two sheds are empty. Twenty percent of the storage volume of Plot 28 is occupied. All drums are labeled and show no signs of leakage. Drums are stacked two high and extend the length of the shed.

4.2.3 Drainage Considerations

An investigation of the drainage patterns around each of the buildings was performed to determine the possibility of localized flooding as a result of intense rainfall events. The methodology consisted of inspection of site grading plans for each building followed by on-site inspections. The plans' inspection was used to note the following key features for each building:

- o General drainage patterns as evidenced by the topographic contour lines on the plans.
- o Closed basin areas in which water may pond.
- o Culverts or ditches whose failure or blockage may cause ponding of areas near the buildings.
- o Areas of concentrated flow that may cause erosion or scouring of important areas.

The purpose of the on-site inspection of the site drainages was to perform the following:

- o Corroborate the key features found in the plans inspection.
- o Note any alterations or variances from the plans.
- o Record any additional potentially harmful situations.
- o Describe ditch and culvert conditions, soil types, and vegetative cover.

The analysis of drainage conditions was qualitative. The areas around the buildings had approximately 30 years to develop characteristics such as ponds, gulleys, or built-in ditches that are indicative of improper drainage design. Lack of these characteristics illustrates that the drainage patterns are at least adequate for the rainfall or snowmelt events that have occurred during the last 30 years.

Contaminated Wheat Storage - Building 354

Building 354 is built on compacted fill which slopes away from the building at approximately 0.5 percent. The building's downspouts end at concrete splash pads to direct water from the building's foundation. The area is vegetated in grasses and forbs with nearly 100 percent coverage. No drainage problems were found at Building 354. The built-up loading docks are approximately four feet above ground level and are protected from roof runoff by rain gutters. There are no indications of ponding or excessive erosion.

Storage Warehouses - Buildings 785-788, 791, and 793-798

The salt storage warehouses were constructed in 1952 and 1953 along "E" Street and December 7th Avenue. The average land slope in this area is approximately 25 feet per mile (0.5 percent) and dips towards First Creek to the northeast. Soil types are generally clayey sands or sandy clays with moderate permeability. The area is vegetated with grasses and forbs with close to 100 percent cover in the areas that are not maintained and between 50 and 100 percent cover in the maintained areas around the buildings.

The site grading plans for these buildings show that the buildings are built up on compacted fill which typically slopes away from the buildings at approximately 0.4 percent. The entrance way to each building is fronted with a gravel apron and driveway for vehicular access. The building downspouts routinely end at a small concrete splash pad that directs the water away from the building. Figure 2-3 illustrates the overall drainage conditions for the salt storage buildings area.

The on-site inspection revealed no major drainage problems. The built-up areas around each building are high enough and slope sufficiently to direct water away from the buildings. No indications of ponding, excessive erosion, or in ditches and culverts in need of maintenance were observed. The natural slope of the land and presence of ditches in addition to the natural drainage quickly remove water from the area.

Concrete Storage Huts - Buildings 871A-D, 872A-D, 873A-C, and 874A-D

These concrete storage huts are elevated approximately four feet above the natural ground surface with the exception of Buildings 871A, 871B, and 871C. The latter buildings are approximately 1.5 feet above the ground surface. Figure 2-4 illustrates the general drainage conditions of the area. The southern one-third of the area drains to the west through a culvert under the perimeter road. The eastern half of the remaining area as well as the north-west corner flows to the northeast to exit through another culvert. Three minor sumps in the west-central portion of the area collect water from small closed basins. The road junction near Building 873B may be flooded for a time following an intense storm event. However, these sumps pose no flooding hazard to the elevated buildings in the area. Two shallow V-ditches between Buildings 871A, 871B, and 871C enhance the drainage of the northeast corner of the area so that these buildings are not susceptible to flooding.

Earthen Concrete Bunkers - Buildings 881 - 886

Buildings 881 through 886 lie near Upper Derby Lake which is a cattail-filled wetland surrounded by cottonwoods. The sandy soil of the area precludes large amounts of runoff except during the most intense storms. There is no gullying in the area. Although in close proximity to the wetlands, Buildings 885 and 886 are at least five feet above the most recent high water mark of the wet-lands. None of the buildings are in the 100-year floodplain. Runoff from the roof of the buildings is directed to the rear of the building via rain gutters and elongated spouts. The concrete pad at the entrance way to the buildings is sloped away from the door. Thus, these buildings are relatively safe from flooding or drainage problems.

Concrete Magazine Igloos - Buildings 1605, 1608 - 1610

The area around these buildings slopes strongly to the east and is surrounded by roads with cut banks. The berms on three sides of the magazines direct water away from the buildings. The concrete entrance ways are shallowly sloped away from the doors towards the perimeter roads. Although a minor dam between the road and the magazine (i.e., a line of snow from snow plowing operations) could cause ponding in front of the door and subsequent seepage into the magazine, the occurrence of such ponding is unlikely considering the attention to which maintenance of clear entrance ways is given. No other problems exist in the area.

Storage Sheds - Plots 1 through 12, 27, and 28

These storage plots are located east of First Creek in Section 31. Each plot contains two or three long, aluminum-sided, gravel-floored storage buildings. The gravel floors of the buildings are slightly built up from the surrounding ground surface. The sides of the buildings do not come into contact with the ground surface to halt or redirect overland flow. During intense rainfall events, overland flow could pass through these buildings. Each pair of plots (1 and 2, 3 and 4, etc.) is surrounded by 12 foot earthen berms with the only opening in the berm being the road between the plots (Figure 2-3). The drainage from Plots 1 through 8 travels northward along this road where it exits the site. Several areas show evidence of ponding within these plots but these areas are well away from any storage buildings. Plots 9, 10, 11 and 12 drain into the southwest corner of their respective berms. The water ponds there to evaporate and/or infiltrate into the soil. No flooding hazard is apparent to the buildings in these plots. Plots 27 and 28 are constructed on a westward sloping hill and are not surrounded by bunkers. The drainage passes around Plot 27, enters an excavated area below the building, passes under a gravel road through a culvert, then passes around Plot 28 as it makes its way toward First Creek. The area should experience no flooding except possibly for minor amounts of runoff that would pass into or through the buildings during intense rainfall events.

4.3 TANKS

Three facilities at RMA are classified as treating and/or storing wastes in tanks. These include the hydrazine blending facility, South Plants spray dryer, and the laboratory wastewater treatment facility (Figures 2-1 and 2-7). The hydrazine blending facility is used periodically to blend Aerozine

50 missile fuel. The spray dryer is maintained in standby status. The laboratory wastewater treatment facility stores and treats water from the RMA laboratory facilities.

4.3.1 Hydrazine Blending Facility

A detailed discussion of the hydrazine blending facility is presented in "Standard Operating Procedures for Plant Operation Branch, Air Force Propellant Blending Facility" (1982). During the blending process, the off-gases are scrubbed with water. This water is collected in a 44,000 gallon sump and pumped to two storage tanks on the east end of the plant. These tanks have capacities of 50,000 and 200,000 gallons and are made of carbon steel. Spillage, wash-down water and area runoff also enter the sump and are pumped to the storage tanks.

Hydrazine Waste Sump

The hydrazine waste sump is located south of the hydrazine blender (Building 756) (Figure 2-7). This sump is gravity fed by the storage area catch basins, blender fume scrubber, waste drains in the blender facility and the steam expansion line from Building 755. The waste materials are carried to the sump by underground pipes. The contents of the sump are neutralized by batch treatment with calcium hypochlorite. The pH is maintained between 7 and 10. To attain these pH values, solid hypochlorite is added to the sump. Mixing of the waste and hypochlorite is accomplished by recirculating the sump contents through a pump.

The sump is constructed of reinforced concrete. The base of the sump is at a minimum of ten inches thick and is underlain by at least four inches of gravel. Reinforcing is provided by crisscrossed No. 4 rebar at twelve inch spacing. All concrete is 3,000 psi. The base slopes to the southwest where the pump is located. The walls are made of similar construction.

The sump is rectangular in plan view. Inside east-west dimensions are 40 feet while the north-south inside dimension is 26 feet. The height of the walls are 7.5 feet above the base.

All construction joints have rubber water stops. All splices between the floor slab and walls are bonded with cold weatherstop joint kit material. All metal form work and holes were grouted to make a water tight wall.

When the sump is emptied, the waste is pumped to two storage tanks (Tanks 805 and 463D) located on the east side of the facility (Figure 2-7). The waste is transferred by a sump pump located in the southwest corner of the waste sump. This pump is a 7 1/2 HP, 1750 RPM, 220/440 volt, 60 cycle explosion proof, Class 1, Group "D" unit. The motor is manufactured by Louis Allis Company and the pump is made by Yeoman Company.

Tank Storage

The waste is pumped through a flexible firehose which extends to the southeastern portion of Building 757. There, it is connected to pipes that are elevated on stanchions for final transport to the tank storage area. At the tank area, the waste is pumped into the tanks through inlets at the top. The tanks are filled independently. These tanks are labeled as Buildings 805 and 463D by RMA and have 50,000 and 200,000 gallon capacities, respectively. The tanks are 3/16-inch diameter steel plates that rest upon three inches of sand and another 3/16-inch section of steel plate. The outer sides and tops of the tanks are coated with six inches of polyurethane foam. Felt and sprayed asphalt form an asphalt barrier at the inner base of the tanks. The dimensions of the tanks are:

TANK	CAPACITY	HEIGHT	DIAMETER
805	50,000 gal	15'2 1/2"	24'0"
463D	200,000 gal	29'5"	34'3"

Both tanks are equipped with tank level indicators and have ladders for access to the top. At the top of each tank is a three inch welded neck flange and valve and blind flange and several vents.

Each tank is surrounded by an eight-foot high reinforced concrete wall and is underlain by a one-foot thick concrete pad. Dimensions of the berm for the 50,000-gallon tank are 33 feet by 33 feet and 65 feet by 65 feet for the 200,000-gallon tank. This resulting secondary containment system is capable of holding at least the volume of the tank it surrounds. Inside the containment system, sump pumps and gravity drains exist to permit controlled discharge should an overflow or breach of the primary containment vessel occur. Wastewater that is spilled can return by gravity flow to the wastewater sump.

Access to the hydrazine sump and storage area is controlled. A system of two fences encircles the facilities and the site is security patrolled. The hydrazine blending facility is located in an area of RMA with limited access. No privately-owned vehicles or personnel without permission are allowed in the area.

4.3.2 South Plants Spray Dryer

The South Plants spray dryer is located adjacent to Building 540. This spray dryer was manufactured by Bowen Engineering and is similar to the North Plants spray dryer. Due to the similarity between the two dryers, a description of the operation is not presented here. Refer to Section 4.4.2, the description of the North Plants incineration complex.

4.3.3 Laboratory Wastewater Treatment Facility

Wastewater from the laboratories in Buildings 313, 741 and 743 is collected by drains and conveyed to a storage tank (Figure 2-7). The waste is pumped through underground three-inch diameter pipe. Where this pipe passes over other buried lines, a concrete encasement surrounds the waste line for ten feet on each side of the cross over. At selected intervals manholes provide access to gate valves which may be used to control the flow. The stored contaminated wastewater is then transferred to a wastewater treatment plant located in Building 540. The treated effluent is discharged into the RMA sewer system where it is again treated in the sewage treatment plant and discharged under NPDES Permit Nos. CO-0030061 and CO-0021202. The specifications and flow are described below.

Wastewater Tank

Contaminated wastewater from Buildings 313, 741 and 743 enters the tank for storage prior to treatment in Building 540. The tank is made of carbon steel and is 35 feet in diameter and 24 feet high. The capacity of this tank is approximately 170,000 gallons.

The edges of the tank are supported by a ring beam foundation. This reinforced concrete foundation is circular, six feet in depth, and has a width of 10 inches. The reinforcement consists of vertical No. 4 bar at 12 inch centers and horizontal No. 6 bar at 11 inch centers. Sixteen 7/8-inch diameter anchor bolts secure the tank to the ring foundation. Immediately underneath the tank is four inches of gravel/crushed stone. Underlying this layer is 5'8" of a compacted gravel and sand mixture (GW).

The tank is surrounded by a berm to prevent spills or overflows from leaving the site. This embankment is three feet higher than the tank base. Dimensions of the berm are 65 feet by 85 feet. The berm was designed to contain at least the volume of the tank it surrounds. The embankment and all areas within the resulting containment are covered with a three inch layer of bituminous pavement. This pavement is sloped to the northwest corner of the facility where a three foot deep by three foot diameter reinforced concrete sump concrete is located. This sump is used as a recovery area for any spilled materials.

Access to the embankment and tank facility is controlled by a six-foot high chain link fence that has line and corner posts anchored in concrete. A one foot high extension arm on top of the fence has three strands of barbed wire.

The tank is equipped with a ladder for access to the top where a roof hatch and vent are located. Also at the top is an entrance for a three inch steam line which prevents wastes from freezing within the tank. Temperature within the tank is monitored through a temperature well and switch located 1.5 feet above the base of the tank. Should the temperature become too low or high, an alarm is activated to warn operations personnel.

Liquid levels are also monitored in the tank. A low level alarm is located 3.0 feet from the tank base and a high level alarm is located three feet from the top of the tank. A six inch overflow pipe is provided for any overfilling of the tank. Should this occur, water would flow to the previously described sump in the northwestern portion of the facility.

Wastewater Treatment Plant

Contaminated water from the wastewater storage tank is conveyed continuously at a rate of approximately two gallons per minute to a small treatment system located in Building 540. An underground three-inch diameter pipe is used to convey the wastewater. The water first passes through a 100 micron prefilter to remove suspended solids. The wastewater then enters a six foot high, 18 inch diameter activated carbon column. This unit contains approximately 120 pounds of activated granular carbon. After passing through the carbon column, the effluent enters a six foot high, six inch diameter activated alumina column. The activated granular carbon is effective in removing organic compounds while the activated alumina removes inorganic species (mostly fluoride). After treatment, the water is discharged into the sanitary sewer. The sewer transports the waste to the sewage treatment plant in Section 24.

4.3.4 Drainage Conditions - South Plants Tank Facilities

The area around Building 540 (the South Plants spray dryer and wastewater treatment facility, Figure 2-7) is covered with asphalt or gravel. The area to the south and east of the buildings drains southward to a V-ditch which carries the water eastward through several culverts and turns northward to eventually pass under the railroad tracks. The area north of the buildings drains eastward along the railroad tracks and flows into the same ditch. No drainage problems are evident. Inconsequential ponding could occur in the asphalt or gravel-covered areas but would not reach the buildings. Blockage of the culverts or ditches would cause localized ponding, but the pond would quickly overtop the roadway and continue flowing downstream before reaching the buildings.

4.4 NORTH PLANTS INCINERATOR

The North Plants incinerator (Building 1611) and associated spray dryer (Building 1703) are considered jointly in this Part B Application. The incinerator complex was recently used to demilitarize Chemical Agent Identification Sets (CAIS). This program was completed in December 1982. Following program completion, the incinerator was cleaned and modified. Incineration of DDT-contaminated ammunition began in January 1983.

A Colorado Department of Health Air Emission Permit has been granted for the DDT-contaminated ammunition incineration. The next program, scheduled to begin in mid-1983, will be incineration of adamsite (DM) in bulk and grenades.

No requests are being made for exemption status. All wastes are assumed to be hazardous based on testing protocol or knowledge of waste characteristics. Results of the ongoing DDT program are presented. An alternative trial burn submission is being presented in lieu of an actual trial burn for adamsite. Results of the completed CAIS program are presented in support of the ongoing DDT program and the future adamsite program. Due to the demonstrated efficiency of the North Plants incinerator during past operations, a trial burn is not necessary for these new feed materials. In addition, the small quantities of the new waste materials are such that all of the waste would be incinerated during a test burn sufficient to meet RCRA requirements.

4.4.1 Analyses of the Wastes

The composition of the waste including identification and quantification of hazardous organic constitutents was provided in Section 3.4 as follows:

Waste	Status	Composition
CAIS	Completed	See Section 3.4.1
DDT-Contaminated Ammunition	Currently being incinerated	See Section 3.4.2
DM (Adamsite)	To be incinerated	See Section 3.4.2

Comparisons of the types of wastes will be discussed in more detail in later sections that provide the results from the CAIS and DDT-contaminated ammunition programs.

4.4.2 Engineering Description of the Incinerator

The detailed engineering description of the incinerator and the spray dryer is found in Volumes 6 and 7, Technical Description, Chemical Agent Identification Set (CAIS) Project Documentation prepared for the Department of Army, Rocky Mountain Arsenal by Stearns-Roger Engineering Corporation (1979 with revisions). This 10-volume project documentation was also revised in 1982 and 1983 to accommodate the DDT-contaminated ammunition program and is also referred to as the North Plants Incinerator Project Documentation. The following summary is modified from the Stearns-Roger's discussion and description. The incinerator facilities are located in Building 1611. The basic components of the incinerator system include:

- Negative pressure ventilation systems for all building process areas.
- A separately ventilated control room with observation windows overviewing the operational areas.
- Electronically interlocked air locks with decontamination facilities for personnel and material entry and/or exist.
- A deactivation furnace (rotary kiln) for disposal of hazardous material.
- A decontamination furnace for incineration or decontamination of large material items.
- A packed column exhaust scrubber system which handles both the building ventilation air and furnace exhaust.
- A five field, dry type electrostatic precipitator for particulate removal.
- Material handling systems for all areas of the building.

- o Utility and support services.
- o A spray dryer (Building 1703) capable of drying process brine into dry salts.

Figure 4-20 is a flow diagram of the incinerator process that depicts operating conditions during the CAIS program. Figure 4-21 presents the floor plan of Building 1611. Figure 4-22 is a schematic diagram of the salt solution storing, drying and drumming processes. The following paragraphs describe the components of the incineration complex in more detail.

Ventilation System

The process and process control portions of Building 1611 are serviced by three air handling units. Air Handling Units (AHUs) 1 and 2 are heating and ventilating units that supply all fresh outside air. The units filter, heat (if necessary), and circulate air to process areas. Air Handling Unit 3 is an air conditioning unit that services the Control Room and Observation Room with conditioned recirculated air while also supplying fresh outside air. Tables 4.3 and 4.4 contain measured and design flows for the incinerator system at various locations. Tables 4.3 and 4.4 provide flow information measured in August 1979 and September 1981, respectively. A schematic of the air flow distribution is contained in Figure 4-23.

The volume and air pressure to each process are controlled by dampers and booster fans that are placed to attain the desired air circulation and balance. All process areas are kept at negative air (static) pressure ranging from minus 1/4-inch water gauge to minus 1 inch water gauge. The pressure and air change rate scheme were designed so that the air flow is from less likely contaminated areas to more likely contaminated areas.

Special ventilation provisions were made for process stations where release of agent was considered more likely. The glovebox in the Disassembly Room, used for disassembly of all the CAIS sets in metal shipping containers (pigs), is equipped to exhaust agent vapors if they are present. The glovebox is not used for the DDT-ammunition incineration nor will it be used for the adamsite program. However, the glovebox is described here since it may be used in the future. Air is drawn through the glovebox in the direction of material flow so that possible exposure to the downloading operators is controlled and backflow into the glovebox of any residual agent evaporated from sets during incineration is eliminated. This glovebox air is subsequently exhausted into the system afterburner to ensure complete destruction of any agents.

The discharge air from the rooms is routed through ducts to a mixing section between the electrostatic precipitator exhaust and the scrubber gas inlet. In this section, all the ventilation air is combined with the furnace exhaust gases prior to being passed through the building scrubber system.

Control Room

Building 1611 has separate Control and Observations Rooms (Figure 4-21) which allow direct visual and television monitoring of operations. The Control Room is equipped with the necessary process monitors and alarms to ensure correct operation of the system. It also has a micro-processor for controlling critical systems functions and an event recorder and teletype for equipment status verification and control.

Air Locks

Entry and egress from all potentially contaminated areas are through interlocked air chambers (Figure 4-21). These facilities also include personnel showers and undressing areas with observation windows and separate ventilation exhaust ducting. These facilities are also used to process personnel in full or lesser protective outergarments.

Deactivation Furnace

The deactivation furnace is a screw mover variable drive unit (rotary kiln) that was used to destroy the agent set contents. It is used as the first step in the destruction of the DDT-contaminated ammunition. It is a U.S. Army-APE 1236 Model. This furnace is a four-inch thick cast alloy rotary kiln, approximately twenty feet long and three feet in diameter. On its interior surface is an integral cast helix which causes material to proceed through the furnace at a rate proportional to the rotational speed of the kiln. The kiln can also be batch operated or operated in reverse. The furnace is fired with fuel oil by a burner at the discharge end and is equipped with 1 Hauch Model 783P burner/nozzle. Furnace gases exhaust from the kiln input end. Operating parameters follow:

- Normal exhaust gas temperature range: 350°F to 500°F.
- Normal burner end operating temperature: 1100°F.
- Furnace hold time for Chemical Agent Identification Sets: Approximately 36 minutes.
- Residence time of the gas: typically 0.8 sec.
- Rotational speed was 1/3 rpm for the CAIS program and is 2 rpm for the DDT-contaminated ammunitions program.

Because the combustion products of this furnace leave through the same end that the contaminated materials enter, the exhaust gas residence time in the furnace depends on when the contaminated products are released within the furnace. This time may be from fractions of a second up to one second. Typical residence time for the gas and volatized waste is 0.8 seconds.

Afterburner

The combustion products from the deactivation furnace pass through an oil fired afterburner which is located on the roof of the Deactivation Furnace Room. The afterburner was built by Refcon to U.S. Army specifications and is equipped with 2 Hauck NMC220 burners/nozzels. The afterburner measures 32.5 feet from its inlet to outlet. The actual combustion chamber is 30 feet long with an inside diameter of 73 inches. The afterburner has a carbon steel outer shell with a replaceable refractory lining (insulation firebrick, 4.5 inches thick).

Gases from the deactivation furnace and the disassembly glovebox enter the afterburner at temperatures of approximately 400°F and are raised to a minimum of 1650°F. The dwell time of the gas (and volatized waste) at 1650°F or higher is a minimum of two seconds. Exhaust from the afterburner is mixed with the air from the Deactivation Furnace Room in order to lower the exhaust temperature before it enters the air mixing and quench system.

Decontamination Furnace

The decontamination furnace is a rectangular structure approximately eleven feet by eleven feet by eight feet high (outside dimension). Heat is supplied by five oil fired, gas piloted, forced draft, proportioning burners. The burners/nozzels are Hauck 779P type. This furnace has two zones: Zone 1 which can be used between 1200°F and 1800°F, and Zone 2 which can be maintained at a maximum of 1800°F. Material to be decontaminated is fed into Zone 1 of the furnace. Temperatures in the two zones are controlled automatically by positioning the burners to high or low fire, as required. Burner ignition and flame safety are controlled and monitored by one system. Zone temperatures are controlled separately.

The differential pressure between the furnace and atmosphere is sensed and transmitted to a differential pressure indicator controller that is calibrated to control furnace pressure about a specific set point from 0 to -1 inch water. If the differential pressure sensed is different from the set point, the controller will cause a pressure control damper in the stack to change its position and return the differential pressure to its normal operational value.

During incineration of the CAIS, exhaust gases from the decontamination furnace were exhausted to the quench system. Modifications have been made and the exhaust gases from the decontamination furnace now proceed to the afterburner.

Quench

Exhaust gases from the afterburner enter the quench chamber (Figure 4-21) where they are cooled by evaporation to a temperature of approximately 225°F and approximately 80 percent relative humidity. The quench liquid is maintained at a pH above 9 by the addition of sodium hydroxide. The resulting sodium hydroxide/sodium carbonate solution neutralizes any acid gases produced (e.g., HCl) by the incineration. The quench liquid flow is not monitored; however, pump pressure is monitored to determine if blockage in the line has occurred.

Electrostatic Precipitator

The cooled and humidified exhaust from the quench is processed through an electrostatic precipitator (EP) (Figure 4-21). The EP is a conventional dry type dust collector with wire-type discharge electrodes and plate-type collecting electrodes. The unit was manufactured by Precipitator Pollution Control Systems. It is a five stage precipitator in that the charging and collection of particles takes place in each field of the system. The precipitator is used to control the emission of particulates to the environment. The particulates consist mainly of varying combinations of fly ash and metal oxide, depending on the type of materials incinerated. The air volume at the inlet is approximately 14,000 ACFM at 200°F and 24.4 inches Hg. This calculates to a gas velocity through the EP of 3.5 feet per second. The total collecting surface area per field is approximately 2240 square feet. Each collecting plate is 8 feet by 14 feet and 10 plates comprise a field. Dust collected from the air stream is removed from the collection plates by intermittently rapping the plates in each field sequentially. This task is performed automatically at preset intervals. The dust drops into a hopper under each of the five fields. Each hopper is designed with a 60 degree valley angle and has a capacity of 900 cubic feet. From the hoppers, the dust is removed and placed into metal drums for storage.

Scrubber System

The exhaust from the electrostatic precipitator mixes with the remaining building ventilation air prior to entering the packed tower scrubbers. These scrubbers, which are located south of Building 1611 (Figure 4-21), are designed to remove gas vapors and acid mists. The system equipment consists of two packed column scrubbers, three scrubber pumps, one vent stack, two exhaust fans, air ducts, piping for caustic soda, potable water and steam, and associated instrumentation and controls. Each scrubber consists of a vertical cylindrical column packed with 1 1/2-inch diameter polypropylene pall rings in two sections.

The scrubbers have an internal diameter of 11 feet 5 inches and are approximately 65 feet in height. The two packed sections are each approximately 12 1/2-feet high. The remainder of the height in the scrubber is occupied by a liquid sump at the bottom, bed support plates, limiters, mist eliminators, distributors and redistributors.

The ventilation air enters the scrubber near the bottom, travels upward through the column packing and leaves through the top of the scrubber. The differential pressure is set to range from 1.5 to 4 inches water. A caustic/carbonate solution is pumped at approximately 650 gph and enters near the top of the scrubber where it is distributed over and falls through the packing. The solution collects in the sump at the bottom of the scrubber to be recirculated or pumped to Building 1703 tanks for later spray drying.

Utility Services

Utility and support services exist in the current facility for all building requirements. Caustic soda is supplied to Building 1611 from an existing system that serves other RMA requirements. Potable water is supplied to the building and used for personnel showers and in the quench/scrubber systems. Steam is provided by means of a local boiler for use in building heating and for control of scrubber freezing and sedimentation during cold weather.

The facility has separate domestic and process waste systems. The process waste stream from floor drains and room sumps is piped to a waste tank in the building. From there, it is pumped to the Building 1703 storage tanks. From the storage tanks, it is fed to the spray dryer to produce a dry salt.

Electrical power is provided to Building 1611 from the commercial RMA distribution system. It is augmented by an emergency generator system located in Building 1713.

Natural gas is provided by an underground piping system. Fuel oil used in the deactivation furnace, afterburner and decontamination furnace is stored in a 200,000 gallon tank (Tank 1510). No auxilliary fuel system is utilized. Fuel oil supply is regularly monitored and reported to assure no interruption.

Spray Dryer

The spray dryer, located in Building 1703 (Figure 2-8), removes water from the brine solutions which result from scrubbing and quenching the exhaust gases with sodium hydroxide and carbonate. To accomplish this task, the brine is atomized and evaporated. Salts are collected in cyclones and received in a hopper. The collected salts are then compacted, placed in sealed drums and stored. The air from the cyclones passes through a venturi scrubber that traps fine particles that may have escaped separation in the cyclones. The air stream then passes through a cyclonic wash scrubber. This process is the final polishing step prior to exit from the stack. The scrubber water is recycled through the feed system so that it may pass through the spray dryer. Figure 4-22 is a schematic of the salt storing, drying, and drumming processes.

The spray dryer was manufactured by Bowen Engineering and was designed to resist seismic and wind forces as prescribed by the Uniform Building Code. The drying chamber and all components that come in contact with the feedstock are made of eleven gauge, 304L stainless steel. The drying chamber has observation and lighting windows to allow the operator to visually inspect the inside of the chamber to determine if any buildup of wet or dry materials is occurring. The dryer is fired with natural gas and/or fuel oil had a maximum evaporating capacity of 30 gallons per minute for the CAIS feed stocks.

In addition to the salts from the spray dryer, residues from the electrostatic precipitator, quench and furnaces are drummed and stored. A discussion of the storage methods is presented in Section 4.2.2.

Automatic Waste Feed Cutoff System

Waste entering the incineration system must first be loaded into the box feed chute. A door is located on the chute before the deactivation furnace. This door is activated by pneumatic cylinders. In the event of a malfunction or emergency, the door is closed by signals sent from the microprocessor in the control room. The microprocessor monitors the activities listed below. The doors will remain open and waste can enter the incinerator only if the following conditions exist:

- Conveyor room supply fan damper is open (5 second delay before closing door).
- Deactivation conveyor room supply fan is on.
- EP is on.
- Afterburner temperature is not low.
- Deactivation furnace temperature is not low.
- Scrubber inlet temperature is not high.
- Deactivation blower is on.
- Retort (deactivation in furnace) is on.
- Afterburner control is on.
- Deactivation furnace is not flamed out.
- High agent alarm stack is normal.
- Glove box differential pressure is not low.
- Decontamination module differential pressure is not low.
- Scrubber #1 flow is not failed.
- Scrubber #2 flow is not failed.

- Scrubber fans 1 and 2 are on.
- AHU-1 motor is on.
- AHU-2 motor is on.
- Humidifier tank fill failure is off (3 minute delay before closing door).
- Decontamination furnace or room differential pressure failure is off (5 second delay before closing door).
- Afterburner is not flamed out.
- Deactivation blower is enabled.
- Retort is not in oscillate mode.
- Mask alarm is normal.
- Caustic flow is on.
- Box feed chute enable switch is on.

If any of the above conditions is not met, the doors to the box feed chute will be closed by the microprocessor and waste flow into the system will be shutoff.

Temperature, Pressure and Flow Monitoring Devices

The location of valves controlling pressure and flow rates for the deactivation furnace, decontamination furnace, and afterburner are shown on the schematics in Figures 4-24, 4-25 and 4-26, respectively. These valves control and monitor fuel and air pressure and flow rate. Additional temperature monitoring equipment (temperature elements) not located on these schematics are present in the three incinerator units (deactivation furnace, afterburner and decontamination furnace).

In the deactivation furnace three temperature elements exist. These elements generate electrical signals that are proportional to the temperature. One is located at the burner end, another is located at the stack end and the third element is located at the burner end of the retort hood. The electrical signals are sent to the control room where they are continuously recorded. Out of limits temperatures sensed by the recorder are sent to the micro-processer or displayed on the control panel. The temperature controller also initiates a preportional electrical signal to the temperature control drive unit located at the deactivation furnace. If the actual furnace temperature is different than the desired furnace temperature, the controller sends a signal to either further open or close the preportioning oil burner valve. The desired temperature is usually set and stabilizes at 1100°F.

Temperature elements also exist in the deactivation furnace. Their locations are in furnace zones 1 and 2 and the flue collector. Zone and stack temperatures are transmitted to a recorder for continuous monitoring. The zone temperatures are also transmitted to two temperature controllers. When zone temperatures do not correspond to the set point temperatures, the controls cause the temperature control drives at the furnace to reposition the burner(s) to the high and low fire positions.

The afterburner is equipped with five thermocouples. One senses afterburner inlet temperature, and two sense the chamber temperature, the fourth senses the outlet temperature while the final thermocouple senses the inlet cooling air temperature. All five temperatures are monitored and recorded continuously. The burner end temperature should read 1850 ± 50°F while the exhaust end should read 1700 ± 25°F. Values are manually read every 30 minutes and adjustments made if necessary. Control alarms also sound if the afterburner chamber temperature is too high or low.

4.4.3 Summary of CAIS and DDT-Contaminated Ammunition Incineration Programs

An alternative trial burn submission is being presented in lieu of an actual trial burn for the adamsite bulk and gernades [40 CFR 122.25(b)(5)(iii)]. Results of the CAIS trial burn; Phases I, II and III of the CAIS incineration; and the DDT-contaminated ammunition program (in progress) are summarized in this section. These results are included to indicate the performance efficiency of the incineration complex in support of the proposed program. The proposed adamsite program is described in Section 4.4.4.

4.4.3.1 CAIS Trial Burn

A pilot test for the CAIS was conducted at the North Plants Incinerator from April 28, 1979 to December 7, 1979. The complete report of the trial burn is contained in the Final Pilot Test Report, Volumes I, II and III and was prepared by Scott et al. (1979) of USATHAMA and RMA. Data from this report are summarized below. The objectives of the CAIS trial burn were to determine if the North Plants incinerator had the capability to:

- Control concentrations and emissions of all agents and hazardous compounds within the established allowable limits.
- Incinerate CAIS at or near ultimate production rates.
- Reduce the sets to residue free of agent contamination.
- Provide a safe working environment for all personnel.
- Completely thermally decontaminate all metal hardware to a "XXXXX" condition (safe for release to the public).
- Comply with state of Colorado particulate emission and opacity standards that were in effect at the time of the trial burn.

Waste Analysis

Chemical and physical analyses of the wastes that have been incinerated are presented in Chapter 3.0. For the test burn the following agents were tested:

- CG (Phosgene)
- CN (Chloroacetophenone)
- HN-1 (Mustard)
- HN-3 (Mustard)
- H (Mustard)
- L (Lewisite)
- PS (Chloropicrin)
- HD (Mustard)
- CK (Cyanogen Chloride)
- GA (Tabun)
- DM (Adamsite)
- Various simulants

Tables 3.5, 3.6, 3.7 and 3.8 of the previous chapter summarize the contents of the different types of kits and associated agents used in the trial burn. The chemical and physical properties of the agents are provided in Section 3.4.1 and Appendix 3A.

Sampling and Monitoring Procedures

During the trial burn, air samples were collected in the work area and at the stack. Location of the sampling points are indicated in Figure 4-27. In addition, the analyzed compounds, collection device, sampling rate, analytical technique, sampling interval and the detection limits are provided in Table 4.5. Detailed procedures concerning the analytical techniques are found in Volume III, Appendix K of the Final Pilot Test Report. The exact location of the 11 sampling points follow:

- Control Room - Equipment was positioned adjacent to the west stairwell's balustrade and near the west wall of the room. The air sweep in this room was from east to west which favored the placement of sampling equipment near the west end of the room.

- Disassembly Room - Equipment was positioned adjacent to the north wall and as close as possible to the west wall and box feed chute work areas without blocking the door to Airlock No. 4. Again the air sweep in this room was from east to west favoring the western placement of air monitoring equipment.

- Residue Handling Area - The equipment was placed into a small wooden shelter, which was located outside of and adjacent to the west wall of the compacting room and adjacent to the south wall of the west doorway leading from the residue area to the compacting room. Sampling was done via teflon tubing through the shelter wall. The MIRAN 80, which sampled residue handling area air via a teflon tube, was located in Airlock No. 6. This location was selected because of limited space in the residue area and to facilitate possible use of the MIRAN to sample other areas.

- Stack Monitoring Station - This monitoring station was located in a small building, constructed around both stacks, approximately 26 feet above the ground.

- Deactivation Furnace Room - The monitoring equipment in this room was positioned south of the furnace and adjacent to the south wall near the deactivation furnace discharge conveyor.

- Conveyor Room - Air monitoring equipment was placed underneath the top flight of stairs near the decontamination furnace transfer conveyor.

- Hopper Room - Equipment was placed into a small, sheet metal, shelter located adjacent to and outside of the north wall of the hopper room. Sampling was conducted via a sample line which ran through the north wall into the hopper room.

- Decontamination Exit Shroud - The monitoring equipment was placed into a small wooden shelter and located north of the west doorway, leading from the residue area to the compacting room and adjacent to the south side of the exit conveyor. Sampling was done, via tubing, through the exit shroud wall.

- Decontamination Furnace Room - Monitoring equipment for this station was located in Airlock No. 6 adjacent to the northwest corner of the airlock. Sampling lines were run through the wall into the decontamination furnace room.

- Spray Dryer Stack - Equipment was located in the sampling shack on the stack.

- Spray Dryer Work Area - Equipment was located near the salt compacting area.

Test Schedule

During the pilot test, which was conducted from October 1, 1979 to December 17, 1979, a total of 1761 CAIS were incinerated. The test was divided into two phases. The purpose of the first phase was to determine the systems' ability to process all types of CAIS. The purpose of the second phase was to demonstrate sustained production rates for each set. Phase I, from October 1 to November 6, consisted of 32 tests of the incinerator and spray dryer. In this phase, 1010 kits were destroyed. Phase II, from November 6 through the end of the pilot test, destroyed 751 kits in an additional five tests. Tables

4.6 and 4.7 summarize the dates, test numbers, set type, number of sets and chemical agents destroyed in Phases I and II of the trial burn.

Results of Trial Burn

Because the trial burn was conducted prior to the promulgation of RCRA incinerator regulations, some of the suggested measurement were not performed. The majority of the collected information is presented in Appendix 4A and summarized below.

Feed POHCs - As shown from the compositional data concerning the CAIS, the following organic compounds present are listed in 40 CFR § 261, Appendix VIII:

- o Chloroform
- o Cyanogen chloride
- o Mustard and Nitrogen Mustard
- o Phosgene
- o Potassium cyanide

Lewisite and adamsite would be considered in the group "Arsenic and Compounds, N.O.S. (not otherwise specified). These compounds would technically be considered the Principal Organic Hazardous Constituents (POHCs). In addition, other agents present are also considered hazardous constituents. Tables 3.5 through 3.8 in the previous chapter provide the percent of agent and/or POHC in each set.

Emissions of POHC's and Hazardous Combustion Products - As previously indicated, the test burn was conducted prior to development of RCRA incinerator standards. Air emissions at the stack collection device were monitored for the following agents or compounds:

- o Phosgene (CG)
- o Chloroform
- o Cyanogen chloride (CK)
- o Chloroacetophenone (CN)
- o Sarin (GB)
- o Mustard (H)
- o Lewisite (L)
- o Chloropicrin (PS)
- o Inorganic arsenic (As)
- o Nitrogen oxides (NO_x)
- o Sulfur dioxide (SO_2)

Analysis of Scrubber Water and Residues - Chemical analyses were conducted on samples from the quench system and the east and west scrubber. These samples were analyzed for hydroxide, carbonate, bicarbonate, pH, specific gravity, temperature and dissolved solids. These analyses are presented in Appendix B of the Final Pilot Test Report which is included as Appendix 4A to this application.

Agent Destruction Efficiency - Agent destruction efficiencies for specific agents and CAIS are provided in Table 4.8. These efficiencies were summarized from Volume I, Final Pilot Test Report (Scott et al., 1979). This report also contains the support data for the calculations. The agent destruction efficiencies were calculated using the following formula:

$$\text{Percent Destruction} = 1 - \frac{\text{Gas Flow x Sampling Time x Concentration of Agent Detected}}{\text{Amount of Agent Fed During Sampling Time}} \times 100\%$$

When the concentration of the agent at the stack was below the minimum detectable level, the percent efficiency was calculated to be 100 percent. Although 100 percent efficiency cannot be demonstrated due to the limitations inherent in the analytical technique, other data do in fact indicate that percent destruction was achieved during normal operations. These data include GC/MS analysis of tenex and bag samples, laboratory testing and theoretical analysis.

As shown in Table 4.8, 100 percent of all POHCs and agent were removed during normal operations except for mustard of which 99.99 percent was removed. Since the trial burn, forklift exhaust and diesel fuel oil fumes have been shown to cause positive readings for mustard in the colormetric analysis. These contaminates can be eliminated by use of GC techniques for verification. Precautions have also been taken to eliminate contaminations at the sampling locations. Since these improvements, the removal efficiency of mustard has been shown to be 100 percent. Destruction removal efficiencies during upset conditions ranged from 96.42 to 99.80 percent. The conditions causing the upset are also provided in Table 4.8. In all cases, the conditions were corrected immediately and the emissions were only temporary.

Hydrogen Chloride Removal Efficiency - No direct measurement of hydrogen chlorine at the stack was recorded. Although a true hydrogen chloride removal efficiency was not produced from the data, several chemicals containing chloride were monitored at the stack. These included phosgene, chloropicrin, cyanogen chloride and chloroform. Destruction efficiency of these compounds are provided in Table 4.8.

Previous simulant tests indicate that over 50 percent of the HCl is neutralized in the quench. The remaining HCl is removed by the EP and scrubbers. Specifically, results indicate that during the CAIS pilot test, the EP residue and spray dried salts contain 20 and 6 percent chloride, respectively. The spray dried salts also contained a large amount of excess carbonate. This carbonate was available for reactions if required. This excess neutralizing capacity in the scrubbers is also maintained by the neutral to basic pH conditions. In summary, most of the acidic gases are neutralized in the quench. The scrubbers then effectively remove the remaining acidic gases.

Particulate Emissions - Destruction System - The Colorado Department of Health incinerator standard of 0.10 grains of particulate matter per dry standard cubic foot (corrected to 12 percent CO_2 with the contribution of auxiliary fuel to the CO_2 content discounted), as determined by using stoichiometric CO_2 values in calculating correction factors, was not exceeded while CAIS were processed. Average values were as follows:

CAIS TYPE	MEAN (gr/DSCF)	RANGE (gr/DSCF)
K945	0.06	0.048-0.064
K951/952	0.04	0.033-0.049
K548	0.07	0.042-0.106
K955	0.10	0.055-0.175

Detailed data are contained in Volume III, Appendix F, Final Pilot Test Report (Scott et al., 1979).

Particulate Emissions - Spray Dryer - The particulate emissions from the spray dryer operation did not exceed the calculated Colorado Department of Health process rate emission standard of 13.17 pounds per hour. The average emission was 3.85 pounds per hour. The range was from 3.37 to 4.52 pounds per hour.

Source of Fugitive Emissions - Fugitive emissions are monitored in various locations (see section on Sampling and Monitoring procedures). Results of this monitoring are provided in Appendix 4A. If concentrations are observed above specified limits, immediate remedial actions are employed. Fugitive emissions are also controlled by the airlock and ventilation systems previously described.

CO_2 and CO Measurement - Concentrations for CO and CO_2 at the stack during destruction of CAIS were reported in Volume III of the Final Pilot Test Report. These concentrations are summarized below:

CAIS	CO (%)		CO_2 (%)	
TYPE	MEAN	RANGE	MEAN	RANGE
K945	0.0	0.0-0.0	0.86	0.85-0.87
K951/952	0.0	0.0-0.0	0.74	0.72-0.75
X548	0.0	0.0-0.0	0.80	0.70-0.87
K955	0.04	0.0-0.08	0.86	0.80-0.90

The above CO_2 values could not be used to calculate the actual quantity of the CO_2 produced by CAIS combustion by the subtraction of the calculated CO_2 contribution of the auxiliary fuel from the measured CO_2 during testing. Attempts to do so resulted in negative CO_2 values for some sample runs. As an alternative, stoichiometric CO_2 values were used to calculate correction factors. This procedure was accepted by the Colorado Department of Health. Appendix F of the Final Pilot Test Report includes the calculations of the CO_2 values and the correction factors.

Incinerator Operating Characteristics - Figure 4-20 summarizes average operating temperatures and gas residence times during the trial burn. As explained in Section 4.4.2, the deactivation furnace temperature was automatically controlled around a set point of 1100°F. The decontamination furnace was also automatically controlled around the following set points:

TYPE OF MATERIAL	ZONE 1 TEMPERATURE
Pigs box residue	1100°F
Oversize petal K955 (inserts)	1400°F
Oversize X-Sets/K955 (burn)	1650°F

The afterburner was manually controlled at 1850 ± 50°F at the burner end and 1700 ± 25°F at the exhaust end.

Waste feed rates in terms of number of CAIS are summarized in Tables 4.5 and 4.6. These values correspond to the following feed rates in terms of pounds per hour.

CAIS TYPE	RATE (lb/hr)
K951, K952, K953, K954	1500 (including steel shipping containers)
K945	140
X Sets	200
K941, K942	1443 (including steel shipping containers)
K955	125

The velocity of the gas through the incinerator system is indicated by the differential pressure measurements recorded across the decontamination furnace and scrubber. The differential pressure between the decontamination furnace and the furnace room is set at negative 0.15 inch water. The operating range is 0.13-0.17. If the values outside this range are measured, a pneumatic signal is transmitted to maintain constant differential pressure. The differential pressure at the scrubber ranges from 1.5 to 4 inches water. If the pressure exceeds 4 inches, remedial actions are taken immediately. The differential pressures are recorded every hour and indicate if any reduction or blockage of gas flow has occurred.

Certification - The incinerator in Building 1611 and spray dryer in Building 1703 are currently operating under air emission permits C-12, 103-1 and 103-2. These permits were granted from the Colorado Department of Health.

4.4.3.2 Phases 1, 2 and 3: CAIS Operations

Data provided in the previous section (4.4.3.1) were collected during the CAIS trial burn. Since the trial burn, all CAIS have been incinerated in a three phase program. A total of seven types of CAIS were incinerated. Phase 1 destroyed two types (K941 and K942) as well as those X-type sets containing mustard. Phase 2 destroyed a third type of CAIS (K945) and the majority of the remaining X-type sets. All the remaining sets were destroyed during Phase 3. The operational dates of each phase and the types of CAIS incinerated follow:

PHASE	DATES	CAIS INCINERATED
1	May 5, 1981-January 28, 1982	K941/K942, X302, X547, X550, X551
2	February 2, 1982-April 19, 1982	K945, X548, X549, X545, X546
3	April 22, 1982-December 22, 1982	K955, X552

The Department of the Army is currently finalizing the three reports discussing the results of the three phases of the CAIS incineration program. The following paragraphs summarize data from these reports.

Waste Analysis

The analyses of the CAIS was previously presented in Tables 3.5 through 3.8.

Sampling and Monitoring Procedures

The sampling and monitoring procedures are the same as for the trial burn (Table 4.5) except for the following changes:

- o CK is monitored with a Drager tube.
- o PS is collected with a Wilks MIRAN Model 80 and analyzed by IR Spectroscopy.
- o L is monitored by analyzing for inorganic arsenic. (Analyses are verified by Lewisite procedure in Table 4.5.)
- o Sampling time for CG and chloroform is approximately 15 minutes.

The sampling and monitoring procedures used during the CAIS operations are provided in Table 4.9. Other small changes were made during Phases 1, 2 and 3 of the operations. The exact procedures used in each phase are explained in detail in the above referenced reports which are currently being finalized.

Test Schedule and Feed POHCs

The production schedule and feed rate for Phases 1, 2 and 3 are provided in Tables 4.10, 4.11 and 4.12. The POHCs are the same as those listed for the trial burn. Quantification of POHCs and agents are provided in Tables 3.5 through 3.8.

Emission of POHCs and Destruction Efficiencies

During normal operations, emission of agents at the stack was below detection limits. As previously demonstrated during the trial burn, this resulted in a Destruction Removal Efficiency of 100 percent. Air monitoring results for a typical month, October 1982, are provided in Table 4.13. The average values are somewhat misleading as many values of "less than the detection limit" were used to obtain the average. In such cases, a value equal to the detection limit was used. Therefore, the mean actually represents the highest possible value. During October 1982 two upset conditions were observed. The upset conditions resulted from the following causes:

- Temperature control rod on afterburner accidentally broken resulting in afterburner flame out (October 18, 1982, 1000-1100 hours).

- Afterburner flame out due to quench pump failure (October 28, 1982, 1300-1400 hours).

The rod and pump were repaired immediately. However, the following upset emissions were measured:

DATE	CG (ppm)	$CHCl_3$ (ppm)	H ($\mu g/m^3$)	PS (ppm)
October 18	7.50	11.0	<1.0	2.53
October 28	9.26	1.31	-	1.48

Hydrogen Chloride Removal Efficiency and Emissions of Carbon Monoxide

Neither hydrogen chloride nor carbon monoxide were measured. However, from data collected during the trial burn, the concentrations of these gases are expected to have been below detection limit at the stack.

Particulate Emission

The emissions were expected to be similar to those observed during the trial burn. No quantitative measurements were made during Phases 1, 2 and 3.

Incinerator Operating Characteristics

The feed rates of the CAIS are presented in Tables 4.10, 4.11 and 4.12. The temperature and differential pressures were similar to those during the trial burn.

4.4.3.3 Incineration of DDT-Contaminated Ammunitions

Incineration of DDT-contaminated ammunition commenced on January 24, 1982. The program is scheduled to last about 19 weeks including 1 week of preoperational preparation and testing and 1 week of cleanup. During this time 851 tons of ammunition will be incinerated.

Waste Analyses

From the analyses of the ammunition (see Section 3.4), the following compounds are listed in 40 CFR § 261, Appendix VIII, and have been selected as POHCs:

- o DDT
- o DDE
- o PCP (Pentachlorophenol)

Sampling and Monitoring Procedures

The sampling locations are as previously discussed in Section 4.4.3.1. The parameters monitored, the collection methods, analytical technique, sampling time and detection limits are provided in Table 4.14.

Schedule and Feed POHCs

Currently, approximately 12 tons of ammunition are being incinerated per day (3 shifts, 24 hours). This amounts to the following maximum feed rate of POHCs:

POHC	MAXIMUM FEED RATE[1]
DDT	0.14 Kg/day
DDE	0.0028 Kg/day
PCP	0.038 Kg/day

The current incineration rate is slightly ahead of the scheduled 17 weeks.

Emission of POHCs and Destruction Efficiencies

Emission of DDT, DDE, PCP and HMT (hexamethylene tetramine) at the stack are summarzied in Table 4.15 through the week of March 14, 1983. So far, none of these compounds have been observed above their detection limits. Therefore, the destruction removal efficiency is 100 percent. The 100 percent level is confirmed by the GC analyses in that no concentration peaks are observed for these compounds.

(1)Based on M16 rounds with 150, 3 and 90 g/bullet of DDT, DDE and PCP (see Section 3.4).

Hydrogen Chloride and Carbon Monoxide

The concentration of acid gases (reported as HCl) and carbon monoxide at the stack are summarized in Table 4.15. As observed, the concentrations of acid gases are below the detection limits. Only one analysis above the detection limit of CO has been reported.

Particulate Emission

Data for the quantity of particulates emission are currently being analyzed. These data will be submitted to EPA as soon as they are available.

Incinerator Operating Characteristics

The temperature, residence time of the gases and gas velocity are similar to those maintained during the CAIS operation. The rotational velocity of the kiln has been increased to 2 rpm to prevent formation of a molten metal from the ammunition in the bottom of the rotary kiln.

4.4.4 Proposed Adamsite Incineration Programs

The next incineration program is adamsite (DM) grenades and bulk. The DM (adamsite) demilitarization program will last approximately 13 weeks. The program includes two weeks of preoperational training, two weeks of testing, eight weeks of incineration and one week of cleanup. The time frame for DM is based upon a five day week with three shifts per day. The DM program is expected to begin in mid 1983.

The following information is provided to meet requirements found in 40 CFR §122.25(b)(5)(iii). The information is being submitted in lieu of a trail burn. The summary information provided below is supported by calculations performed by RMA personnel. These calculations are supplied as Appendix 4B.

4.4.4.1 Waste Analyses

The adamsite (DM) material to be incinerated includes DM filled M25A2, M6, and M6A1 grenades and bulk DM in 18 pound packs. Based on 40 CFR 261, Appendix VIII and RMA experience, the following compound was selected as the POHC:

o Diphenylaminechloroarsine (DM)

Table 3.15 of the previous chapter provides the chemical analyses of the grenade fill material. The bulk DM is mixed with diatomaceous earth which is used as a drying and dispersing agent. The resultant mixture contains 0.95 lb. of DM per 1.0 lb. of bulk material.

The heat value of the waste material is negligible compared to that of the fuel oil and is not considered in any calculations. All of the waste is composed of solid materials and the DM is a white powder.

4.4.4.2 Detailed Engineering Description of Incinerators

A detailed description of the incinerator units can be found in Section 4.4.2 of this chapter. The incinerator units are identical to those used for incineration of DDT-contaminated ammunitions. The units will also be the same used for incineration of CAIS except that the exhaust from the deactivation furnace will pass through the afterburner.

4.4.4.3 Comparision of Waste Analyses

The analyses of the proposed waste are provided in Table 3.15 of the previous chapter. Some types of CAIS also contained DM. Analyses of the CAIS are provided in Tables 3.5, 3.6, 3.7 and 3.8. In addition to the CAIS listed in these tables, CAIS type X549 contained DM (0.07 lb/set). In this type of CAIS, DM was the only agent present. Only 51 of these CAIS were incinerated. The majority (50) were incinerated during a two day period (February 24 and 25, 1982) of Phase 2 of the CAIS operations (see Table 4.11). The chemical composition and physical form of the POHC (DM) in the proposed program is identical to the DM in the CAIS.

4.4.4.4 Comparision of Design and Operating Conditions

As previously indicated, the design of the incineration units is identical to previous incineration programs. The operating conditions will also be very similar if not identical. The operating conditions proposed for the DM program are provided in Appendix 4B and summarized in Section 4.4.4.6. These proposed conditions were calculated from data collected during completed programs. Actual operating conditions will be optimized during the scheduled two weeks of testing.

4.4.4.5 Results of Previous Burns

The results of the following incineration programs have been presented earlier in this chapter:

PROGRAM	RESULTS
CAIS Trial Burn	Section 4.4.3.1
CAIS Operation (Phases 1, 2, and 3)	Section 4.4.3.2
DDT-Contaminated Ammunition	Section 4.4.3.3

4.4.4.6 Expected Incinerator Operations

Detailed calculations supporting the following expected conditions are provided in Appendix 4B.

Expected Carbon Monoxide Levels

Based on past incinerator performance, the level of CO in the stack gas is expected to be below detection limits.

Waste Feed Rate

The following feed rates have been estimated:

MATERIAL	WASTE FEED RATE	DM FEED RATE
M25A2 grenade	14/min	1.96 lb/min
M6 grenade	4/min	0.52 lb/min
M6A1 grenade	4/min	0.6 lb/min
Bulk DM	2.5 lb/min	1.625 lb/min

The actual rate will be established during the scheduled two weeks of testing.

Combustion Zone Temperature

As during previous operations, the control temperature probe in the afterburner will be set at 1650°F. This probe is located immediately prior to the cooling air inlet ports and does not indicate the maximum temperatures. The maximum temperature near the inlet will be 2300-2500°F while the average temperature in the afterburner will be approximately 1975°F.

Indication of Combustion Gas Velocity

The velocity of the gases in the incinerator units will be measured as in previous programs using pressure differentials. These measurements are described in Section 4.4.3.1 of this chapter and Section 3.4.1 of Appendix 4B. The projected flow rate of the gas through the afterburner is approximately 15.8 feet per second.

Expected Stack Gas Volume, Flow Rate and Temperature

Past data indicate that the volumetric flow rate at the stack will be approximately 34,000 dry standard cubic feet per minute. The projected temperature will be about 102°F.

Computed Residence Time

The computed residence time of gases in the afterburner is 1.5 seconds. This is slightly less than the previous estimate of two seconds during the CAIS programs. However, the 1.5 seconds is based on actual flow measurements taken in 1981. Therefore, the residence time during CAIS and DDT-contaminated ammunition programs was probably closer to 1.5 seconds than 2.0 seconds.

Expected Hydrochloric Acid (HCl) Removal Efficiency

Data from completed incineration programs indicate that the quantity of HCl in the stack was below detection limits and therefore, the system efficiency was in excess of 90 percent. This efficiency is expected to be maintained during the proposed DM program. At the feed rates proposed for the DM gernades and bulk, HCl removal efficiency will have to range from 58 to 72 percent to limit emission to 4 lb HCl/hour.

Expected Fugitive Emissions and Control Procedures

Fugitive emissions will be monitored at the same locations used in previous programs. If concentrations are observed above specified limits, immediate remedial actions will be employed. Fugitive emission will also be controlled by the airlock and ventilation systems.

Proposed Waste Feed Cut-Off Limits

Automatic waste feed cut-off controls will be identical to previous programs. These are described in Section 4.4.2 of this chapter and Section 2.4 of Appendix 4B. This appendix also describes manual cut-off commands.

Expected Particulate Removal Efficiency

Data from previous programs indicate a system particulate removal efficiency of approximately 99.8 percent. To meet the performance standard of 0.08 grains per dry standard cubic foot, the particulate removal efficiency must range from 97.7 through 99.2 percent during incineration of bulk DM at the proposed rates. Section 4.2 of Appendix 4B indicates that higher feed rates can also be employed without violating the performance standard.

Expected POHC Destruction and Removal Efficiency

The expected destruction and removal efficiency for DM is estimated to be greater than 99.9995 percent based on studies of DM destruction (Appendix 4B).

4.4.4.7 Monitoring and Waste Analysis Plan

Monitoring will be performed for the following parameters:

- POHC
- HCl
- Particulates
- CO
- Gas velocity (as indicated by differential pressure)
- Waste Feed Rate
- Combustion Zone Temperature

Monitoring locations, methods and sampling intervals will be similar to previous programs (for example see Table 4.14 for methods and sampling intervals for chemical parameters, Section 4.4.2 for temperature monitoring and Figure 4-27 for monitoring locations). The actual monitoring program for DM is currently being finalized and will be submitted to the EPA as soon as it is available.

As part of the proposed incinerator programs, analyses of the waste to be incinerated must be performed. Regulations require the following analyses:

- Heat value of waste.
- Viscosity or description of physical form.
- Identification of any hazardous organic constituents.
- Approximate quantification of the hazardous constituents.
- Quantification of designated POHCs.
- Halogen content of the waste.
- Sulfur content of the waste.
- Lead and mercury concentrations in the waste.

The manufacture of DM grenades and DM bulk was according to specifications resulting in the compositions previous documented in Section 3.4.2. These data can be used to calculate or evaluate all the requested information except for the heat value. The heat value of the DM grenades and DM bulk is negligible when compared to the heat value of the fuel oil. Therefore, the incineration temperature will be maintained independently of the heat value of the waste. Similarly, enough information presently exists concerning the composition of the waste before incineration and, therefore, no further analyses will be performed. Because manufacture of the DM grenades and bulk was according to specifications, deviation from the analyses presented in Table 3.15 should be minimum.

5.0 GROUND WATER MONITORING

No ground water monitoring data is presented because no surface impoundments, waste piles, land treatment facilities, or landfills are included in the permit application [40 CFR 264.90(a)].

6.0 PROCEDURES TO PREVENT HAZARDS

6.1 INTRODUCTION

The bases for the information presented in this chapter are RMA's standard practices and procedures and individual Standing Operating Procedures (SOPs) for all major operations at RMA. RMA's SOPs contain information on the program-specific measures to prevent hazards including emergency equipment, procedures, preventive maintenance, remedial actions and inspections. The specific procedures to prevent hazards relative to RCRA considerations are briefly summarized below.

6.2 SECURITY

The Rocky Mountain Arsenal is surrounded by a four-foot high four strand barbed wire fence. Signs, which are about 12 by 14 inches and read "U.S. PROPERTY, NO TRESPASSING", are posted every 300 feet along the fence. Additional signs, which are 4 by 6 feet and read "U.S. ARMY MILITARY RESERVATION, NO TRESPASSING", are posted about every 1,000 feet around the perimeter.

Entry at the two main entrances, the West Gate and the South Gate, is controlled by guard stations. The gates are open 24 hours a day and are manned by guards at all times. Personnel without authorized clearance (as indicated by badges and stickers on their vehicles) must enter through the West Gate. Entrance procedures require sign-in before temporary passes are granted. About 20 other gates are present around the perimeter. These gates are kept locked at all times and used only for emergencies. Guards also patrol the entire perimeter at least once during each eight-hour shift.

The security force at RMA consists of 76 people including 73 guards. Guard duty is divided into three eight-hour shifts. During any shift, 23 to 24 guards are on duty, divided into 1, 2, or 3-man teams. All guards are equipped with two-way radios having primary and alternate communications frequencies. The guards also carry firearms. The patrol teams have four-wheel drive vehicles that allow access throughout most of RMA. During each shift, one patrol team is designated as the security alert team and one as the backup alert force. The security alert team responds to any related problems on the facility in support of other guards or personnel.

Much of the eastern part of RMA is classified as controlled access (generally east of E Street and some areas between D and E streets - see Figure 2-1). No privately owned vehicles or people without permission are allowed into the area. Signs are posted and guards patrol the area. Signs are labelled "AUTHORIZED PERSONNEL AND GOVERNMENT VEHICLES ONLY BEYOND THIS POINT BY ORDER OF THE COMMANDING OFFICER" One guard patrol is assigned to the area during each shift. The RMA storage buildings and hydrazine blending facility are included within the controlled area.

The North Plants area is also security fenced with a gate that is locked during non-working hours. The incinerator complex including administration buildings and four concrete magazine igloos are located within the North Plants area. A sign is posted at the gate which states that "NO CIVILIAN VEHICLES BEYOND THIS POINT BY ORDER OF COMMANDING OFFICER". The incinerator and igloos are located in further fenced, patrolled areas which can be entered only through a guarded gate. Only personnel on the entry control roster are allowed in the incinerator area or magazine area. All others must be escorted by appropriately qualified personnel.

The South Plants area is also fenced. Several buildings, including the laboratory wastewater treatment facility (Buildings 540), wheat storage (Building 354) and spray dryer (Building 540) have restricted access. These buildings are posted as containing hazardous materials and are kept locked.

The DPDO yard storage area is fenced with a gate which is locked during non-working hours. During regular working hours access is controlled by DPDO staff.

6.3 INSPECTION SCHEDULES AND REQUIREMENTS

Inspection schedules and requirements are presented in the following sections for the specific facilities included in this permit application. The information for each facility is provided in the following format:

- o Types of potential problems.
- o Frequency of inspection.
- o Correction of deficiencies.
- o Inspection files.

6.3.1 Defense Property Disposal Office (DPDO)

Types of Potential Problems

Potential problems at the DPDO facilities could arise from the following:

- o Rupture or leaking of containers of hazardous waste.
- o Fires.
- o Explosions.
- o Entry by unauthorized persons.

Inspection Requirements and Frequency

The Hazardous Material Monitor (HMM), appointed by the DPDO Chief, conducts an inspection of all safety and emergency equipment, fences, security areas, devices and storage areas every Monday upon opening of the DPDO facility for operation, and at end of the operation day each Friday. In the event that these designated days of inspection fall on a holiday, the inspection is conducted on the day before or following when the facility resumes operation. The DPDO Chief and his hazardous materials/hazardous waste committee may determine a requirement for a more frequent inspection schedule.

The HMM also performs periodic detailed inspections of all DPDO areas, items, property and facilities. The frequency of these detailed inspections varies for the items on the schedule. The schedule is based on the potential for possible deterioration or malfunction to occur and the potential for such an incident to cause an environmental or human health problem if it went undetected between inspections. Areas subject to heavy use and susceptible to spills (such as loading and unloading areas) are inspected daily when in use.

Correction of Deficiencies

The DPDO Chief routinely reviews the inspection report and directs the appropriate remedial action for any deterioration or malfunction of equipment or structures which the inspection reveals. This work is typically undertaken on a schedule which ensures that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or a problem has already occurred, remedial action is taken immediately. The designated HMM is responsible for the immediate correction and/or remedies of any minor deterioration or malfunction of storage containers, equipment or structures which are discovered during required inspections. Corrective actions will be completed in a timely manner to preclude any hazards to human health or the environment. In the event that a hazardous spill incident is imminent or has already occurred, the HMM will contact RMA for cleanup assistance as per the Intra-Service Support Agreement.

Inspection Files

All inspection logs are filed in Building 621, the DPDO Administration Office, (Figure 2-2), in the HM/HW files. Each inspection log is placed in the appropriate file and compiled for a one year period. Inspection logs are sequentially numbered according to day of month, month and year. Logs from each year are kept for three years and will be purged from the files on the fourth calendar year. Official inspectors from state regulatory agencies and the EPA may review and copy inspection logs upon request. The HMM is also responsible for maintaining the files of inspection logs and will permit access only to authorized personnel (i.e., state and federal inspectors, DPDO representatives).

6.3.2 RMA Container Storage

Types of Potential Problems

Potential problems could arise at the container storage facilities from the following:

- o Presence of liquid waste due to incomplete drying.
- o Rupture or leaking of containers of hazardous waste.
- o Fires.
- o Entry of unauthorized personnel.

Inspection Requirements

Inspection results are recorded on standard inspection record forms which include the inspector's name, date and time of inspection, building number, number of containers, container and building conditions, and any problems observed.

Inspections will be made for leaking containers, aisle space, deterioration of the containers and the containment system, as well as evidence of intrusion or disturbance of the storage buildings. Evidence of spills, drainage problems, container problems and building problems will be noted. Inspection will also reconfirm the number of drums stored. Inspections will cover Buildings 354, 785-788, 791, 793-798, 881-886, 871A-D, 872A-D, 873A-C, 874A-D, 1605, 1608-1610 and the 37 sheds in Plots 1-12 and 27 and 28. Inspections will include only those buildings used for storage at the time of the inspection (i.e., empty buildings will not be inspected).

Frequency of Inspection

Containers in the storage buildings will be inspected on a quarterly basis. Inspections of all areas except Building 354 will be conducted by trained Toxic Material Handlers of the Plant Operations Branch. The Supply Division will be responsible for inspection of Building 354. In addition, security patrols inspect the container storage building exterior areas daily for evidence of intruders or other extraordinary occurrences.

Quarterly rather than weekly inspections are adequate because the inert salts are stored in sealed drums within secure storage buildings. Thus, the likelihood of problems is low. The quarterly inspections of the stored salts were included in Response 6 of Appendix A of the Memorandum of Understanding between RMA, the EPA, the Colorado Department of Health and Shell Chemical Company.

Correction of Deficiencies

In the event that spilled or released hazardous wastes are detected during inspection, they will be cleaned up and repackaged into new containers. If leaking containers are found, they will be overpacked in 85-gallon steel containers or reprocessed into dry material and repacked into 55-gallon containers. Problems with the containment buildings will also be corrected. A program was initiated in February 1983 to correct existing minor building problems and repackage/reprocess leaking containers.

Inspection Files

Inspection reports are filed in the Plant Operations Office in Building 1710. The reports will be held for three years.

6.3.3 Hydrazine Blending Facility

Types of Potential Problems

Potential problems at the hydrazine blending facilities could arise from the following:

- Rupture or leak of tank.
- Spill due to piping leak.
- Explosion.
- Fire.
- Entry of unathorized personnel.
- Discharge of contaminated fluid from sump.

Inspection Requirements and Frequency

The hydrazine foreman from the Plant Operations Branch is responsible for once-daily inspection of the above-ground portions of tanks, catch basins, the blender fume scrubber and waste drains to detect obvious signs of leakage (e.g., wet spots or dead vegetation). Overfilling control equipment (e.g., waste feed cutoff systems and by-pass systems) is inspected by the foreman each operating day to ensure that it is in good working order. The foreman inspects tank monitoring data (e.g., fluid level, pressure and temperature gauges) where present, each operating day, to ensure that the tanks are being operated according to design considerations.

The foreman checks the waste level in the sump each operating day to maintain sufficient freeboard for prevention against overtopping due to overfilling, wave or wind action, or precipitation input. When the freeboard limit is reached, the facility foreman is responsible to see that the waste material is properly stored or disposed. Condition of the tanks and surrounding areas to detect leaks or corrosion is assessed each working day by visual inspection by the foreman. Because the two tanks are covered with a foam coating, inspection of the welds is not possible. Condition of the piping is also inspected. Tank interiors are inspected for erosion or corrosion by the foreman whenever tanks are emptied for cleaning.

The inspectors wear modified level D protective clothing including a respirator (see Appendix 6A) for routine safety inspections. Inspection findings are recorded on standard inspection report forms.

Correction of Deficiencies

In the event that problems are discovered, the hydrazine foreman is responsible for implementing corrective action(s). Equipment malfunctions are repaired as soon as possible. Spills are cleaned and liquid put into the sump or storage tanks.

Inspection Files

Inspection reports are filed in the Plant Operations Office in Building 1710. Inspection files will be maintained for three years.

6.3.4 South Plants Spray Dryer

Types of Potential Problems

Potential problems which may occur include the following:

- Release of contaminants to atmosphere due to malfunction of dryer.
- Spill of salts at compactor or loadout area.
- Fire or explosion due to natural gas leak or equipment malfunction.

Inspection Requirements and Frequency

When operating, the South Plants spray dryer will be inspected each working day by Plant Operations personnel. Independent inspections will also be conducted by RMA Quality Assurance (QA) personnel. Specific inspection procedures will depend upon the waste to be dried. Inspection procedures will be similar to those for the North Plants spray dryer. The security personnel routinely patrol the area around the buildings to inspect for unauthorized entry or unusual conditions.

Correction of Deficiencies

In the event that salts are spilld in the spray dryer area they will be cleaned up, packaged into approved containers and stored in the salt storage warehouses. If liquids are found, the waste will be rerun through the dryer. If contaminant releases are detected, the system is shut down so that the problem can be corrected. Detailed procedures will be similar to those described for the North Plants Incinerator in Section 6.3.6.

Inspection Files

Inspection logs will be maintained for three years in the Plant Operations Office in Building 1710.

6.3.5 Laboratory Wastewater Treatment Facility

Types of Potential Problems

Potential problems which may occur at the laboratory wastewater treatment facility include:

- o Leaks in piping to and from waste storage tank.
- o Release of waste from waste storage tank by overflow or leak.

Inspection Requirements and Frequency

The wastewater treatment facility, including the storage tank and treatment column, is inspected daily by Plant Operations personnel. For the storage tank, daily visual inspection includes the area around the tank and berm for signs of leakage and condition of the tank for signs of leakage or corrosion. The temperature and level monitoring equipment is checked daily. The areas around the fenced waste storage tank and Building 540, which contains the waste treatment facility, are also inspected daily by security patrols to detect any unauthorized entry or unusual conditions.

Correction of Deficiencies

Should a leak develop in the piping to and from the waste storage tank, the flow will be stopped by closing one of the several gate valves in the line. These valves are located at critical locations in the line. Once the leak is repaired the valves will be opened and flow will resume. If a release of waste occurs at the waste storage tank, all contaminants will be kept within the asphalt lined berm until the problem is corrected. A pump will be placed in the waste sump at the northwest corner of the facility to pump the waste into the storage tank.

In the event of a mechanical breakdown of the treatment equipment at the facility, waste flow will be stopped and the parts will be replaced or repaired.

Inspection Files

An inspection log book is kept in Building 540. Inspection files will also be maintained for three years in Building 1710.

6.3.6 North Plants Incinerator

Types of Potential Problems

Potential problems which may occur at the North Plants Incinerator include the following:

- Fires and/or Explosions - The major possible sources of fires or explosions are leaks in piping or tank storage of natural gas or fuel oil at the North Plants.

- Unauthorized Entry - Entry of intruders to the North Plants could result in fires or release of hazardous wastes.

- Release of Hazardous Wastes - The major possible sources of hazardous waste release at the North Plants include:

  - Emission of unburned wastes from the incinerator stack.

  - Release of liquid or gaseous materials in the disassembly room.

  - Release of waste due to accidental damage during unloading or handling.

Frequency of Inspection

Production personnel are responsible for identifying unusual or out of the ordinary conditions in their respective portions of the operating incinerator facility. Observation by production personnel is essentially continuous throughout each work day. Independent inspections of the operating incinerator facility are also conducted daily by QA personnel. QA is responsible for an inventory of daily production operations, decontamination sign-offs, and verification that (1) monitoring equipment is operating properly; and (2) deactivation and decontamination furnace temperatures and dwell times are within prescribed limits.

Firewatch crews are responsible for swing (1600 to 2400 hours) and graveyard (0000 to 0800 hours) shift inspection when these are non-operating shifts. Firewatch responsibilities include maintenance of plant standby status, shutdown and start-up of the demilitarization operations, maintenance of ventilation, inspections and contingency procedures. Inspections by the firewatch crews are conducted three times during each shift.

Preventive maintenance of the entire incinerator facility is conducted throughout the year with frequency of inspection and maintenance of various equipment ranging from daily to annually. Details on the specific inspection procedures and the frequency of inspection for preventive maintenance are provided in North Plants Incinerator Project Documentation (1979 with revisions), Volume 5 (Preventive Maintenance). The entire volume is devoted to inspection procedures and frequency and preventative maintenance measures by incinerator process part (such as afterburner or scrubber).

Correction of Deficiencies

When remedial actions are called for due to release of hazardous waste or due to equipment malfunctions, the following will occur depending upon the severity of the occurrence:

- All personnel will don their respiratory mask (if appropriate), alarms will be sounded, and QA personnel will be summoned.
- Laboratory personnel will increase monitoring rates and monitor equipment will be checked.

- o If the cause of an alarm is readily identified and corrected, operations will resume. However, all personnel will work with masks on (if appropriate) until two consecutive clean monitor readings have been obtained (to verify that the problem has been alleviated).

- o If a problem persists, the furnaces and conveyors will be shutdown (except decon furnace conveyor), the building evacuated and a meeting of cognizant personnel will be held to determine a course of action to return the facility to normal operations. Shutdown procedures are described in Appendix 4B.

Cleanup of spilled hazardous wastes will generally involve chemical neutralization or absorbtion of the spilled material, cleanup and incineration of all waste products.

In the event of a fire or explosion in the North Plants incinerator, the following will occur:

- o Notification of the control room and fire prevention staff.
- o Evacuation of plant, if necessary.
- o Cessation of disassembly room operations.
- o Shutdown of ventilation.
- o Shut off of fuel oil storage tank outlet valve.

Detailed descriptions of remedial actions for each operational area of the North Plants Incinerator are given in Volume 3 (Contingency Procedures), North Plants Incinerator Project Documentation (1979 with revisions).

Inspection Files

QA inspection records for the North Plants facility are filed in Building 111. Plant operating logs are filed in Building 1710. The records are maintained for a period of at least three years, after which time they are placed into storage.

6.4 PREPAREDNESS AND PREVENTION REQUIREMENTS

RMA does not seek a waiver of preparedness and prevention requirements, required equipment [40 CFR 122.25(a)(6) and 264.32]. However, as discussed in Section 6.4.2 RMA does seek a waiver from 40 CFR 264.35, required aisle space.

6.4.1 Required Equipment

Internal Communications

The Rocky Mountain Arsenal maintains a number of internal communications networks including:

- o Fire reporting telephone system.
- o Commercial telephone service.
- o Radio communications nets for various emergency groups including:
  - Security Net 148.9/149.6 MHZ (X-Ray prefix)
  - Standby Security Net 407.575/411.200 MHZ (X-Ray Alpha prefix)
  - Emergency Net 165.0375 MHZ prefix (Charlie)
  - Tech Escort Net 36.89 MHZ prefix (Red Hat)
  - Toxic Yard Net 148.675 MHZ prefix (Toxic)
  - Monitoring Team Net 165.0876 MHZ prefix (Tango).
- o Emergency "Red" phone.
- o Emergency Sirens.
- o Shell Company emergency steam whistle.
- o Automatic sprinkler alarms.
- o Smoke detectors.
- o Fire pull boxes.
- o Low air warning signals.

External Communications

The following external communications networks are available at Rocky Mountain Arsenal:

- o Commercial telephone service.
- o Metropolitan emergency telephone system (METS).
- o Ten channel scanner to monitor neighboring fire department radio frequencies.

In the event of an hazardous waste or agent release, fire or other emergency at RMA which may endanger off-post civilian populations or the environment, then federal, state and local agencies listed in Chapter 7 will be notified. If there is an imminent hazard to populated areas, the Public Affairs Officer or other individual designated by the Commander will notify the news media over the Metropolitan Emergency Telephone System.

Emergency Equipment

RMA maintains a wide variety of emergency equipment. A summary of this equipment is provided in Section 7.5 of the Contingency Plan of this permit application. Emergency equipment is typically present in facilities with ongoing operations and from RMA's Fire Department. Detailed lists of emergency equipment are provided in Appendix 7A.

Emergency equipment available at operating facilities includes the following:

- o Portable fire extinguishers using CO_2, water, and dry chemicals.
- o Sprinkler and/or water deluge systems.
- o Water of sufficient volume and pressure to operate sprinkler and/or deluge systems.

6.4.2 Aisle Space Requirement

Prior to RCRA, a uniform policy on maintaining proper aisle space within storage buildings did not exist at RMA. Existing aisle space is shown in Figures 4-1 through 4-16 for the Warehouse Buildings. In many of the buildings adequate aisle space exists to allow inspection and movement of personnel and fire or spill control equipment. However, in some of the buildings containers are placed so that detailed inspection and equipment movement is not possible. Because the salts are stable and stored inside sealed containers within buildings which have adequate drainage systems, the probability of problems is low. During the 10 years of operation of this storage system, no records of problems exist. Because of this and the fact that containers will be moved to an on-site landfill within five years, RMA seeks a waiver from the aisle space requirement, 40 CFR § 264.35. RMA initiated a long-range program in February 1983 to begin to correct discrepancies in the container storage areas. As part of this program, when containers are moved (for example, to repackage leakers), they will be replaced to provide adequate aisle space. However, this may not result in movement of drums in all buildings.

6.5 PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

Preventive procedures, structures and equipment are briefly described below for each of the facilities included in this application. The discussions for each facility include information for loading/unloading operations, runoff control, water supply contamination, equipment and/or power failures, and personnel protection equipment and procedures.

In addition, several RMA systems exist which help prevent hazards to off-site areas. An extensive ground-water contaminant containment system was installed along the northern RMA boundary (downgradient boundary) in 1981. This dewatering and recharge well system with treatment plant was designed to remove contaminants from the alluvial and upper Denver Sand aquifers. Dewatering wells on the upgradient side of an impermeable barrier (slurry wall) remove water for treatment while recharge wells on the downgradient side of the barrier inject the treated water back into the aquifer. The ground water contaminants resulted from past operations and practices rather than ongoing programs. However, if contaminants were released into the ground water from programs discussed in this application, the system would prevent their movement off-site.

RMA also maintains an on site fire department, the Fire Prevention Branch, which operates 24 hours per day, 7 days per week. The Fire Prevention Branch conducts weekly, monthly, quarterly or semi-annual fire protection inspections of all buildings and structures at RMA. For example, in fiscal year 1982, 738 inspections were made. All fire extinguishers are also inspected monthly. Equipment of the fire department is described in Section 7.5.1 and Appendix 7A.

6.5.1 Defense Property Disposal Office

Unloading Operations

Hazardous waste arrives at DPDO from the generator in sealed drums. Waste at the DPDO facilities is unloaded using a hydraulic drum loader that is equipped with gripping forks to prevent puncture of drums, and a forklift for materials on pallets.

Runoff Control

A relatively small volume of hazardous waste is stored at the DPDO. The waste is contained primarily inside steel 55-gallon drums within a large asphalt lot. Runoff from the lot does occur onto the surrounding land, however, contamination of the runoff is unlikely because the waste is inside secure containers. Containers are also typically moved within a year so that chances of containers deteriorating is lessened. No secondary containment system is present at the DPDO. However, the DPDO and RMA began a program in February 1983 to check available buildings at RMA in order to find a storage building more suitable for storing the DPDO hazardous wastes.

Water Supply Contamination

Contamination of water supplies in the area due to spilled hazardous waste is unlikely as discussed above because the waste is stored in secure containers. In addition, no surface water is present in the near vicinity.

Equipment and/or Power Failure

In the event of a simultaneous hazardous waste spill and equipment and/or power failure, emergency power and lighting are available from the Engineering Plans and Services Group for cleanup activites. Equipment failures during a hazardous waste spill will be replaced with backup equipment from other facilities, if necessary.

Personnel Protection Equipment and Procedures

The Hazardous Materials Monitor inspects the DPDO facility twice weekly to ensure that personnel are not unduly exposed to hazardous wastes and that proper safety procedures are followed.

6.5.2 RMA Container Storage Areas

Unloading Operations

Hazardous waste containers are placed on pallets with hydraulic drum loaders and unloaded and handled using forklifts. Loading and unloading is the responsibility of the Toxic Material Handlers of the Plant Operations Branch, who are specifically trained to handle toxic materials.

Runoff Control

The salts and residues are stored in sealed 47- and 55-gallon steel and fiberboard drums within secure buildings as described in Section 4.2.2. Buildings are equipped with drainspouts and adequate drainage also as described in Section 4.2.2. Because the salts are stored in containers within secure buildings and drainage systems are present around the buildings, the possibility of contaminated runoff is unlikely.

Water Supply Contamination

As discussed above, contamination of water supplies by spilled hazardous waste is unlikely because the stable salts are stored in containers within buildings with cement foundations and adequate drainage. In addition, on-site surface water is not used for water supplies. First Creek, an intermittent stream, is the nearest surface water to the storage buildings. The 100-year flood conditions for First Creek are described in Section 2.5.4.

Equipment and/or Power Failure

Emergency equipment, power and lighting can be provided at the storage areas if necessary from the Fire Department and other facilities.

Personnel Protection Equipment

Protective clothing, appropriate masks and self-contained breathing apparatus are provided when necessary for personnel at the storage facility. Protective clothing levels are detailed in Standard Operating Procedures (SOPs) and summarized in Appendix 6A. Protective clothing other than coveralls and boots is not worn during normal operations in the storage areas. Protective clothing levels and requirements for the toxic storage area are included in Appendix 6A. These requirements generally apply to areas where active chemical agents (classified by the Army as surety material) rather than the neutralized waste are stored.

6.5.3 Hydrazine Blending Facility

Unloading Operations

The hydrazine waste storage tanks and loading areas are bermed and lined with concrete in order to contain the total tank volume should a spill occur during transfer or at other times. Waste is piped from the blending facility to the sump and from the sump to the storage tanks. Tank liquid levels and capacity are monitored during transfer of waste fluid to ensure that overflow does not occur.

Runoff Control and Water Supply Contamination

The hydrazine blending facility, as described in Section 4.3.1, is built on a concrete pad protected by concrete berms. The sump is also concrete. Precipitation onto and runoff from the facility goes into the sump. The waste and runoff from the sump is pumped to storage tanks. Thus runoff within the system is contained, which prevents contamination of water.

Equipment and/or Power Failure

In the event of an equipment and/or power failure, all transfer of wastes will cease. The system has been designed such that a power or equipment failure does not result in a release. Waste material will be retained in the sump and system until power or equipment service is resumed.

Personnel Protection Equipment

As described in Appendix 6A, personnel at the hydrazine blending facility wear modified level A, B, or D or standard level D clothing depending upon the type of operation being performed. Additional details regarding personnel protection at the hydrazine blending facility are provided in Appendix 6A.

6.5.4 South Plants Spray Dryer

Unloading Operations

Waste which is put into drums will be moved with hydraulic drum loaders, placed in pallets and the pallets loaded and unloaded with forklifts.

Runoff Control and Water Supply Contamination

The South Plants Spray Dryer is adjacent to Building 540 and is built on a concrete foundation, surrounded by asphalt. The system is designed such that a spill outside the spray drier is unlikely.

Equipment and/or Power Failure

The system is self-contained so that a release does not occur in the case of a power or equipment failure.

Personnel Protection Equipment

All personnel involved in spray dryer operation are thoroughly trained in the particular procedures and hazards of their work. If appropriate for the operation, personnel will wear cotton underclothing, protective mask (slung position), treated gloves, treated coveralls and safety shoes. Personnel also wear hard hats and ear protection during operations when outside of the control room. Other protective clothing is available as described in Appendix 6A.

6.5.5 Laboratory Wastewater Treatment Facility

Unloading Operations

The wastewater is transferred to the storage tank and treatment facilities via pipelines. No loading or unloading operations are involved in the system.

Runoff Control and Water Supply Contamination

The wastewater treatment facility (carbon and alumina columns) is located within Building 540, therefore, no runoff will enter or leave the building. The storage tank is surrounded by a berm. This berm, as described in Section 4.3.3, is capable of holding at least the volume of liquid in the storage tank and will prevent any leakage or runoff from leaving that facility.

Equipment and/or Power Failure

The laboratory waste system is not electrically operated and thus will not be affected by power failure. In the case of problems, the gate valves can be turned off to ensure that no flow occurs. The no flow condition will continue until the equipment is repaired or replaced.

Personnel Protection Equipment

The wastewater treatment facility is a closed system and does not require protective clothing in normal operation. Should a breakdown occur and the system need to be dismantled, personnel will wear gloves, coveralls, safety shoes, and protective mask in a slung position as appropriate. Levels of available protective clothing are described in Appendix 6A. The personnel involved with the laboratory wastewater treatment facility are trained in the particular procedures and hazards of their work.

6.5.6 North Plants Incinerator

Loading/Unloading Operations

Contaminated materials are stored on pallets and loaded and unloaded from trucks using forklifts or cables from the receiving room overhead crane. From the receiving room, wastes are transported using a monorail hoist/trolley or roller conveyors. Wastes resulting from the incineration process are placed in 55-gallon drums. Drums are placed on pallets with hydraulic drum loaders and the pallets loaded and unloaded with a forklift. Pallets are carried on a stake body truck and strapped in place for movement to the storage areas.

Runoff Control and Water Supply Contamination

The incinerator system is within Building 1611 and the spray dryer in Building 1703. Materials are conveyed to the spray dryer in pipes. Adequate drainage exists around the buildings such that precipitation and runoff do not come into contact with feed materials and waste products. Thus contamination of runoff is unlikely.

Equipment and/or Power Failure

In the event of a power failure, all waste feed will stop. The decon and deact furnace will be automatically shutdown. All personnel will don their protective masks if appropriate to the program and will wait two minutes. If emergency power comes on, all personnel will evacuate to the control room where efforts will be made to return normal power to the facility. If emergency power fails, all personnel will evacuate the building until normal power is returned.

Equipment failure necessitates stopping the processing of waste until the problem is remedied. The system has been designed such that power or equipment failure does not result in release.

Flow charts of decisions and actions to be taken for problems which may occur due to power or equipment failure have been developed. Detailed descriptions of actions to be taken during power and/or equipment failure are described in the Contingency Plan, Volume 3 of the North Plants Incinerator Documentation (1979 with revisions).

Personnel Protection Equipment

Protective clothing requirements by area and function for the North Plants incinerator vary with the particular incineration program. Appropriate clothing is assigned based upon the particular incinerator program. Appendix 6A provides a description of the protective clothing levels available. Levels A, B and C are applicable to incineration programs involving chemical agents.

6.6 PREVENTION OF REACTION AND IGNITION OF IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES

Hazardous waste materials have been tested to determine ignitablity, reactivity, corrosivity, or toxicity. The wastes that are ignitable and reactive must be stored and handled in such a manner to prevent accidental reaction or ignition. For example, such wastes should be separated and protected from open flames, smoking, welding, cutting, hot surfaces, sparks, and heat.

The physical and chemical properties of the hazardous wastes can also be used to determine if wastes are compatible when mixed. This determination can be made by following steps outlined in A Method for Determining the Compatibility of Hazardous Wastes, EPA-600/2-80-076. To determine the compatibility of a binary combination of wastes, each waste is assigned to reactivity groups. The group combination is checked for properties such as heat generation; explosion, flammable or toxic gas generation; fire; solubilization of toxic substances; etc.

6.6.1 Defense Property Disposal Office (DPDO)

All waste currently stored at the DPDO will be removed in June 1983. A program was recently begun to find an appropriate storage building for waste received by DPDO in the future. Waste will thus be kept out of the sun. Compatibility of future waste will be checked. Incompatible and reactive wastes will be stored separately. For instance, methylethyl ketone will be kept in a fireproof area and separated from oxidants.

6.6.2 RMA Container Storage Areas

The salts and residues resulting from the demilitarization of agents are not ignitable. However, when exposed to pH values of two, the salts may generate some gases. These gases may contain sulfur and some organic vapor. If the vapors are toxic and in a quantity sufficient to present a danger to human health, the salts may be reactive. However, the salts are stored in sealed containers in secure buildings. Acids are not stored in the same buildings. Therefore the salts are generally not reactive. The different variety of salts and residues are compatible with each other. Therefore, no special separation to prevent mixing is necessary.

The DDT-contaminated ammunition and adamsite are stored inside buildings away from strong heat sources. No smoking or other potential sources of fire are allowed.

6.6.3 Hydrazine Blending Facility

Hydrazine and UDMH in the pure state (products) are reactive and ignitable. As these compounds exist in the waste form (diluted with water), they are not ignitable. However, they are reactive since toxic gases such as N-Nitrosodimethylamine can be generated. Hydrazine, which is a strong reducing agent, is also incompatible with many other chemicals. Therefore precautions are taken to maximize the possibility that no reaction or mixing occurs. These precautions include:

- Air monitoring for toxic gases.
- No smoking allowed at any time.
- No flames or welding allowed unless "hot work" permit is obtained (issued by Fire Prevention Division and Safety Office after thorough tests for explosive vapors).
- Use of spark-proof tools on-site.
- Prohibition of matches, lighters, and similar items at the facility.
- Cessation of operations during electrical storms and severe weather conditions.
- Protective clothing and respiratory protection.
- Strict leak prevention measures and spill cleanup procedures.
- Double security fence to prevent access.

6.6.4 South Plants Spray Dryer

The South Plants spray dryer is maintained in a standby status. The South Plants spray dryer is cleaned after each project so that it is used for only one process at a time.

6.6.5 Laboratory Wastewater Treatment Facility

Waste stored in the tank and treated in the carbon column is primarily water with traces of organic compounds. Standard laboratory practices are followed in the laboratory in order to prevent mixing of incompatible wastes in the sinks. Once in storage, the waste is so dilute that the likelihood of problems is low.

6.6.6 North Plants Incinerator

Incinerator feed wastes are opened under controlled conditions. A sealed glovebox is available for disassembly of containers of lethal agents before they are incinerated. The glovebox is not necessary for the DDT-contaminated ammunition and DM programs. The incinerator was designed to be capable of incinerating explosives and chemical agents so that reactions or explosions of wastes are contained. The waste products resulting from incineration of hazardous chemicals are not ignitable. Some of the salts may produce gases and organic vapor when exposed to pH values of 2.0. However, the wastes do not come into contact with acid solutions. Wastes from the incineration process are tested to ensure that no chemical agents remain.

7.0 CONTINGENCY PLAN AND EMERGENCY PROCEDURES

7.1 GENERAL INFORMATION

The purpose of this contingency plan is to minimize hazards to human health or the environment due to fires, explosions, or any unplanned sudden or nonsudden release of hazardous waste constituents to the air, soil or surface water at the Rocky Mountain Arsenal (RMA). A number of contingency procedures already exist at RMA for specific and general types of emergency situations. The most comprehensive of these is the Chemical Accident and Incident Control Plan (CAIC Plan) which is an annex of the Rocky Mountain Arsenal Disaster Control Plan [Department of the Army (DOA), Rocky Mountain Arsenal, December 1, 1982]. The CAIC Plan applies to chemical surety materials.

The CAIC Plan applies to all organizational elements of Rocky Mountain Arsenal, including tenant activities. It is designed to minimize the harmful effects of a chemical accident or incident; however, it also applies to emergencies caused by fire or explosion when hazardous chemicals may be involved. An individual, designated as the Chemical Accident and Incident Control Officer (CAICO) by the commander having CAIC responsibility, controls all emergency teams and supervises operations at the immediate accident or incident site until arrival of the on-scene coordinator.

The CAIC Plan includes discussions of the following procedures and responsibilities during chemical accidents or incidents:

- Procedures to be performed in the event of a chemical accident or incident.
- Communications procedures - both internal and external.
- Emergency Control Center and Emergency Response Teams.
- Public affairs.

- Evacuation of RMA and adjacent civilian areas.
- Reporting and investigation.
- Commander mission responsibilities.
- Training exercises.

In addition to the CAIC Plan, a number of other contingency plans and procedures are in effect for specific facilities and operations at RMA. The magnitude and detail of these plans vary depending on the complexity of the particular operation and the relative toxicity of the chemical agents being handled. Existing Standing Operating Procedures (SOPs) detail all operating procedures for various RMA facilities. The SOPs describe safety and contingency measures to be followed during emergencies. RMA also has a Spill Prevention Control and Countermeasure Plan (SPCC) which applies to oil and hazardous materials.

The following list contains brief descriptions of the various contingency plans and procedures which are contained in SOPS and other documents that are specific to certain facilities and operations at the RMA:

- <u>Contingency Plan for the North Plants Incinerator (Volume 3 of Project Documentation DOA, RMA, 1979 and Revisions)</u> - Detailed procedures to be followed in the event of a release of hazardous waste or other emergency at the North Plants incinerator. This document was originally developed for the CAIS program and revised for the DDT-contaminated ammunition program. Established procedures will be followed (with revisions) for other hazardous waste which will be processed here. If a major new incineration program were initiated, a new SOP would be prepared.

- <u>Standing Operating Procedures (SOP) for Hydrazine Blending Facility (DOA, RMA, November 1, 1982)</u> - Describes safety procedures, protective clothing requirements, waste handling and neutralization and emergency equipment and procedures. Currently under revision.

- Fire Prevention Division Action for Hydrazine/UDMH Emergencies (SOP ISF-20 DOA, RMA, May 4, 1981) - Describes fire prevention actions for hydrazine blending facility.

- Spill Prevention Control and Countermeasure Plan (RMA, 1983) - Identifies nontransportation related sources of oil and hazardous substances and outlines measures required to prevent and contain any accidental discharge resulting from equipment or storage facility failure.

- Defense Property Disposal Operations (DPDO) Standing Operating Procedures (DOA, RMA, No Date) - Outlines procedures for storing and handling hazardous waste materials, security measures, surveillance, inspection and emergency procedures and equipment.

- Standing Operating Procedures for Mustard Demilitarization, (South Plant Spray Dryer) (DOA, RMA, May 28, 1971) - Describes safety procedures, locations of emergency equipment and alarm procedures.

- Standing Operating Procedures for CAIC Plan Implementation (DOA, RMA, various dates) - Details preponsibilities and duties of various missions during CAIC plan implementation.

The following Contingency Plan for Rocky Mountain Arsenal is a result of incorporation of the existing contingency plans and procedures, particularly the CAIC Plan, into a RCRA Part B Application format. Very few augmentations or revisions of existing plans were necessary to produce this document.

7.1.1 Plan Locations

Copies of this contingency plan and all revisions to the plan will be filed at the following locations (with number of copies):

Rocky Mountain Arsenal

1 Commander
1 Deputy Commander
1 Chemical Surety Officer
1 Alternate Chemical Surety Officer
2 Chemical Accident/Incident Control Officer
1 Assistant CAICO

1 General Attorney
1 Public Affairs Officer/A & DC Officer
1 Equal Employment Opportunity Officer
1 Comptroller
1 Civilian Personnel Office
1 SDO Instruction Book
2 Communications Officer (USACC)
10 Security Officer
3 Quality Assurance Office
3 Safety Office
1 CDR, Headquarters Detachment
1 OIC, NBC Team
1 ASL Meteorological Team
2 Chief, Management Support Office
4 Director of Technical Operations
6 Director of Installation Services
3 Fire Prevention Division
2 Director of Health Services
10 Emergency Action Officer

Tenant/Contractor Activities

1 USA Reserve Training Center
1 Army/Air Force Exchange Service
1 Fitzsimons AMC Comissary Warehouse
1 Defense Supply Agency
4 Shell Chemical Company
1 NoStrip Chemical Company
1 US Mint
1 USAF, 3454 Technical Training Sq

Off-Post Addressees

U.S. Army

1 Headquarters, Department of Army (MONA-SU)

1 US Army Material Development & Readiness Command (DRCPS-M)

1 US Army Material Development & Readiness Command (DRCPA-P)

2 US Army Material Development & Readiness Command (DRCNC)

2 US Army Armament Material Readiness Command (DRSAR-PEM)

1 US Army Armament Material Readiness Command (DRSAR-SR)

1 ARRCOM Alternate Headquarters

1 DARCOM Master Record Repository

2 Sixth United States Army (AFKC-OP-PN)

1 Fort Carson & 4th Infantry Division (Mech) (AFZA-DDT-P)

1 Fort Carson & 5th Infantry Division (Mech) (AFZA-CC)

1 Commander, US Army Toxic and Hazardous Material Agency (USATHAMA)

1 Fitzsimons Army Medical Center

1 On-Scene Commander, DARCOM

1 Alternate On-Scene Commander, DARCOM

1 Adams County Sheriff's Department

1 Adams County Fire Departments

1 Adams County Office of Emergency Preparedness - Safety

1 Adams County Health Department

1 Colorado Department of Health

1 Colorado State Patrol

1 Commerce City Fire Department

1 Commerce City Police Department

1 St. Anthony's Flight for Life

7.1.2 Amendment of Plan

This contingency plan will be reviewed and immediately amended, if necessary, whenever:

- o The facility permit is revised.
- o The plan fails in an emergency.
- o The facility changes in such a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency.
- o The list of emergency coordinators changes (minor modification).

- The list of emergency equipment changes (minor modification).

7.2 EMERGENCY COORDINATOR

At all times at least one employee will be either on the RMA premises or on call and will have responsibility for coordinating all emergency response measures. The emergency coordinator is thoroughly familiar with all aspects of the RMA's contingency plan, all operations and activities at RMA, the location and characteristics of waste handled, the location of records within the facility and the facility layout. The emergency coordinator has the authority to commit the resources needed to carry out the contingency plan.

The following RMA personnel function as emergency coordinators (listed in order of authority), and are the only individuals who are authorized to activate the contingency plan:

- Commander (or acting Commander) of the Rocky Mountain Arsenal. Lieutenant Colonel Richard W. Smith.

  Telephone: Work-289-0139; Home-341-9916.

- Chemical Accident and Incident Control Officer (CAICO). John A. Ursillo.

  Telephone: Work-289-0265; Home-750-2941.

- Senior Fire Prevention Division Representative. Raymond A. Pimple, Fire Chief.

  Telephone: Work-289-0192; Home-477-4185.

The Senior Fire Prevention official is usually notified first and usually implements the Contingency Plan. On and off-duty notification of the emergency coordinators and other important personnel are shown in Tables 7.1 and 7.2.

As part of the CAIC plan, procedures have been established for the formation of an Emergency Command Center (ECC) and certain emergency teams to be responsive to a chemical accident/incident. The ECC and the teams will also be used as necessary to respond to a hazardous waste emergency situation. Use will depend upon the severity of the incident as determined by the emergency coordinator. The emergency teams consist of the following:

- o Agent Monitoring Team (2)
- o Agent Monitoring Team
- o Decontamination Team
- o Backup Decontamination/Hotline Team
- o Primary Hotline Team
- o Ambulance Team
- o EMT and Assistant Fire Chief
- o Fire/Rescue Team
- o Tech Escort Team
- o Primary Decontamination Team
- o Security Response Forces

7.3 IMPLEMENTATION OF CONTINGENCY PLAN

The contingency plan will be implemented based on the recommendation of the senior person at the scene of an incident, or if no recommendation is given, based on his own judgement or after his own inspection. The contingency plan will be immediately implemented whenever a fire, explosion, or release of hazardous waste or hazardous waste constituents occurs which could threaten human health or the environment. Details on implementation procedures are contained in the CAIC Plan Implementation SOPs and in Section 7.4.1.

7.4 EMERGENCY PROCEDURES

The following emergency procedures will be immediately implemented by the emergency coordinator whenever an imminent or actual emergency situation occurs.

7.4.1 Notification and Mobilization

In the event of an emergency, the individual who discovers the emergency will mask as appropriate, sound the alarm, and take actions defined by local SOP's of the organization responsible for the facility or area. If the emergency situation can be quickly and safely resolved by the organizational element involved, appropriate actions will be taken and the Commander, CAICO, Fire Chief, Chemical Surety Officer (CSO), and Safety Manager notified as soon as possible.

If the emergency cannot be locally resolved, or if there is any doubt, the individual discovering the emergency, or the supervisor, if available, will immediately report to Security by telephone (Ext. or by radio). When making a report, the complete situation will be described, including the following, when possible:

- Time and location of emergency.
- Is an explosion or fire involved?
- Type of agent involved. Agent released?
- Are there casualties, intruders, or hostages?
- Estimated wind speed and direction.

Personnel at the scene will follow prescribed procedures (detailed later in this chapter and in facility SOPs) for rescue, first-aid, agent containment, and evacuation until the arrival of the CAICO or senior Fire Prevention official who will then assume command of these activities at the site of the emergency.

Security will immediately notify the CAICO or Fire Prevention Division by telephone (Ext. 223) or by radio ("Charlie" net) and describe the emergency. The CAICO or senior Fire Prevention official may elect at this time to implement the Contingency Plan or he may proceed immediately to the accident/incident site and evaluate the situation before deciding to implement the Contingency Plan.

When a decision is made to implement the Contingency Plan, the senior Fire Prevention official/CAICO will order sounding of the EMERGENCY signal and will instruct Security to make the required notifications of on- and/or off-site agencies and personnel (Tables 7.1 and 7.2). Notifications will be made using the notification format in Table 7.3.

In the event that an emergency incident at RMA could affect the off-site civilian population, local and state agencies listed in Section 7.6 will be notified. A code word, which is changed monthly, will authenticate the notification. After the Commanding Officer has determined that there is a hazard to populated areas, the Public Affairs Officer or other individual designated by the Commander will transmit the message shown in Table 7.4 over the Metropolitan Emergency Telephone System.

Security will start monitoring the "Charlie" net, and Fire Prevention will start monitoring the "X-ray" net. All personnel involved (Emergency Control Center members, Emergency Response Teams, etc.) will report to their assigned stations as soon as possible.

Upon arrival at a location reasonably upwind of the emergency scene, the senior Fire Prevention official or CAICO will:

- Establish a temporary Command Post (CP) in the Fire Prevention Division's emergency van.
- Verify contact with Security Desk, Fire Prevention Watch Desk, and the ECC.
- Dispatch Assistant CAICO, Assistant Fire Chief/EMT, Rescue/Fire-fighting Team, Decontamination Team, and any necessary security guard(s) to the accident/incident site, as required.
- If personnel injuries or chemical exposures are sufficiently life-threatening to warrant immediate evacuation, dispatch an ambulance directly to the scene. Vehicles that are immediately available at the site and not grossly contaminated may also be used for such evacuation, if necessary. Preliminary decontamination of both personnel and vehicles will be accomplished before evacuation to the Health Clinic.
- Based on the wind speed and direction and on the location of the accident/incident, establish an access route to the scene and notify all involved personnel (by radio) of the route to be used.

- o Designate location of the "Hot Line," (boundary of emergency area) to be established and clearly marked between the CP and the emergency site, and monitor Hot Line operations.

- o Determine what additional assistance and support is required and notify the appropriate activities by direct radio contact or through the ECC.

Upon arrival at the site of the accident/incident, the Assistant CAICO will:

- o Direct the activities of the Assistant Fire Chief/ EMT, Rescue/Firefighting Team, and Decontamination Team.

- o If casualties are evident or are suspected, proceed with rescue/first-aid operations. In this case, initial fire fighting efforts will be directed only to support rescue. If sufficient manpower is available, simultaneous efforts will be made to stop or minimize the chemical release.

- o Make a complete, concise assessment of the emergency and report all information to the CP and ECC by radio, including:

  -Character of released materials, if appropriate
  -Exact source of release
  -Amount of release
  -Areal extent of release or affected area

- o Concurrent with identification of the release, the Assistant CAICO must assess possible hazards to human health or the environment as a result of the emergency. This assessment must consider direct and indirect effects of release, fire or explosion, gas generation, pressure or heat buildup, incompatibility of substances, and contamination of surface waters.

- o Proceed with firefighting, first-aid, and other immediate remedial action, as dictated by the type and urgency of the problems existing at the site. When actual firefighting is involved, the level of protection will be determined by the Senior Fire Prevention Official and approved by the CAICO.

A decontamination station will be set up as near as practical on the clean side of the "Hot Line" entrance/exit. All personnel, equipment, and vehicles leaving the "Hot" side will be processed through the decon station immediately before exiting, unless the emergency coordinator authorizes exceptions as noted in descriptions of the Fire Prevention official and CAICO duties above.

Security guards will block off the area to all except those personnel and emergency vehicles which answer the call or are subsequently requested by the emergency coordinator. The authorized personnel will be directed through a single entrance/ exit to the Command Post. A record of the personnel and vehicles entering and exiting the "Hot Line" area will be maintained by a security guard for personnel accountability.

Individuals reporting to the Command Post will follow the designed access route unless otherwise directed by the emergency coordinator and will report immediately to the CAICO before taking action in support of accident/incident control activities.

The ECC Director will position the downwind monitoring teams and will advise the CAICO of the initial "worst case" downwind hazard (one percent lethality and "no effect" distances). When the emergency has been more completely or accurately described, the ECC Director will advise the CAICO of any change in the downwind hazards.

The Quality Assurance Office survey and detection teams will provide a monitor with an agent detector to monitor personnel and equipment at the "Hot Line" decontamination station. This monitor will verify that decontamination has been completed before releasing personnel and equipment having been in the "Hot" area, unless the emergency coordinator authorizes exceptions as noted above. Upon release, personnel will be transported to the Health Clinic for medical clearance as soon as practicable.

The "Hot Line" decontamination team supervisor, assisted by the designated security guard, will be responsible for enforcing the decontamination requirements described.

The emergency coordinator will notify all appropriate organizations when he has determined that the emergency situation is ended.

7.4.2 Control Procedures

Specific spill contingency plans for each hazardous materials storage area or treatment facility on site are detailed below. Emergency equipment is described in further detail in Section 7.5 and Appendix 7A.

7.4.2.1 Defense Property Disposal Operations (DPDO) Facility

Emergency Alert and Mobilization - If a spill is observed, all DPDO facility personnel will be notified via an existing alarm system and/or an internal communications system, which are accessible to all personnel. The DPDO telephone or 2-way radio will be used to notify the emergency coordinator of the incident depending upon severity, and will provide a communication link until the Emergency Teams arrives on site. The emergency coordinator would be immediately appraised of the following:

- Nature of the emergency
- Area affected by the emergency
- Casualties, if any
- Equipment needed

Surveillance - The Hazardous Material Monitor (HMM), who is a DPDO employee appointed as HMM by the DPDO chief, is responsible for conducting physical inspections of the DPDO. The HMM will ensure that all ignitable, reactive and incompatible hazardous waste is placed in proper storage areas and segregated to prevent potential dangerous reactions. The HMM will routinely monitor all employee handling procedures of hazardous waste and will be responsible for checking the accuracy of all turn-in documents for hazardous waste at the time of receipt of subject property. The warehouse foreman will conduct a check of the facility each workday to inspect for leaking containers or unsafe conditions.

Major Type of Failure - Ruptured barrel or container.

Emergency Equipment and Personnel - Portable fire extinguishers and fire control equipment, spill control equipment, absorbent materials, decontamination equipment and water of adequate volume for hoses, sprinklers or water spray system are maintained at the DPDO site. The emergency team, under the direction of the emergency coordinator, will be responsible for cleanup of spilled hazardous waste.

Procedures and Techniques for Cleaning Up Discharge

- Identification: All containers are either properly labelled as to their contents or manifests are available at the DPDO which identify the contents. Releases of unknown material can be identified by emergency chemical analysis, if required to prevent imminent harm to human health and/or environmental pollution.

- Containment: Released materials will be contained on the large impervious asphalt pad surrounding the hazardous waste storage areas. Spills would be prevented from spreading by the use of absorbent materials. The relatively small sized individual barrels and containers, as well as the small total volume of hazardous waste at the DPDO facility, ensures that no released materials would escape off site, thereby precluding the need for a secondary containment system. Aqueous Film Forming Foam and Alcohol-Type Concentrate is available at the RMA for use in controlling petroleum-type and acetone-type fires, respectively.

- Removal: Excess amounts of discharge will be collected using vacuum trucks, booms and absorbent materials. A small amount of liquid may be absorbed by the asphalt surface, and some volatile liquid components will evaporate.

7.4.2.2 RMA Storage Buildings

Emergency Alert and Mobilization - Fires or evidence of forced entry will be reported by security. Spills of hazardous waste will be reported by the Toxic Storage Yard foreman following inspections of the storage warehouses and buildings.

Surveillance - Security patrols the areas daily, inspecting the exterior of buildings for fires or evidence of intrusion by unauthorized persons. Staff from the Plant Operations Branch will inspect the interior of buildings quarterly for evidence of hazardous waste spills, incompetent containers and other hazardous conditions.

Major Type of Failure - Container or barrel leak or rupture. Most leaks or ruptures would be minor involving small numbers of drums. A major release could occur as a result of a catastrophic event.

Emergency Equipment and Personnel - Portable fire extinguishers and fire control equipment, spill control, absorbent materials, decontamination equipment and water of adequate volume for hoses, sprinklers or water spray system can be transported to the site of an emergency.

Procedures and Techniques for Cleaning Up Discharge - The appropriate emergency team, under the direction of the emergency coordinator, will be responsible for cleanup of major spills of hazardous waste. Minor spills will be handled by personnel of the Plant Operations Branch.

- o Identification: Hazardous waste in the storage buildings is identified on individual containers or in the records. Containers of like materials are segregated. Emergency chemical analyses can be performed in the event a release of an unknown substance occurs.

- o Containment: The hazardous waste in storage buildings is in solid form, and cannot migrate off site unless mixed with a liquid. The containers are housed in buildings and are protected from the elements, therefore, migration of spills off-site is highly unlikely.

- Removal: Leaks or spills from containers at storage facilities will be cleaned up and repackaged into another container in good condition, and will then be returned to storage. If persistent residues exist following a cleanup, the residues will either be neutralized (if possible), or the contaminated material (soil, water, etc.) will be placed in steel containers and returned to storage. Waste being stored in containers with apparent structural defects will be overpacked into competent 85-gallon steel containers and returned to storage or reprocessed and packed into 55-gallon containers.

7.4.2.3 Hydrazine Blending Facility

Emergency Alert and Mobilization - Automatic activation of the fire alarm system occurs when heat sensors on overhead water deluge systems are tripped. Manual activation of fire alarms is also possible. The hydrazine operations foreman is responsible for notifying the emergency coordinator in the event of a major release of contaminants.

Surveillance - On-going every work day by crew and supervisors, daily by security and periodically by the Fire Prevention Department.

Major Type of Failure - Rupture of stationary storage tank, leak in waste storage area catch basins, fires or explosions.

Emergency Equipment and Personnel - Overhead water deluge systems, portable CO_2 fire extinguishers, adjustable water deluge gun, self contained breathing apparatus, showers, eye wash.

The hydrazine crew is responsible for dealing with emergencies at the site as described in the SOP (1982) to be augmented with the appropriate emergency teams (directed by emergency coordinator) for major emergencies. Protective clothing requirements for the hydrazine blending facility are listed in Appendix 6A.

Procedures and Techniques For Cleaning Up Discharge

- Identification: Spilled materials are treated with calcium hypochlorite until the following acceptable limits are reached. The waste is subsequently transferred to the waste storage.

  - Unsymetrical Dimethyl Hydrazine (UDMH) - less than 1000 ppm.

  - Hydrazine - less than 200 ppm.

  - Nitrosodimethylamine (NDMA) - less than 1 ppm.

  - pH - 7 to 10 standard units.

  Unidentified hazardous waste releases can be sampled for emergency chemical analysis to determine chemical composition.

- Containment: Above-ground tanks on site have secondary containment systems (berms) which will trap released materials. Vacuum trucks, absorbent materials, berms and drains will be used to further contain tank spills.

- Removal: The storage area catch basins will receive any spills at the hydrazine blending facility. These effluents will be washed down to the sump, where contaminants are treated with sodium hypochlorite to reduce contamination levels prior to pumping the fluids to tanks for storage.

  Storage tank pits collect rainwater around each tank. The fluid in these pits is sampled periodically, and if hydrazine, UDMH or NDMA cannot be detected the water is disposed into an adjacent field. If the above constituents are detected, the fluid is treated along with fluid from the catch basins, as described above.

7.4.2.4 South Plants Spray Dryer

Emergency Alert and Mobilization - Spills of salt or brine in the South Plants Spray Dryer will be identified by the operator. Salt spills will be cleaned up and packaged for storage. Brine spills will be run through the spray dryer, reduced to salt and the salt packaged and stored.

Surveillance - Periodically observed during each working day by operator, foreman and QA. Security patrols the perimeter of the South Plants area for intruders or other emergencies visible from outside buildings.

Major Type of Failure - Spill or release of salt or brine.

Emergency Equipment and Personnel - A sprinkler system and portable fire extinguishers are available for fire control. Decontamination facilities are available in the vicinity, including emergency showers and eyewash and spill cleanup materials and equipment. Minor emergencies will be handled by personnel at the site. The emergency coordinator and appropriate emergency teams will respond to significant emergencies.

Procedures and Techniques for Cleaning up Discharge

- Identification: - Spills and release in the spray dryer will consist of salts, caustic, brine, or natural gas.
- Containment: - Spills will be contained within the dryer building. Escape of natural gas will be controlled by shuting off the gas feed valve. Liquid spills will be contained and reprocessed.
- Removal - Contaminated materials will either be packaged in containers and put into storage or reprocessed, packaged and stored.

7.4.2.5 Laboratory Wastewater Treatment Facility

Emergency Alert and Mobilization - Leaks or problems with the system will be identified by the operator. Spills will be cleaned up or pumped back into the storage tank. The likelihood of a major emergency requiring response by the CAIC team is very low.

Surveillance - Inspected daily during working days by the operator.

Major Type of Failure - Leak in piping, tank or treatment column.

Emergency Equipment and Personnel - The system is located near the South Plants spray dryer and similar equipment is available for emergencies at both. A sprinkler system and portable fire extinguishers are available for fire control. Decontamination facilities including emergency showers and eyewash and spill cleanup materials and equipment are also available in the vicinity.

Procedures and Techniques for Cleaning Leaks

- Identification: - Leaks will be identified by the operators.
- Containment: - The storage tank is surrounded by a berm which will contain any leaks. If major leaks occur in the piping system, the soil will be tested and excavated, if contaminated.
- Removal: - Spills around the tank will be pumped back into storage. Contaminated soil around the piping system will be excavaated, if necessary.

7.4.2.6 North Plants Incinerator

The procedures described below for the North Plants incinerator were developed for the CAIS program. Depending upon the types of future operations, these procedures will be followed or modified as appropriate. If major modifications occur, an amendment will be submitted to EPA. Similar procedures will be followed for other programs involving lethal chemical agents. Less stringent procedures using OSHA standards will be followed for industrial chemicals.

Emergency Alert and Mobilization - Two systems in the plant are used to monitor for chemical agents and other hazardous chemicals. The first system uses standard bubbler and filter collection for laboratory analysis in Building 313. The second system uses the infrared MIRAN 80 real time detector. During the current DDT-contaminated ammunition program, only the standard bubbler system is used.

Results obtained from bubbler and filter analyses are telephoned to the plant by the laboratory. Upset conditions detected by the Miran 80 will cause visual and audible alarms to function in the disassembly room or the monitor shack and in the control room and the Building 1611 laboratory. Upon activation of alarm or notification, the plant engineer or foreman will take actions as specified in the following paragraphs according to the plant area involved. For severe problems, the plant engineer or foreman will make a PA announcement describing the problem to the plant at large.

Visual observation of an agent or chemical spill, or agent or chemical symptoms in personnel also constitute an emergency. Any such observation must be reported immediately to the local supervisor and by him to the plant engineer or foreman who will take the actions indicated in the following paragraphs as appropriate to the plant area involved. All such visual indications will be accompanied by a PA announcement from the control room describing the problem to the plant at large.

Mobilization will commence immediately upon notification of an emergency situation. In the event of an emergency situation, all personnel will be told to mask. If the emergency condition cannot be easily and quickly resolved, the building will be evacuated. Detailed actions to be taken during an emergency at the North Plant Incinerator are described in Volume 3, Contingency Procedures, North Plants Incinerator Project Documentation.

Surveillance - Surveillance is ongoing every work day by crew, supervisors and QA. During operations involving chemical agents, continuous monitoring occurs in the assembly room and laboratory analyses of samples are taken every one to two hours, depending on the agent or chemical being processed.

Major Type of Failure - Leaking chemicals from the feed items and stack emission of hazardous waste as by-products of incineration are the potential major types of failure.

Emergency Equipment and Personnel - A list of emergency equipment available for the North Plants Incinerator is included in Appendix 7A. Protective clothing is described in Appendix 6A. Currently, during the DDT-contaminated ammunition incineration program, no special emergency equipment is stored at the North Plants complex. During incineration programs which involve chemical agents, such as the recently completed CAIS program, more emergency equipment including first aid/atropine kits is stored at the north plants. The emergency response team is comprised of the Fire Prevention Chief, Chief of the Industrial Division and Chief of Plant Operations Branch.

Procedures and Techniques For Cleaning Up Discharge

- Identification: Discharge of contaminants to uncontrolled areas within the plant, or to the atmosphere via the stack, will be identified by the monitoring equipment and from laboratory analyses of grab samples, as described above. Non-routine materials will be identified per instructions in Section 1, Volume 3 of the North Plants Incinerator Project Documentation.

- Containment: Spills of hazardous waste within the incinerator facility will be of a very small volume and will be contained within the buildings. Detailed procedures for the containment of waste spills have been established for the disassembly room, control room, holding room, decontamination furnace, decontamination module and stack. These procedures are detailed in Sections 3 and 4, Volume 3 of the North Plants Incinerator Project Documentation (1979 with revisions).

- Removal: Chemical contaminants will not be removed from the North Plants incinerator premises, but will be incinerated, along with any contaminated wastes generated by cleanup operations depending upon the specific programs.

- Incinerator Operating Requirements: The North Plants incinerator will cease operation whenever changes in waste feed, incinerator design, or operating conditions exceed limits designated in its permit. Monitoring procedures and equipment which are employed to ensure that stack emissions do not exceed established limits have been previously described in this section. Additional operating procedures are provided in Section 3G, Volume 3, North Plants Incinerator Project Documentation (1979 with revisions).

7.4.3 Prevention of Recurrence or Spread of Fires, Explosions or Releases

In the event of a fire or explosion in or around a hazardous waste handling facility at RMA, fire prevention personnel from the RMA Fire Prevention Branch will monitor the situation to ensure that fires do not reerupt or that explosive conditions do not persist. Firefighters will remain at the scene of a chemical accident until the arrival of decontamination and monitor teams and until relieved from duty by the CAICO. The Fire Prevention Branch at RMA is described more fully in Section 7.5.1.

During a major emergency, the emergency coordinator will be responsible to see that all reasonable measures are taken to prevent occurrence, recurrence, and spread of existing release or fire. Appropriate facility personnel are responsible for minor emergencies. Prevention procedures are described for each facility.

DPDO

When necessary to prevent further spills or spread of existing spills, leaking containers will be repackaged into competent containers. Liquid spillage will be contained (using absorbent materials and dikes) on the DPDO premises where possible and contaminated water and oil will be removed to a proper storage or disposal area. In the event of fire at the DPDO, fire prevention personnel will remain on-site until they are absolutely sure that the fire will not spontaneously recur. The Hazardous Material Monitor will inspect the site for combustible or explosive liquids and gases following a fire and DPDO operations will not resume until the DPDO chief receives approval from the Emergency Coordinator.

RMA Container Storage

Spilled salts at the salt storage areas will be contained by the buildings in which they are stored. The salt does not contain liquids, therefore, the released material will not migrate off-site.

In the event of a release of hazardous material, the spill will be repackaged into competent containers. Damaged or leaking containers will overpacked in 85-gallon steel drums or the material will be reprocessed and repackaged into 55-gallon drums.

Hydrazine Blending Facility

In the event of a hydrazine waste spill, fire or explosion at hydrazine tank facilities, all tank filling and/or emptying activities will immediately cease. Line and tank gauges will be monitored for pressure changes and indications of leakage. Spilled waste will be contained in the concrete-lined sump beneath the waste tanks. Spilled waste and contaminated soil and water will be cleaned up and removed to proper storage or disposal areas. The hydrazine foreman will be responsible for monitoring facility operations following an emergency to determine if the factors which caused the emergency have been remedied. Operations will not resume until the emergency coordinator has determined that the emergency will not recur and gives approval for start up.

Fires or explosions at the hydrazine blending facility will be contained to the facility whenever possible. Due to the danger involved with large fires at this facility, however, the Fire Chief may decide to allow a large fire to burn out rather than risk casualties attempting to put the fire out.

South Plants Spray Dryer

Spread of releases of waste from the spray dryer is prevented by maintenance of negative pressure (below ambient atmospheric pressure). In the event of a release of hazardous waste at the spray dryer, waste feed will cease and the unit will be shut down according to procedures outlined in SOP SMURM-0-P-6 (DOA, RMA, May 28, 1971). Released salts will be cleaned up, placed in containers and removed to a storage building. The facility will then be monitored by the plant engineer for leaks, pressure buildup and generation of dangerous gasses.

Laboratory Wastewater Treatment Facility

Because the laboratory waste is primarily water with trace amounts of waste, hazards caused by fire are unlikely. The fire department would respond to fires or explosions. Releases would be treated as described previously. Recurrence will be prevented by correction of the problem during the release.

North Plants Incinerator

The North Plants incinerator facility contingency procedures are detailed in the Project Documentation, Volume 3 (1979 with revisions). In the event of a hazardous waste release, the following general procedures are implemented in order to prevent the occurrence, recurrence or spread of the existing release:

- No additional waste materials are entered into the glovebox (for programs where the glovebox is used) or processing area.
- Waste in the glovebox or processing area is incinerated.
- Operators mask and leave (as directed) the control room after their immediate task is finished.
- The area is decontaminated and the cause of the release is determined.

Processing of hazardous waste will not resume until the supervisor gives approval for start up.

7.4.4 Storage and Treatment of Released Material

The emergency coordinator will provide for treating, storing or disposing of recovered waste, contaminated soil, surface water or other contaminated material. Details of procedures to be followed for cleanup and disposal of spilled hazardous wastes are contained in SOPs for various facilities and are summarized as follows:

DPDO

Solid hazardous waste spills or releases will be immediately cleaned up, repackaged and returned to storage. Liquid hazardous wastes will be neutralized, when possible, cleaned up with absorbent materials, and stored for eventual disposal.

RMA Container Storage

Any spills of hazardous waste salts will be cleaned up, reprocessed or repackaged and returned to storage.

Hydrazine Blending Facility

Spills of hydrazine and/or UDMH (products) will be diluted with water, treated with and then stored in waste storage tanks at the hydrazine facility. Spills of diluted hydrazine or UDMH waste from the waste storage tanks will be contained in a concrete sump beneath the tanks. The concrete sump is designed to contain greater than the total capacity of the two waste storage tanks. In the event of a tank leak, transfer operations from the waste sump at the blending facility will cease, until the waste tanks have been repaired and all waste material in the tank catchment has been cleaned up and returned to tank storage.

South Plant Spray Dryer

Solid hazardous waste spills will be cleaned up, packaged and put into storage. Liquid hazardous waste will be processed through the dryer and solid waste products will be packaged and stored.

Laboratory Waste Treatment Facility

Spills will be pumped back to the storage tank or cleaned with absorbent materials, placed in containers and stored or incinerated.

North Plants Incinerator

Hazardous waste material which is spilled or released will be neutralized. The neutralized contamination will be cleaned with absorbent materials and all contaminated materials will be incinerated or placed in process waste system.

7.4.5 Incompatible Wastes

Mixing of incompatible wastes can cause excessive heat generation, explosion, fire, toxic or flammable gas generation, etc. The emergency coordinator will ensure that, in the affected area of the facility no waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed. In addition, the emergency coordinator will ensure that incompatible materials are not allowed to mix while cleanup is underway. Solutions used in the clean up will be checked for compatibility with the waste before clean up is commenced. Furthermore, the compatibility of chemicals involved in the spill will be checked. Compatibility will be determined by reference to A Method for Determining the Compatibility of Hazardous Wastes, EPA-600/2-80-076. Because of the nature of some decontamination procedures, some reactions between chemicals will occur. However, the procedures described above will minimize reactions and prevent excessive heat generation, explosions, fire, toxic or flammable gas generation.

7.4.6 Post Emergency Equipment Maintenance

The emergency coordinator will ensure that all emergency equipment which is used during an emergency is cleaned and fit for its intended use following the emergency. This includes, but is not limited to:

- o Detoxification of all equipment which has come in contact (either direct or indirect) with contaminants (including ambulance used to transport contaminated casualties).
- o Replenishment of emergency medical, detoxification and life support supplies, including first aid kits, SCBAs, neutralizing agents, etc.

7.5 EMERGENCY EQUIPMENT

A wide variety of emergency equipment is available at Rocky Mountain Arsenal. Some emergency equipment is centrally located for use throughout the Arsenal. Most of the large emergency equipment is available through the RMA Fire Prevention Branch. Other more specialized equipment is located at specific on-site operational facilities.

Detailed lists of emergency equipment available through the Fire Prevention Branch are given in Appendix 7A. A brief summary of emergency equipment available at RMA is provided in the following sections.

7.5.1 Fire Control and Prevention

The Rocky Mountain Arsenal maintains its own fire department, the Fire Prevention Branch. Equipment includes three pumper trucks capable of delivering a variety of fire suppressants, one tanker truck, three decontamination trucks, one ambulance, a fire chief's van equipped for fire or chemical emergencies, and two pickup trucks, one of which is equipped for unmanned exposure protection. Fire Prevention Branch personnel include a fire cheif, 5 lead firefighters and 10 firefighters. The fire department operates on a full-time, 24 hour-per-day basis. The fire department has a Mutual Aid Agreement with the Adams County Fire Departments.

The water supply for suppressing fires at RMA includes both potable and process water. On the Arsenal, 165 fire hydrants are in use. Of these, 53 are on potable and 112 are on process water mains. Process water is supplied by Ladora Lake, located on the Arsenal. Potable water is provided by the City of Denver. Further information on available pressure and pumping capacity is provided in Appendix 7A.

In addition to equipment housed at the fire station, a number of portable fire extinguishers (water, dry chemical, and CO_2) are present at each operating facility (Appendix 7A). The hydrazine blending facility also maintains a water deluge system with overhead sprinklers and a water deluge gun. The North Plants incinerator has a sprinkler system throughout the operational portions of the building. Sprinkler and deluge systems are both automatic or manually operated. Fire alarms can be sounded via manual control boxes, radio, telephone, or automatically when deluge systems are activated.

7.5.2 Health Services

The RMA maintains an on-post health center with a doctor and nurse present during daytime working hours. The health center is staffed and equipped to deal with moderate-sized medical emergencies as a result of chemical accidents, fires or explosions which might occur at RMA.

Fitzsimons Army Medical Center provides backup health services for any major emergencies which could occur at the RMA.

7.5.3 Protective Clothing

Protective clothing is issued out of the RMA post laundry, which is fully equipped to provide and clean necessary levels of protective clothing for routine tasks or emergency situations. Protective clothing is issued to RMA personnel on a daily basis, depending on their work task. Protective clothing is also stored at strategic locations in buildings housing sensitive operations for use during emergencies.

Army demilitarization programs have standard levels of protective clothing that are used in all phases of the programs involving chemical agents. The types of protective clothing at RMA include Levels A, B, C, D and F, and Dust Protective Clothing. Levels A, B and C apply only to chemical agents. Other equipment which may be added or substituted is also available. Descriptions of the components of the various levels of protective clothing and emergency storage locations are given in Appendix 6A. Industrial standards are followed for programs which do not involve chemical agents.

7.5.4 Miscellaneous Emergency Equipment

RMA maintains a variety of miscellaneous emergency equipment and materials for the cleanup and control of fires and hazardous waste releases. A summary list of this equipment is as follows:

- o Absorbent materials, booms and portable suction pumps for containing and cleaning up spills.
- o Chemical agents for fire control.
- o Heavy equipment and hand tools for diking and cleanup of spills.
- o Furnace for burning contaminated materials.
- o Neutralizing liquids for spills.
- o Sealant materials for tank leaks.
- o Emergency shower and eyewash facilities are located near the North Plants incinerator and hydrazine blending facility.

7.6 COORDINATION AGREEMENTS

Lists of agencies with which coordination agreements have been made are as follows:

AGENCY	LOCATION	TELEPHONE NO.
Federal Emergency Management Agency	Denver	234-6542
Denver Police Department (night)	Denver	575-2111
Sheriff's Office	Adams County	288-1535
Chief of Police	Commerce City	288-1535

AGENCY	LOCATION	TELEPHONE NO.
Adjutant General or Colorado Division of Disaster Emergency Service	Denver Denver	733-2431 279-8855
Colorado State Patrol	Denver	757-9475
Colorado Department of Health	Denver	320-8333
National Response Center	Washington D.C.	800/424-8802
Fitzsimons Army Medical Center	Aurora	361-8350
St. Anthony's Flight for Life	Denver	629-3900

7.7 EVACUATION PLANS

Notification of facility personnel to evacuate can be made via alarms, telephone, PA systems, bullhorn or person to person. Evacuation of facility areas will be along prescribed routes (which are posted in all operating facilities) to assembly points, then upwind away from the source of the emergency. Orders to evacuate an area can only be given by the Commander, Senior Fire Prevention official or the CAICO. For the North Plants incinerator, the ECC, CAICO, Division Chief or Technical Operations Director can order an evacuation.

Personnel who may have been exposed to toxic chemicals will be checked for contamination by QA. Personnel showing agent symptons or signs of contamination will be treated in order to provide initial decontamination and removed to the Health Clinic.

Evacuation instructions from the RMA Disaster Control Plan (DCP) and Chemical Accident and Incident (CAIC) plan are included in Appendix 7B. Details of evacuation procedures for the North Plants incinerator facility are also included. Additional details on evacuation of the Hydrazine Facility are provided in the Hydrazine Blending Facility SOP (DOA, RMA, November 1, 1982). Evacuation plans for each building are posted in that building at RMA.

7.8 REQUIRED REPORTS

If the emergency coordinator determines that a facility has had a release, fire, or explosion which could threaten human health or the environment outside of the facility, he will report his findings according to procedures detailed in Section 7.4.1 (Notification) of this contingency plan.

The Commander will notify the EPA Regional Administrator and appropriate state and local authorities that the facility has satisfied conditions listed in Sections 7.4.5 and 7.4.6 before operations are resumed in the affected areas of the facility. RMA's contingency procedures comply with the National Contingency Plan.

The emergency coordinator will note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15 days after the incident, he will submit a written report of the incident to the EPA Regional Administrator. The report will include:

- o Name, address, and telephone number of the Commander of RMA.
- o Name, address, and telephone number of the facility.
- o Date, time and type of incident (e.g. fire, explosion).
- o Name and quantity of material(s) involved.
- o The extent of injuries, if any.
- o An assessment of actual or potential hazards to human health or the environment, where this is applicable.
- o Estimated quantity and disposition of recovered material that resulted from the incident.

7.9 AMENDMENTS TO THE CONTINGENCY PLAN

The contingency plan will be reviewed and amended as necessary if the RCRA Part B permit is revised, the plan fails in an emergency or major changes in design or operation of the facilities occur. Minor revisions will be submitted for changes in the emergency coordinators or emergency equipment.

8.0 PERSONNEL AND TRAINING PROGRAM

8.1 INTRODUCTION

As of February 1983, 333 civilians and 16 military personnel were employed at RMA. Only some of these people are involved with operations that deal with hazardous waste. A description of the overall organization of the RMA staff by division, which identifies those divisions directly or indirectly involved with hazardous waste management, is presented in the first section of this chapter. A brief discussion of specific positions in groups which deal with waste is also included as is discussion of personnel records. The second section includes description of current training procedures, additional RCRA hazardous waste training which will be implemented, and training records. Personnel and training from the DPDO are discussed separately in the final section since the DPDO is not directly a part of the RMA organization.

8.2 PERSONNEL ORGANIZATION, JOB TITLES AND DUTIES

Rocky Mountain Arsenal is a part of the U.S. Army Armament Material Readiness Command (ARRCOM). The organization chart for RMA is presented in Table 8.1. Most of the RMA staff are civil service employees. Table 8.2 lists only those staff positions by division which deal directly or indirectly with hazardous waste management. Secretaries and clerks are not included. Civilian and military staff are indicated. Discussion of the group organization and function is included in the following paragraphs. The majority of this information was obtained from RMA Regulation 10-1, Mission, Organization and Functions (1982).

Specific job descriptions for each position listed in Table 8.2 are included in Appendix 8A. Job titles and duties are described. Personnel records are maintained for each employee in the Civilian Personnel Section at the Fitzsimons Army Medical Center and within each division's administrative files at RMA. The files include a Department of Army Job Description Form 374. Training information is included within the file. Military personnel records are maintained in the Military Personnel Section at Fitzsimons. Department of the Army Form 2554-R describing the military positions which require graduate education is included where appropriate.

8.2.1 Office of the Commander

The Office of the Commander includes military technical personnel and civilian non-technical personnel (clerks and secretaries). The Commander is the individual in charge of RMA. The Deputy Commander is second in charge. The function of the Commander and the Office is to command the RMA in an effective and efficient manner to accomplish the assigned mission under ARRCOM.

8.2.2 Special Assistants

Special Assistants to the Commander's Office include both civilian and military individuals with specific functions. The duties of the civilian Public Affairs Officer have only peripheral relationship to hazardous waste management. However, in the unlikely case of a significant emergency involving off-site hazards, the Public Affairs Officer would have responsiblity for releasing information on the incident. The military Chemical Surety Officer is responsible for administering all programs which deal with chemical surety material (products).

8.2.3 Non-RMA Support Staff

Non-RMA support staff includes military and civilian personnel assigned to RMA by other army branches. Fitzsimons Army Medical Center administers civilian personnel functions for the RMA Commander under a master service agreement with the U.S. Army Health Services Command. The Civilian Personnel Office provides personnel services and maintains personnel records and training files at Fitzsimons. These positions are not involved in hazardous waste management.

The Director of Health Services is appointed by the Commander of Fitzsimons to serve on the RMA Commander's staff. The Director provides medical services at RMA including operation of the Toxic Aid Station and Civilian Employees Health Clinic.

The Director of Communications plans and administers operation of telephone and radio equipment. This position is not directly involved in hazardous waste management.

The Technical Escort Detachment is a detached element of the U.S. Army Technical Escort Unit from the Aberdeen Proving Ground in Maryland. This military detachment provides escort services in support of chemical, demilitarization and installation restoration programs. This function is required by Army regulations in all situations where military weaponry is involved. The Technical Escort Detachment is also responsible for the disposal of hazardous explosive material and has the capability to assist in response to chemical accident/incident situations.

8.2.4 Safety Office

The Safety Office reports directly to the Commander. Its purpose is to formulate and implement environmental health and safety policies, standards and safe practices that will help in the prevention of accidents and fires, supervision of cleanups, and elimination of personal and occupational illness. The Safety Office also implements programs to protect the general public in their contact with RMA or its products. Employees include a manager, a safety engineer, and a safety and occupational health specialist. Only the safety and occupational health specialist position is currently filled.

8.2.5 Security Office

The Security Office is responsible for the security system at RMA including fixed and mobile security police patrols, civilian guard system, visitor control, employee badge identification system, and law enforcement. In addition, the Security Office is responsible for security clearance for personnel handling classified material. Staff include a chief, security specialist, seven guard supervisors, 6 lead guards, and 60 guards (one of whom is an instructor).

8.2.6 Quality Assurance Office

The purpose of the Quality Assurance Office is to develop and administer the RMA's Quality Assurance Program. The staff is responsible for inspection and testing during demilitarization programs including decontamination certification and test support. This group reports directly to the Commander although the staff work with the various Technical Operations groups. Personnel include a supervisor, a chemical engineer, a supervisory quality inspection (QI) specialist, four QI specialists, and a metrology (instrumentation) QI specialist.

8.2.7 Comptroller, Management Support and Management Information Systems

Several offices provide support functions at RMA but are not involved in hazardous waste management. The Comptroller's office has responsibility for general financial resources. The Management Support Office provides a variety of administrative support functions for the Commander. The Management Information Systems Office provides data processing and computer support services to all offices at RMA.

8.2.8 Directorate of Technical Operations

The Directorate of Technical Operations is one of the two major divisions at RMA. Its mission is to direct the technical programs including demilitarization and hydrazine blending, prevent and contain sources of contamination, and develop environmental and decontamination technology. The Directorate is made up of the following divisions and offices.

Management Systems Control Office

This office is responsible for environmental planning and permitting and management planning for the Directorate of Technical Operations. This office is responsible for RCRA planning and permitting. Personnel include a chief, a program analyst, an environmental specialist, and a technical writer. The environmental specialist will also serve as the training director for RCRA-related training.

Environmental Division

The Environmental Division consists of the Survey Evaluation Office, Contamination Migration Branch, Analytical Systems Branch, and Treatment Technology Branch. The Survey Evaluation Office operates the laboratory computer, collects and stores data from environmental and process studies and operations and conducts a quality control program. The staff consists of a supervisory physical scientist, a physical scientist, two chemists and four physical science technicians.

The Contamination Migration Branch is responsible for contamination, surface and ground water, soil and ecology studies. Personnel include a soil scientist, an hydraulic engineer, a hydrological technician, a biologist and a geologist.

The Analytical Systems Branch operates the RMA chemical and physical laboratory. Testing is conducted on demilitarization waste effluents, chemicals, agents, aerozine missile fuel, water and various effluents. This group also operates the stack monitoring system at the North Plants Incinerator. Staff consist of four supervisory chemists, 12 chemists, a supervisory physical scientist, a physical scientist, and three physical science technicians.

The Treatment Technology Branch provides chemical engineering support for treatment of contaminaton in ground water, surface water and soils. Personnel include a supervisory chemical engineer, a chemical engineer, and an environmental engineer.

Industrial Division

The Industrial Division operates the demilitarization facilities (including the incinerator), the hydrazine blending facility, and the laundry. The Industrial Division is subdivided into the Process Development and Engineering Branch, and Plant Operations Branch. The chief of the Industrial Division is responsible for both branches

The Process Development and Engineering Branch assists in process development and demilitarization engineering and designs. This group also assesses process engineering modifications and designs improvements. Staff include a general engineer, a chemical engineer, a electrical engineer and a mechanical engineer.

The Plant Operations Branch is responsible for actual operation of the incinerator and associated demilitarization, hydrazine blending and storage, and laundry facilities. This group is also responsible for the storage buildings and toxic storage yard. The Plant Operations Branch is the primary group at RMA which is directly involved with hazardous waste management. Staff are responsible for all facilities included in this permit application except for the DPDO. Personnel include a supervisory chemical engineer/chief, a mechanical engineer, an electronics technician, two chemical plant operator foremen, seven chemical plant operator leaders, 22 chemical plant operators, one toxic/explosive material handler foremen, five toxic/explosive material handlers, three clothing treatment plant operators and a crane operator. A military assistant chief is also assigned to the Plant Operations Branch.

8.2.9 Directorate of Installation Services

The Directorate of Installation Services is responsible for maintaining the facilities at RMA including the procurement and dispersement of supplies, maintenance of buildings and equipment, and fire control. The Installation Services are not directly involved with hazardous waste although some divisions of that group are indirectly involved. The exception is the Fire Protection Branch which would deal directly with waste materials in the case of a fire or accident.

Divisions not involved with hazardous materials include the Contracting Division which procures materials and services and the Supply Division which distributes supplies. Other divisions which may have some involvement are described below.

Equipment Management Division

This group is responsible for managing and maintaining installation equipment and vehicles. Personnel consist of a supervisory equipment specialist, two equipment specialists, a mobile equipment maintenance foreman, a mobile equipment servicer, a heavy mobile equipment repair inspector, two auto mechanics and a rate specialist.

Facilities Engineering Division

This division is divided into several branches which are responsible for providing engineering, construction, maintenance, repair or alterations of equipment, buildings, roads, grounds and utilities at RMA. An environmental engineer is directly assigned to the Facilities Engineering Division.

The Resources Management Branch provides operating control of the facilities work management system by planning, scheduling and evaluating the work effort to accomplish the Division's activities. Staff includes a chief, scheduler and program assistant.

The Engineering Plans and Services Branch provides engineering services for the RMA buildings and utilities. Staff include a supervisory general engineer, an electrical engineer, a mechanical engineer, a civil engineer, and an engineering technician.

The Buildings, Grounds and Utilities Branch provides maintenance and repair services. Personnel include a maintenance general foreman, an equipment repair specialist, a pest controller, two carpenters, four engineering equipment operators, a crane operator, a mobile equipment operator foreman and a painter. Other staff include a maintenance leader, two welders, six equipment mechanics, two pipefitters, a sheet metal mechanic, an electrician foreman, two instrument mechanics, and four electricians.

The Fire Prevention Branch administers the fire prevention and protection program, responds to fire calls and chemical accidents, and provides emergency first aid. Service is provided on a 24-hour day, 7-day per week basis. Personnel include a fire chief, five lead firefighters and 10 firefighters.

8.3 TRAINING PROCEDURES

Training is currently handled within each division at RMA with the exception of emergency response training which is installation-wide. Although not specifically designed to meet RCRA requirements, current training procedures have resulted in safe operation of RMA facilities. Current training programs are summarized in Section 8.3.1. Additional hazardous waste related training, which will be initiated at RMA, is discussed in Section 8.3.2. Training records are discussed in Section 8.3.3.

8.3.1 Current RMA Training

Emergency response training associated with the Chemical Accident/Incident Control (CAIC) Plan occurs quarterly. The CAIC Plan was integrated into the Contingency Plan described in Chapter 7 of this permit application. Quarterly training includes procedure drills and simulation of mock incidents. The CAIC emergency teams also meet quarterly to review their functions.

All personnel at RMA have been provided with a Chemical Agent Fact Sheet. The fact sheet explains agent recognition, exposure, self aid and first aid, and the current status and nature of the chemical and engineering programs. In addition, all personnel received an Agent Orientation Briefing. This medical and safety training session covered description of agents, life-saving means, medical surveillance programs, personnel protection, emergency equipment and operational safety.

Most on-post training for those who deal with hazardous materials and wastes is associated with start-up of a new demilitarization program. Standing Operating Procedures (SOPs), which are written for the new programs, include very detailed descriptions of the physical components of the system, technical program, maintenance procedures, preventive maintenance, contingency procedures, protective clothing, monitoring procedures, potential hazards and administrative procedures. Programs include several weeks to several months of training at the start-up of. Training is primarily for the personnel of the Industrial Division Plant Operation Branch and the assigned Quality Assurance personnel. Plant personnel also undergo specific army training for dealing with surety (toxic chemical and explosive munitions) material. In addition, all Plant personnel were given a RCRA-awareness course as part of the training associated with start-up of the CAIS program. Some Plant Operations Branch management personnel have also taken off-post incinerator courses.

Fire control personnel also undergo extensive on- and off-post training. On-post training is continuous during normal performance of duties. Personnel have also had extensive off-post training in first aid and hazardous materials. All have taken first aid and EMT courses. Lead Firefighters and some Firefighters have attended a 3-day (24-hour) Hazardous Material Seminar put on by the Colorado Training Institute of Denver. Three Lead Firefighters have also taken a 96-hour Hazardous Material In-Depth Seminar offered by the same group. Several have also attended training by Burlington Northern Railroad entitled "Railroad Early Response Plan - Techniques of Handling Hazardous Material Incidents".

The management and some technical personnel in the various RMA divisions have also attended two RCRA-related courses. The Chief of the Management Systems Control Office gave a course on RCRA and its implications. Lion Technology, a waste management consulting firm, provided a 1-day EPA-certified course on RCRA requirements and hazardous waste management techniques. Some personnel also attended a course on RCRA training by J.T. Baker. Selected personnel, as appropriate, have attended a variety of off-post hazardous waste courses. These include the EPA/Hazardous Materials Control Research Institute Conference entitled "Management of Uncontrolled Hazardous Waste Sites"; Lion Technology's 3-day EPA-certified course on Hazardous Waste Treatment, Storage and Disposal and Management; and others.

Many of the enlisted Army personnel assigned to RMA are from the chemical career management field. All have taken a required number of Army courses relating to chemical agents, safety, and chemical handling, storage, shipment and disposal.

8.3.2 Additional Hazardous Waste Training

Although past training programs have been adequate for continued safe operation of RMA facilities, additional RCRA-related training will be implemented in the future to comply with the RCRA regulations. This training will serve to make all employees aware of the purpose of RCRA-legislation and approved means of dealing with storage and disposal of hazardous waste. This will also serve to make training more uniform at RMA.

Training films to assist in this effort will be purchased from the Hazardous Materials Publishing Company of Kutztown, Pennsylvania. Table 8.3 lists the training films that will be available at RMA. The training sessions associated with the films will be the responsibility of each division at RMA assisted by the Environmental Protection Specialist of the Management Systems Office of the Directorate of Technical Operations. As indicated above, the Management Systems Control Office is responsible for RCRA permitting. The Environmental Protection Specialist will have overall responsibility for ensuring that RCRA-related hazardous waste training occurs and will serve as the training director. Training sessions will be conducted within six months of approval of the Part B application. New employees at RMA are given a package of material including the CAIC and contingency plans and will receive their RCRA-training within six months of starting work at RMA.

When received, the films will be previewed by the Training Director and a schedule set up to show films and hold training sessions with the appropriate staff. This information will then be submitted to EPA.

8.3.3 Training Records

As stated previously, personnel records for each civilian employee are maintained at the Fitzsimons Army Medical Center, Civilian Personnel Department and within each RMA division's administrative files. Records for military personnel are maintained in the Army Personnel Department at Fitzsimons. Training records are included within each file (at both locations). Active files are maintained for the duration of employment. When an employee leaves, files are maintained for two years. In the case of military employees, records are sent to the records holding center or appropriate installation and copies are maintained for two years in the central files. U.S. Governmental Standard Form 1080 is submitted to the files each time an employee attends an off-post training course. The form is a request to attend the course and receive reimbursement but also includes a brief course description (at least a title), number of hours, and the agency or group that conducts the course. Off-post courses most commonly cover management, technical updating, or hazardous waste related issues.

Records of on-post training typically consist of a training description and date, certificate of training completion, or a sign-up sheet. The description includes a 1-2 page summary of training content. The certificate of completion and sign-up sheet include only the course title. Records of project training of Plant Operations Branch personnel associated with new programs are kept by the chief. In the future a special form or memo will also be added to the files at Fitzsimons to record on-post training.

8.4 DPDO PERSONNEL AND TRAINING

The Defence Property Disposal Office (DPDO) of the Defense Property Disposal Service (DPDS) is an agency of the Defence Logistics Agency. The DPDO leases a portion of RMA but its personnel report to the DPDS. Interaction does occur between the RMA Commander and the DPDO chief. Personnel at the DPDO include the following:

- o Chief, Property Disposal/Off-Site Branch
- o Property Disposal Clerk

- o Material Sorter and Classifier (leader)
- o 2 Material Sorters and Classifiers
- o Warehouseman/Forklift Operator

Personnel records are maintained at the DPDO offices in Building 621A. Job descriptions are included in Appendix 8B.

All DPDO personnel, excluding the clerk, have taken a specific hazardous waste management course. The course was designed and given by the Army Logistics Management Center in conjunction with the Ogden, Utah Regional Headquarter's Office of the DPDS. The 24-hour course included information on RCRA regulations and hazardous waste management, transportation and disposal.

9.0 CLOSURE PLAN

9.1 INTRODUCTION AND CLOSURE PERFORMANCE STANDARD

At this time, no plans exist for permanent closure of the DPDO facility, the hydrazine blending facility, the South Plants spray dryer and the North Plants Incinerator. Thus, the closure plans presented herein are of a contingency nature and necessary to meet the intent of RCRA regulations. However, the salt and residue container storage operations have historically been performed as an interim measure until a final disposal program could be developed. During the last year, RMA initiated several investigations that were designed to evaluate final disposal options. As a result, container placement in an on-site RCRA approved hazardous waste landfill was selected as the means of final disposal. Consistent with this management objective is the requirement for funding, scheduling, systematic planning, design, EPA approval, construction and operation of such a facility. Because a certain amount of lead time is required before construction and operation can commence, RMA has already begun efforts within the Department of the Army aimed at appropriating funds and scheduling the required programs. Current projections indicate that the proposed RCRA approved landfill can be operational by 1987 subject to Army approval and funding.

Army regulations set the criteria under which decontamination and closure will be executed. Applicable regulations include Technical Bulletin No. 700-4 on Decontamination of Facilities and Equipment (Department of the Army, 1978) and the DARCOM Series 385 Safety Regulations (U.S. Army Material Development and Readiness Command). The "XXX" condition identified herein is a military standard which indicates that the munitions or agent contaminated equipment or facilities have been examined and decontaminated by approved procedures. The "XXX" condition means that no contamination can be detected by appropriate instrumentation, test solutions or by visual inspection on easily accessible surfaces or in concealed housings, etc. Facilities classified as "XXX" are considered safe for intended government use.

All of the closure plans have been designed to meet the following performance standards:

- o Minimize future maintenance.
- o Protect human health and the environment.
- o Prevent the escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters or atmosphere.

Because RMA is a federal facility, no closure cost estimates or financial assurance mechanisms are included as per 40 CFR 264.140(c). RMA operations currently involve only hazardous waste management and not disposal so post-closure requirements are not applicable.

Copies of the closure plans will be maintained at RMA. If any changes occur that will affect the closure plans, RMA will submit an amendment to the EPA.

9.2 CLOSURE PLAN FOR THE DEFENSE PROPERTY DISPOSAL OFFICE

This closure plan covers the Defense Property Disposal Office (DPDO), a tenant facility at RMA. Hazardous waste at the DPDO is contained in 55-gallon steel drums which are stored in the asphalt-paved storage yard (Figure 2-2). A program was recently begun to find a more appropriate storage building at RMA. However, until wastes are moved to a building, this closure plan covers the yard.

9.2.1 Closure

Closure for this facility consists of (a) the transport of drums containing hazardous wastes to a RCRA-approved treatment/solidification and disposal facility; (b) survey of the storage area for contamination; and (c) removal of any contaminated soil or other materials that are hazardous waste to a RCRA-approved facility. No partial closure is planned. As previously indicated, the DPDO's mission is to try to sell, donate or otherwise dispose of materials and wastes generated by various Department of Defense (DOD) installations. Consistent with that role, the DPDO functions only as an intermediary organization and does not generate, transport or actually dispose of wastes (or any other materials). In the event that the DPDO facility at RMA was closed, any wastes which could not be sold or donated would be removed via a service contract. The DPDO would contract with an approved contractor who would then become responsible for transportation and the actual disposal operations (subject to DOD supervision).

9.2.2 Maximum Waste Inventory

At the time of this application preparation, a total of 10, 55-gallon drums and one 32-gallon drum of various hazardous wastes were stored at the DPDO facility at RMA. The maximum possible waste inventory is difficult to predict. This DPDO facility does not generate waste but rather receives it from five area DOD installations. Amounts of hazardous waste generated by these facilities are not yet scheduled and thus the system does not allow for much advance notification. In addition, hazardous materials/wastes are stored at the DPDO until a reasonable effort has been expended to sell them.

However, based on experience, the maximum inventory of waste which will be stored at this facility at any one time is about 60, 55-gallon drums. This estimate is based upon the amount of wastes received by this facility since it opened in October 1980. In addition, DPDO's contracting procedures require that service contracts are implemented on a yearly basis. As a result, and at a minimum, drums are removed annually. If patterns change in the future, additional data will be presented to the EPA.

9.2.3 Disposal and Decontamination

The drums containing waste will be removed, processed and disposed by a contractor. Drums would be loaded by the contractor using forklift(s) onto a truck for transport to the selected disposal site. Following removal of the containers by the service contractor, the yard area will be swept and steam-cleaned. Prior to 1988 (completion of a proposed RMA on-site landfill) any hazardous debris generated during a closure program will be placed in 55-gallon drums and stored in the RMA storage buildings. After the proposed RMA on-site landfill has been constructed, drums of waste (containing no free liquids) will be secured in that facility. Soils surrounding the yard are not expected to be contaminated. However, survey work will occur during closure and if evidence of possible contamination is found, a detailed testing program will be implemented to determine the actual presence and extent of any related contamination. If contamination is found, the hazard potential will be assessed in conformance with 40 CFR 261. If a hazard is found to exist, then the problem materials will be excavated or otherwise removed and placed in the nearest EPA-approved landfill or in the RMA landfill when it is built.

9.2.5 Schedule

The schedule varies with the receipt of the wastes. Drums are stored at the DPDO for a maximum of six months to one year. As discussed above, service contracts are implemented on a yearly basis. Final closure will be implemented when the DPDO decides to permanently close the facility. For the purpose of this application, the year 2000 was selected for final closure. Closure will be initiated within 90 days and completed within 180 days of receiving the final waste (including certificate of closure).

9.2.6 Certification of Closure

Upon completion of closure, RMA's Quality Assurance staff and an independent registered professional engineer will inspect the facility. Certification that the area has been closed in accordance with this plan will be submitted to the EPA.

9.3 CLOSURE PLAN FOR RMA CONTAINER STORAGE BUILDINGS

The Department of the Army funded two extensive studies that relate to the closure of the RMA container storage areas. The purpose of the studies was to define the safest, most environmentally sound and cost effective method of permanent disposal of demilitarization salts and residues. The studies included "Disposal of Detoxified Chemical Agents" (Hedley et al., 1975) and

"Systems Analysis Study of Waste Salt Disposal Methods" (AAI Corporation, 1976). Copies of both documents are available at RMA. This closure plan incorporates many of the findings of those studies and specifically deals with existing wastes in containers and potential future waste in Buildings 354, 785-788, 791, 793-798, 871A-D, 872A-D, 873A-C, 874A-D, 881-886, 1605, 1608-1610 and the 37 sheds. Demilitarization waste by-products and residues, and contaminated wheat are stored in fiberboard and steel drums in these buildings. Adamsite and DDT-contaminated ammunition are also stored.

9.3.1 Closure

This closure plan is based upon the transfer of a minimum of 73,542 containers (containing no free liquids) to and placement in an on-site RCRA-approved hazardous waste landfill. The proposed landfill is the most economical and environmentally-sound alternative at this time. Other options considered in the cited studies included sale to and recycling by industry, ocean dumping, ocean floor burial, encapsulation landfills, deep well injection, incineration, and deep geologic burial. None of these options remain feasible at this time.

The projected closure date for the storage buildings is the Year 2000. However, the program to move the containers will begin as soon as the landfill is constructed. Future RMA demilitarization programs may generate additional waste. The process to initiate closure was begun in 1982 with landfill feasibility studies. The closure schedules are discussed further in Section 9.3.4. The steps for final disposal of the salts and decontamination of the buildings are discussed in Section 9.3.3.

One of the purposes of RCRA legislation on closure is to provide a plan for immediate closure should the need arise. Construction of the RMA landfill will not begin until 1986. It was assumed that because RMA is a large government facility, there is little chance that the storage buildings will require immediate closure for any reason. Although the drums could be moved to an off-site landfill, the cost would be excessive because of the large number of drums. The Army considers that the drums are currently in safe storage and that closure will be implemented only when the on-site landfill is completed.

9.3.2 Maximum Waste Inventory

Table 4.2 presents a listing of the numbers of drums of each waste type of the salt residue containers at RMA. As of February 1983, 73,542 drums of salts, residues and mercury-contaminated wheat and 1462 tons of adamsite and DDT-contaminated ammunition were in storage. DDT-contaminated ammunition and adamsite will be incinerated. The incineration process may or may not result in waste which would be disposed of in the landfill.

Currently, 73 storage buildings are included in the permit application. Of these, 45 contain waste and 28 are empty. Total weight of the wastes is estimated to be about 15,497 tons which consists of 9,415 tons of detoxified nerve agent (GB) salts, 5,465 tons of incinerated mustard gas salts and ash residue, 125 tons of phosgene scrubber residue, 42 tons of contaminated wheat, and 450 tons of CAIS salts and residue. An additional 1,462 tons of waste scheduled for incineration consists of 851 tons of DDT-contaminated ammunition and 611 tons of adamsite. Total volume of the wastes is currently estimated to be 34,400 cubic yards. Since the incineration of the DDT-contamination ammunition and adamsite will remove those items from storage and may generate waste, the current inventory and weight and volume estimates will change with time.

By the time the containers are moved to the landfill in 1988, additional containers of waste may have been added as a result of near term incineration programs. For example, the incineration of DDT-contaminated ammunition and adamsite bulk and grenades may produce hazardous wastes that would reenter the inventory of waste stored in containers. The current inventory plus an additional 5000 tons which could be generated prior to landfill construction is considered to be the maximum inventory. The maximum inventory will be removed to the landfill when it is built. The inventory which will be disposed of in the landfill during final closure in the year 2000 will be much less.

9.3.3 Inventory Removal, Disposal and Decontamination

In this section, the basic steps for disposal of the salts and the final closure related to decontamination of the storage buildings are discussed. The wastes currently stored will be moved to the landfill as soon as it is constructed in 1987. Final closure will occur in 2000. Final closure will include disposal of any waste remaining in storage (from future demilitarization programs) and decontamination of the buildings. Further details regarding the construction of the on-site hazardous waste landfill will be provided in a future permit application to the EPA.

The proposed landfill site is located in the NE 1/4 of Section 36 between Basin A and the North Plants (Figure 2-1). Initial conceptual designs include cells, each of which would hold about 125,000 cubic yards of material. The tentative landfill design includes a synthetic lower liner with a leachate removal system above and below. A secondary clay liner will be included in the design. A clay and synthetic cover will also be used to prevent infiltration of precipitation into the wastes.

Containers of salts and residues and mercury-contaminated wheat will be moved from the warehouse buildings to the landfill for disposal. Maximum hauling distance will be 1.5 to 2 miles. Pallets with four 55 or 47 gallon drums will be loaded onto trucks with forklifts. As required by Army regulations, Standing Operating Procedures will be prepared for the transfer operation. Procedures will be similar to those currently used to move the containers from the incinerator to the storage buildings. The containers and pallets will be placed directly into a cell and covered.

In association with final closure, the warehouse buildings will be surveyed and if hazardous contamination exists they will be decontaminated to the "XXX" condition. The "XXX" classification indicates that facilities have been examined and decontaminated by approved procedures; that no contamination can be detected by appropriate instrumentation, test solution or visible inspection on easily accessible surfaces or concealed housings; and that buildings are considered safe for their intended use.

Warehouse floors will be swept of spilled residue and debris. Residue will be placed in 55 gallon containers and disposed of in the landfill. Floors will then be steam cleaned and wet-vacuumed to remove any remaining contamination. Liquids generated by this process will be collected by the wet vacuum and run through a spray dryer. Dryer residue will be packaged in containers and placed in the landfill. Appropriate protective clothing will be worn by cleaning personnel.

The storage sheds located in Plots 1-12 and 27 and 28 have gravel floors. Drums of waste are currently stored on railroad ties on the gravel floors. The drums will be moved to the landfill and placed as discussed above. During final closure, the railroad ties will be removed and placed in the landfill. The gravel areas will be surveyed for any evidence of leakage or contamination. If leakage or contamination are suspected, a soil testing program will be implemented. If contaminated soil is found and determined to be hazardous, those areas will be excavated to the level at which a hazard no longer exists. Any contaminated soil that is detected and removed will also be placed in the landfill unless it is determined that it should first be incinerated.

Expendable equipment used in cleaning such as brooms and gloves will be put in containers and placed in the landfill. Protective clothing will be cleaned in the RMA laundry and returned for other uses. Wet vacuum equipment will be flushed with water and solvents, if necessary. The resulting effluents will be spray dried with other cleanup liquid. Salts from the spray dryer will be put into containers and placed in the landfill.

Special sampling procedures will be implemented in buildings which stored CAIS residue to ensure that there is no significant arsenic contamination.

9.3.4 Schedule

Final closure of the storage buildings will occur in the Year 2000. However, the schedule for building the landfill and moving the existing containers of wastes is as follows:

o Feasibility studies for landfill	- 1982
o Closure plan for salt storage	- 1983
o Environmental analysis of landfill	- 1983
o Environmental impact statement on landfill	- 1983
o RCRA Part B landfill application	- 1984
o Programming into Army MCA cycle	- 1982
o Funding approval	- 1983
o Design completion	- 1984-1985
o Permit approval	- 1985-1986
o Construction	- 1986
o Transfer of existing waste in containers	- 1987
o Completion of transfer of existing waste	- 1988

Because of the large volume of containers, movement to the landfill is projected to require more than one year.

Although the existing waste in containers will be disposed of in 1987 and 1988, new Army demilitarization/neutralization missions will be implemented at RMA in the coming years. These programs may generate additional hazardous waste which will be placed in containers and temporarily stored in the storage buildings until such time as the Army decides to dispose of them in the landfill.

Final closure will be implemented in the year 2000. Closure will begin within 90 days of generating the last waste and be completed within 180 days. Final closure will involve movement of containers of waste (probably a small number) and decontamination of the buildings.

9.3.5 Certification of Closure

Upon completion of final closure, certification by RMA's Quality Assurance staff and an independent registered professional engineer that the container storage areas have been closed in accordance with this closure plan will be submitted to the EPA Regional Administrator.

9.4 CLOSURE PLAN FOR THE HYDRAZINE BLENDING FACILITY

The sump, two waste storage tanks and connecting pipelines for the hydrazine blending facility are included in this closure plan. In order to minimize future maintenance and protect human health and the environment, the hydrazine waste will be solidified and disposed in an EPA-approved landfill. The sump, tanks and associated piping tanks will be decontaminated to the "XXX" condition.

9.4.1 Closure

The U.S. Air Force and Army will select a qualified contractor to be responsible for disposal of the hydrazine waste via solidification and disposal in an approved landfill. The contractor will also be responsible for decontamination and clean-up of the sump, tanks and piping. Final closure is scheduled for the Year 2000 (including certification of closure).

9.4.2 Maximum Waste Inventory

Total capacity for waste storage at the hydrazine blending facility is 294,000 gallons of liquid. Storage includes 44,000 gallons in the sump and 50,000 and 200,000 gallons in the two tanks. Currently, the sump and 50,000 gallon tank are full.

9.4.3 Decontamination and Disposal

The first step in closure of the hydrazine blending facility is the removal of the liquid waste. A disposal contractor will be engaged to remove, transport, solidify and dispose of the waste in an EPA-approved landfill. The contractor will be responsible for collecting and transporting the waste in a safe manner in accordance with EPA and DOT regulations. The contractor will supply all supervision personnel, labor, transportation, packaging and equipment. Only contractors with the experience and capability for performing tank cleaning for unconventional propellant systems will be considered. The cleaning, type of equipment used and handling, and processing and disposal of the waste will be left to the discretion of the contractor, subject to the approval of RMA and the U.S. Air Force representatives. In addition to RCRA and DOT regulations, the contractor will comply with:

- o Specific contract terms and conditions.
- o Army safety regulations.
- o Air Force Manual (AFM) 91-13, Part II, Maintenance of Permanently Installed Storage and Dispensing Systems for Unconventional Fuels.
- o AFM 160-39, Handling and Storage of Liquid Propellants.

Following removal of the waste liquids, the sump, connecting pipes, and storage tanks will be cleaned and decontaminated for other compatible usage or disposed of at an approved facility. Following removal of the waste, the sump, pump, pipes and tanks will be flushed with water and chemical cleaning agents to remove remaining residual material. If possible, tank cleaning will be accomplished without putting a man inside the tank. Cleaning materials other than water will be compatible with the waste materials. Inner surfaces of the tanks will be dried with nitrogen. All gaskets will be considered to be contaminated and will be removed, properly disposed of, and replaced. Immediately after drying, tank openings will be covered to prevent damage or contamination of the interior. Pipes will be flushed with cleaning materials and pressure-checked for leaks.

The U.S. Air Force has established levels at which the system will be considered clean. The following levels apply:

- o Moisture - Dew point of the nitorgen on the tank will be below 0°F after drying.
- o Fuel - UDMH level of less than 1.0 mg/m^3 using a MDA Model 7080 analyzer (or its equal).
- o No detectable N-Nitrosodimethylamine (NDMA).

All waste cleaning materials and gaskets will be placed in drums and disposed of in an approved landfill.

The area in the vicinity of the hydrazine blending facility will be checked for signs of leakage or contamination. If signs of contamination are found or leaks were discovered while pressure-checking the pipes, a soil testing program will be implemented. If contamination is found, the areas will be excavated and contaminated soil disposed of by the contractor.

9.4.4 Schedule

Closure is scheduled for the Year 2000. Closure operations will begin within 90 days of receiving the final waste and will be completed within 180 days. Specific schedule components will be the responsibility of the contractor.

9.4.5 Certification of Closure

Following cleaning and decontamination, the Army Environmental Hygiene Agency (AEHA) will conduct an industrial hygiene sampling program in conjunction with an independent registered professional engineer to certify that the area is free of hydrazine, unsymmetrical dimethylhydrazine (UDMH) and N-Nitrosodimethylamine (NDMA). Certification will be submitted to the EPA Regional Administrator.

9.5 CLOSURE PLAN FOR SOUTH PLANTS SPRAY DRYER

As stated previously, the South Plants spray dryer is maintained in a standby status (see Section 3.3.2). In the past each operation at the South Plants spray dryer has been followed by cleaning and decontamination to the "XXX" level so that the facility is ready for future operations.

9.5.1 Closure

Currently, the South Plants spray dryer is clean and ready for future operations. The closure plan as described below will be implemented for final closure.

9.5.2 Maximum Waste Inventory

Waste materials are treated but not stored at the spray dryer. Waste materials to be dried are transported to the area only when they are ready to be dried. Salts and residue generated by the spray drying procedure are packaged into 55-gallon steel drums. Containers accumulate until a truck load can be moved to the storage buildings.

9.5.3 Decontamination

The spray dryer will be washed out, cleaned and drained by personnel in appropriate protective clothing for the final drying operation (see Appendix 6A). The work area will be washed by personnel in appropriate protective clothing depending upon the last operation. Collected material will be drummed with the spray dried salts and moved to the on-site landfill. Quality Assurance will verify and certify that the area and equipment are free of contamination.

9.5.4 Schedule

Final closure (including certification of closure) will be initiated by the Chief of Plant Operations. The date selected for final closure is the Year 2000. All wastes will be removed within 90 days of receiving the final volume of hazardous waste to be dried. All closure activities will be completed within 180 days of implementing closure.

9.5.5 Certification of Closure

The Quality Assurance Office at RMA will verify the results of the decontamination. The facility will be judged clean or in need of further attention. When found clean, the spray dryer will be certified as closed by QA and an independent registered engineer. This certification will assure EPA's Regional Administrator that the facility has been closed in accordance with the specifications of the approved closure plan.

9.6 CLOSURE PLAN FOR THE LABORATORY WASTEWATER FACILITY

The laboratory wastewater facility is used to store wastewater from the RMA laboratories that is contaminated with minor amounts of organic compounds. The waste is stored in a tank, piped to a treatment facility (Building 540) and disposed of via the sewer system.

9.6.1 Closure

Closure of this facility will involve only decontamination of the equipment since all the waste is treated and discharged.

9.6.2 Maximum Waste Inventory

All of the waste stored in the tank will be treated and disposed of prior to closure. Maximum capacity of the storage tank is 170,000 gallons.

9.6.3 Decontamination

The tank and pipes will be washed with water and appropriate cleaning agents. Pipes will be pressure tested for leaks. The carbon and alumina columns from the treatment facility will be removed and disposed of in the landfill. The remaining parts of the treatment facility will be cleaned for reuse or disposed of in the landfill. Personnel will wear dust-protective clothing.

The area near the tank and piping system will be checked for signs of leakage. If evidence of leaks are found, a soil testing program will be implemented. If contaminated soil is found and determined to be hazardous, it will be excavated and disposed of in the landfill.

The tank, piping system and treatment facility will be decontaminated to the "XXX" level. The QA staff at RMA will be responsible for inspecting the facilities to assure that contamination can not be detected by appropriate instrumentation and visual inspection.

9.6.4 Schedule

Final closure will occur in the year 2000. All closure activities will be completed within 180 days of implementation.

9.6.5 Certification of Closure

The QA office at RMA will verify the results of decontamination. An independent registered engineer will also certify that closure was carried out according to the closure plan. Certification will be submitted to the EPA Regional Administrator.

9.7 CLOSURE PLAN FOR THE NORTH PLANTS INCINERATOR

This closure plan covers the North Plants incinerator complex including the incinerator in Building 1611 and spray dryer in Building 1703. The incinerator and spray dryer will be cleaned as described in this plan to put the facility into a safe standby status for future Army requirements. Future maintenance of the facility will be minimized by the closure activity. Protection of human health and prevention of post-closure escape of hazardous substances or waste to the environment will be assured as a result of this plan. The facility will be cleaned to the "XXX" condition. Much of the program described below was developed to clean the incinerator following the CAIS program. Because the waste which will be incinerated prior to final closure in the year 2000 is unknown at this time, components of the CAIS program closure are described. Modifications will be made as appropriate (and submitted to EPA) depending upon the final program.

For the CAIS program for this type of facility, the "XXX" condition was met when two consecutive bubblers or 30 minutes of consecutive MIRAN readings taken in a room or on a bagged object yield values below the work standard or work-shift time-weighted average (TWA) for the particular chemicals in the CAIS. The condition following final closure will depend upon the last program. Room readings will be taken after all equipment to be removed from the room has been removed. Final readings to certify that the facility has been cleaned and decontaminated to a "XXX" condition will be taken three days after ventilation has been shut down. When this condition is achieved, it will result in levels less than the OSHA work standard or TWA for the particular chemicals in question.

For the CAIS program, to assure that potential arsenic contaminated areas were clean, one eight hour bubbler/filter sample was taken in the area to confirm that the concentrations in the surrounding air are less than 0.01 mg/m^3. This procedure applies specifically to the electrostatic precipitator and spray dryer. For final closure, monitoring may include other agents or compounds, depending upon the last waste to be incinerated.

9.7.1 Closure

Specific steps are described in Section 9.7.3 for decontamination and cleanup following the CAIS incineration which was completed in January 1983. The basic steps also apply to other future incineration programs. Similar steps will be used at final closure depending upon the final waste which is incinerated. Final closure will be implemented following an Army decision to release the North Plants incinerator or to close the facility permanently. For the purpose of this permit application, closure is scheduled for the year 2000.

9.7.2 Maximum Waste Inventory

Waste materials are not stored at the incinerator facility. The items to be incinerated are stored in the RMA storage buildings prior to transfer to the incinerator for decontamination. Only those items scheduled for incineration during the immediate operating day are moved from storage. This procedure is typical and is expected to be followed in future operations.

Wastes generated from the incinerator, electrostatic precipitator, quench and spray dryer are put into 55 gallon steel drums. Containers are stored briefly (less than 90 days) in Building 1703 or 1611 until a sufficient number have accumulated to form a full load for a moving operation. Containers are then moved to the container storage buildings. The closure plan for container storage is described in Section 9.3.

Records of movement of items from storage to the incinerator and waste from the incinerator to the storage buildings are maintained in Building 1710.

9.7.3 Disposal and Decontamination

All waste feed and residue will be removed from the incineration complex to the storage buildings (or landfill) prior to decontamination. The cleanup program will be executed by subsystems or rooms, as further defined in this chapter. The general cleanup philosophy is to clean the most contaminated areas first, progressing to the least contaminated areas. Each subsystem was described in Section 4.4.1 and is presented in Figures 4-20, 4-21, and 4-22. The subsystems and rooms were cleaned in the following order for the CAIS program and would probably be cleaned in a similar order for future programs:

- o Disassembly glovebox, pig handling, and storage modules
- o Decontamination (charging cart) module
- o Box feed chute
- o Disassembly room
- o Air Lock 4
- o Decontamination furnance room
- o Conveyor room
- o Deactivation furnance room
- o Air Lock 7
- o Afterburner and decon furnace
- o Quench
- o Electrostatic precipitator
- o Scrubbers
- o General plant areas
- o Spray dryer

The Quality Assurance Office (OA) at RMA is responsible for inspection and monitoring of plant activities involving closure. The OA Office is a department of RMA reporting directly to the Commander. It is independent of the Industrial Division which operates the plant and which will perform the closure activities. QA is in effect an in-house independent inspection department responsible for verification of protective clothing inspection, inventory control, monitoring equipment calibration, decontamination certification, review of record keeping, environmental monitoring and other similar duties. Throughout the closure operation, QA will be involved in monitoring and inspection. Levels of protective clothing which will be worn during various closure activities are described in detail in Appendix 6A.

Descriptions of the typical cleanup/decontamination procedures which were used for the CAIS program in the various subsystems follow. Similar procedures will be used during final closure, depending upon the last incineration program. Modifications will be submitted to EPA at that time.

Disassembly Glovebox, Pig Handling, and Storage Modules

Cleanup of the disassembly glovebox and storage modules will be initiated by feeding all tools and expendable work material (overpacks, boxes of towels, plastic spray nozzles and hoses) to the deactivation furnace. Area monitoring for appropriate agents will continue during this portion of the cleanup.

The interior of the glovebox will be completely washed with bleach solution. All residue from the cleanup will be fed to the deactivation furnace.

Personnel wearing modified Level B protective clothing will break the glovebox window seal at the sphincter and remove the enclosed equipment. This equipment will be thoroughly washed with bleach, rinsed, and bagged. OA will then check the equipment to verify decontamination. All personnel in the disassembly room not actually handling suspect items will wear Level D protection with butyl rubber boots and worn mask.

The sphincter station area will then be washed with bleach. All gloves, butyl port seals, and butyl gaskets will be removed. These items will be fed through the box feed chute to the deactivation furnace. The clear panels, windows, and ports will be removed, washed with bleach, rinsed with water, and removed from the disassembly room after QA checks and certifies them.

The conveyor belts from the pig handling module and transfer conveyor will be placed in barrier bags and the bags will be sealed and transported to the decontamination furnace. They will be placed in the furnace and destroyed. The interior of the pig handling module and transfer conveyor will be thoroughly washed with bleach. All bleach will be drained into the process waste tank for spray drying.

The cloth from the iris valves will be removed and destroyed by feeding into the box feed chute. The iris assembly will be washed again with bleach.

The disassembly room will be sampled for appropriate chemical agents. If no detectable agent is found, operations will proceed in modified Level D clothing with worn masks and gloves. Area monitoring for agents will continue. If at anytime agent is detected, the area will be restricted and decontaminated again.

The transfer conveyor will be unbolted and removed. It will be rewashed with bleach, rinsed, checked by QA, and then removed from the disassembly room.

The decontamination (charging cart) module will be sealed with a blank flange of plexiglass.

The pig handling module will be unbolted from the glovebox. All sections where bolts are removed will be thoroughly washed with bleach and rinsed. The pig handling module will be removed from the disassembly room with the minimum amount of disassembly practicable. It will be checked by QA and certified to be in a "XXX" condition prior to removal.

The working crew will wear modified Level B protective clothing. They will then proceed to separate the disassembly module from the storage module. Upon separation, the cart will be washed with bleach. The disassembly module will be washed with bleach and rinsed. It will be checked by QA and certified to be a "XXX" condition. It will then be removed from the disassembly room. The working crew, remaining in modified Level B clothing, will then unbolt the storage module from the sphincter. All other personnel in the room will wear modified Level D clothing with mask worn.

The deactivation furnace will be shut down. The sphincter will be removed, bagged, transferred to the decontamination furnace and burned. The feed chute will be rinsed with bleach and water, then covered with a blank metal flange. The storage module will be washed with bleach and water. It will be checked by QA and certified to be in a "XXX" condition. It will then be removed from the disassembly room.

The disassembly room will be sampled for agents or chemicals. If no detectable agent is found, operations will proceed in modified Level D protective clothing.

The pig handling module, disassembly module and storage module will be readied for shipment and will ultimately be sent to the Tooele Army Depot in Utah. There, the unit will be stored for possible set up and reuse for isolated CAIS finds, if the situation should warrant it.

Decontamination (Charging Cart) Module

Personnel involved in cleanup of the decontamination module (inner section) will wear modified Level C protective clothing. The interior of the decontamination module will be thoroughly cleaned with bleach and will then be rinsed with water. Particular attention will be directed to the floor, cart and holding table areas. The decontamination module will be allowed to dry and will then be resealed after sampling by QA has verified the system as in a "XXX" condition.

Box Feed Chute

Cleanup of the box feed chute will be performed by personnel wearing modified Level D protective clothing with mask and gloves in place. The workers will override the airlock mechanisms and will proceed to thoroughly wash the chute with bleach and rinse it with water. After QA certifies the box feed chute to be in a "XXX" condition, it will be closed and left in place.

Disassembly Room

Workers wearing modified Level D protective clothing will mop the floor of the disassembly room with bleach and then rinse the area with water. Caution will be observed to provide proper ventilation or protection from bleach vapor. QA will verify and certify that the disassembly room has been cleared to a "XXX" level.

Air Lock 4

Any items remaining in the suit removal room of Air Lock 4 at the close of operations will be returned to supply or the laundry. Items remaining in the suit shower room of Air Lock 4 or in Air Lock 4 will be bagged, transported to the decontamination furnace and burned. The air lock, suit shower and suit removal rooms will be mopped with bleach and rinsed with water. Modified Level D with worn mask, butyl boots and gloves will be used when mopping with bleach. QA will verify and certify the air lock as cleared to "XXX" level.

Decontamination Furnace Room (excluding the furnace itself)

Workers wearing modified Level D protective clothing with rubber gloves and boots will thoroughly vacuum the floor and flat surfaces in the decontamination furnace room and dispose of the bag with trash to the decontamination furnace. The decontamination furnace room floor will be mopped with bleach and rinsed with water. When mopping with bleach, a mask, butyl boots and gloves will be worn. QA will verify and certify the room as cleaned to a "XXX" level.

Conveyor Room

Workers wearing modified Level D protective clothing with rubber gloves and boots will thoroughly vacuum the floor and flat surfaces in the room and dispose of the bag with trash to the decontamination furnace. The conveyors will then be thoroughly cleaned with bleach and rinsed with water. The floor will be mopped with bleach and rinsed. When mopping with bleach, a mask, butyl boots and gloves will be worn. The process waste tank will be pumped dry, filled with bleach solution, circulated and pumped dry a final time to assure at least cleaning of its contents. All plant sumps will be flushed with bleach at this time. All waste from the process waste tank will be spray dried and drummed. QA will verify that the room is clean and certify the room as cleared to a "XXX" level.

Deactivation Furnace Room

The deactivation furnace will be shut down if it has been restarted for any reason. Workers wearing modified Level D protective clothing with rubber gloves and boots will thoroughly vacuum the floor and flat surfaces in the room and dispose of the bag with trash to the decontamination furnace. The floor of the deactivation furnace room will be thoroughly mopped with bleach and rinsed with water. When mopping with bleach, a mask, butyl boots and gloves will be worn. QA will verify and certify that the room is cleared to a "XXX" condition.

Air Lock 7

Air Lock 7 and its associated rooms will be thoroughly vacuumed and the vacuum bag disposed of by drumming with electrostatic precipitator waste. All items in the suit removal of Air Lock 7 will be returned to supply or the laundry. All items in the air lock will be bagged and fed to the decontamination furnace. The air lock and its associated rooms will be mopped with bleach and rinsed with water. QA will then verify and certify the air lock as cleaned to the "XXX" level.

Afterburner and Decontamination Furnace

The afterburner and the decontamination furnace will be shut down. The access door on the afterburner will be opened and the exit side doors on the decontamination furnace will be opened after the units have cooled. Both units will be cleaned and inspected for refractory damage. Modified Level D protective clothing will be worn. Refuse from the furnaces will be drummed with the process furnace residue. The furnace access and exit doors will be closed.

Quench

The quench will be shut down. The access doors to the quench will be opened and the unit will be washed and physically cleaned and allowed to dry. The carbonate tank will be drained, rinsed with a mild acid and all residual carbonate and acid water will be pumped to the spray drier. The system will then be completely drained and left in that condition.

Electrostatic Precipitator (EP)

The electrostatic precipitator will be shut down. The hoppers will be emptied into 55-gallon drums and will be thoroughly cleaned, washed and rinsed. The fields in the ESP are frequently inspected for buildup of residue. If buildup is significant, the fields are hit with a hammer and the residue falls into the hoppers. QA will assure that the electrostatic precipitator is completely empty of residue and is free of arsenic contamination. Drums will be stored with the furnace refuse and spray dried salts as described above.

Scrubbers

The scrubbers and ventilation fans will be shut down. The scrubbers will be rinsed with a mild acid and the scrubber sump will be emptied to the spray drier. The line to the spray drier will be rinsed with a mild acid. Both the scrubbers and all associated lines and sumps will be drained completely to prevent freezing during winter conditions. The liquid will be spray dried.

General Plant Areas

All supplies not directly associated with in-plant specific subsystems will be returned to supply or the laundry. All refuse will be cleaned and removed, including that from the residue handling module and especially around the residue area. This will be drummed with the furnace residue. All batteries will be removed. All water lines will be winterized. All decontamination solutions which do not automatically drain to the process waste tank will be collected and drained to that tank. The process waste tank will then be fed to the spray drier and the solutions will be dried to salt at 800°F. The fans and ducts between the various air pollution control devices are routinely inspected for buildup of residue. During normal maintenance the fans are kept clean. The ducts have never had previous problems with residue buildup.

Spray Dryer

The spray dryer will be operated until all liquid cleanup waste has been reduced to salt. The spray dryer will be washed out, cleaned, and drained by personnel in dust protective clothing. The spray dryer enclosure will be vacuumed and washed by personnel in dust protective clothing. Collected dust will be drummed with the spray dried salts. The spray dryer work area will be vacuumed and washed by personnel in modified Level D protective clothing. Collected dust will be drummed with the spray dried salts. QA will verify and certify the area and equipment free of agent and arsenic contamination.

9.7.4 Schedule

The closure plan will be initiated by the Chief of Plant Operations after approval of the Commander of Rocky Mountain Arsenal and the Commander of U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) have been received. Final closure is projected for the year 2000. Depending upon the last incineration program, modifications will be submitted to the EPA.

Completion of this closure operation will clear the facility of all lethal chemicals and leave the plant in a safe standby condition. RMA will add detailed amendments to this closure plan and submit them to the regulatory authority at least 60 days before any changes are implemented.

The closure plan will be implemented within 90 days after receiving the final volume of waste and completed within 180 days of its implementation.

9.7.5 Certification of Closure

The Quality Assurance Office at RMA will verify the results of the air monitoring criteria previously described in conjunction with an independent registered professional engineer. When satisfied that an area or item has met the necessary criteria, a decontamination tag indicating the appropriate level of decontamination will be affixed. After a room or item has been inspected, an Equipment Inspection and Maintenance Worksheet will be filled out and processed.

Upon completion of the cleanup, an on-site postoperational survey will be made by representatives of USATHAMA and RMA Safety/QA in conjunction with an independent registered professional engineer. Upon the recommendation of this survey team, the facility will be judged clean or in need of further attention. When found clean by the survey team, the area will be certified as closed. This certification will be submitted to the EPA Regional Administrator to assure that the facility has been closed in accordance with the specifications of the approved closure plan.

10.0 OTHER FEDERAL LAWS

Rocky Mountain Arsenal has reviewed and is in compliance with the following federal laws:

- The Wild and Scenic Rivers Act.
- The National Historic Preservation Act.
- The Endangered Species Act.
- The Coastal Zone Management Act.
- The Fish and Wildlife Coordination Act.

11.0 CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Richard W. Smith

Lieutenant Colonel Richard W. Smith
Commander
Rocky Mountain Arsenal

3 May 1982

Date Signed

LIST OF REFERENCES

AAI Corporation, 1976, Systems Analysis Study of Waste Salts Disposal Methods, Engineering Report No. ER8881, Prepared for the Department of the Army, Aberdeen Proving Ground, Maryland.

Brankowitz, W.R., M.E. Witt, J.A. Ursillo, and J.C. Pantleo, 1982, Mustard Operations, Phase 1 Final Report, DOA, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland.

Davis, P.M., M.E. Brooks, T. Mason and S. Suss, 1977, Chemical and Thermal Methods for Analysis of GB Demilitarization Brines and Spray-Dried Salts (M-34 etc.), Technical Report EC-TR-76079, Department of the Army, Edgewood Arsenal, Aberdeen Proving Ground, Maryland, 45 pp.

Department of the Army, Rocky Mountain Arsenal, February 20, 1981a, Disaster Control Plan.

Department of the Army, Rocky Mountain Arsenal, February 20, 1981b, Chemical Accident and Incident Control, Annex C to the Disaster Control Plan.

Hedley, W.H., G.A. Richardson, D.E. Earley, C.M. Moscowitz, and R.B. Reznik, 1975, Disposal of Detoxified Chemical Agents, Monsanto Research Corporation, Edgewood Arsenal Contract Report MRC-DA-485, Prepared for the Department of the Army, Aberdeen Proving Ground, Maryland.

Mazur, J.F., G.E. Podolak, B.T. Heitke, 1980, Use of a GC Concentrator to Improve Analyses of Low Levels of Airborne Hydrazine and Unsymmetrical Dimethylhydrazine, Am. Ind. Hyg. Assoc. Journal, 41:66-69.

Meseke, E.L., R.F. Magardo, E.F. Colburn, P.S. Grasso, and S. Bock, 1978, Simulant Tests Conducted at Rocky Mountain Arsenal for the Disposal of Obsolete Chemical Agent Identification Sets by Incineration, Contractor Report ARCSL-CR-78038, U.S. Army Armament Research and Development Command, Chemical Systems Laboratory, Aberdeen Proving Ground, Maryland.

Office of the Department of Army Project Manager, 1975, Project Eagle, Phase I, Bulk Mustard Demilitarization at Rocky Mountain Arsenal, Prepared for Chemical Demilitarization and Installation Restoration, Aberdeen Proving Ground, Maryland.

Rinehart, D., A. Deiner and G. Pankoff, 1977, The Determination of Isopropyl Methylphosphonofluoride (GB) Emissions from the Rocky Mountain Arsenal M34 Spray Dryer, Technical Report ARCSL-TR-77031, U.S. Army Armament Research and Development Command, Chemical Systems Laboratory, Aberdeen Proving Ground, Maryland, 79 pp.

Rocky Mountain Arsenal, 1976 with Revision in 1980, Phosgene Transfer Operations, Special Procedures and Standing Instruction Operating Procedures.

LIST OF REFERENCES
(Continued)

Rocky Mountain Arsenal, 1980, Mission, Organization and Functions, Rocky Mountain Arsenal, RMA Regulation RMAC 10-1.

Rocky Mountain Arsenal, November 1, 1982, Standing Operating Procedures for the Hydrazine Blending Facility.

Rocky Mountain Arsenal, 1983, Draft of RMA Spill Prevention Control and Countermeasure Plan (SPCC).

Rocky Mountain Arsenal, 1982b, CAIC Plan Implementation, 28 Separate Standing Operating Procedures dated from March 3, 1980 through July 14, 1982.

Scott, J., R.J. Bucci, E.L. Meseke, J.W. Coheen, M. Leister, J. Burbieri, H. R. Vand, and J. Telle, 1977, Engineering Study of the Incineration Facilities at Rocky Mountain Arsenal for the Demilitarization and Disposal of Obsolete Chemical Agent Identification Sets, Edgewood Arsenal Contractor Report EM-CR-77027, DOA, Aberdeen Proving Ground, Maryland.

Scott, J.A., W.R. Brancowitz, E.L. Meseke, and R.J. Medlyn, 1979, Final Pilot Test Report, Disposal of Chemical Agent Identification Sets at Rocky Mountain Arsenal, Colorado, 3 Vols., Department of the Army, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland.

Stearns-Roger Engineering Corporation, 1979 with revisions in 1980 and 1981, Chemical Agent Identification Set Project Documentation, Prepared for the Department of Army, Rocky Mountain Arsenal, 10 Vols., Modified in 1982 and 1983 for DDT Program, now referred to as the North Plants Incinerator Project Documentation:

Volume 1 - Standing Operating Procedures
Volume 2 - Standing Operating Procedures
Volume 3 - Contingency Procedures
Volume 4 - Administrative Procedures
Volume 5 - Preventive Maintenance
Volume 6 - Technical Description
Volume 7 - Technical Description
Volume 8 - Maintenance Procedures
Volume 9 - Maintenance Procedures
Volume 10 - Laboratory Procedures

Stearns-Roger Engineering Corporation, 1980, HVAC Balancing and Operational Checkout for Rocky Mountain Arsenal Building Number 1611, Prepared for Rocky Mountain Arsenal.

Ursillo, J.A., A.L. McKinney, A.G. Jurison, L.M. Lojek, and J.B. Wicks, 1975, Final Report, Project Eagle I Bulk Mustard Demilitarization, Chemical Demilitarization and Installation Restoration, Aberdeen Proving Ground, Maryland.

LIST OF REFERENCES
(Continued)

U.S. Army and U.S. Air Force, 1963, Military Chemistry and Chemical Agents, TM 3-215 and AFM 355-7.

U.S. EPA, 1980a, Samples and Sampling Procedures for Hazardous Waste Streams, Report No. EPA-600/2-80-018.

U.S. EPA, 1980b, A Method for Determining the Compatibility of Hazardous Waste, Report No. EPA-600/2-80-076.

U.S. EPA, 1982, Test Methods for Evaluating Solid Waste, Report No. SW-846, 2nd Ed.

Windholz, M. (Ed.), 1976, The Merck Index, An Encyclopedia of Chemicals and Drugs, Merck & Co., Inc., Rahway, N.J.

Woodward, G.T. and S.H. Bass, 1971, Plan for the Detoxification of Mustard and the Decontamination of Empty Mustard Ton Containers at Rocky Mountain Arsenal, U.S. Army Munitions Command.

TABLE 2.1

COMPARISON OF BUILDING FLOOR ELEVATIONS
AND FLOOD WATER SURFACE ELEVATIONS

BUILDING NO.	FLOOR ELEVATION	100-YEAR FLOOD WATER SURFACE ELEVATION
786	5253.25	5251.23
787	5252.00	5251.23
788	5251.11	5251.23
791	5245.23	5240.76
793	5248.45	5240.76
871B	5269.50(1)	5268.25

(1)Estimated in the field.

TABLE 3.1

INVENTORY OF HAZARDOUS WASTES AT THE DPDO FACILITY[1]

NO.	CONTAINER TYPE	DESCRIPTION	EPA IDENTIFICATION NO.
7	55 gal. drum	Methyl ethyl ketone solvent contaminated with paint wastes including acetone, toluene, epoxy primer, polyurethane, enamel and lacquer thinner	F005
3	55 gal. drum	Paint stripper	U080
1	32 gal. drum with 4 plastic containers inside	Mercury contaminated waste (90% water, 10% mercury) one 5 lb. bottle, one 6 lb. bottle, two 5 gal. containers	D009

TOTAL: 10 - 55 gal. steel drums
1 - 32 gal. steel drums

[1] As of April 15, 1983.

TABLE 3.2

RESULTS OF ANALYSES OF EXTRACTS FROM EP TESTS
PHOSGENE AND MUSTARD SALTS[1,2]

PARAMETERS	UNITS	RCRA CONCENTRATION LIMITS[3]	CG Salt-D11		CG Salt-D5		H Salt-D1		H Salt-D2	
			Split A	Split B	Split A	Split B	Split A	Split B	Split A	Split B
pH[4]	s.u.	--	11.7		11.4		10.3		9.8	
TRACE METALS:										
Arsenic	mg/l	5.0	0.517	0.631	0.316	0.326	1.75	1.75	1.97	1.91
Barium	mg/l	100	<0.01	<0.01	<0.01	<0.01	0.015	0.06	<0.01	<0.01
Cadmium	mg/l	1.0	0.0005	0.0021	0.0088	0.018	0.0024	0.017	0.004	0.0094
Chromium	mg/l	5.0	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Lead	mg/l	5.0	47.9*	41.1*	25.4*	31.4*	0.041	0.054	0.426	0.290
Mercury	mg/l	0.2	<0.0002	<0.0002	0.0003	<0.0002	0.0069	0.0073	0.0095	0.009
Selenium	mg/l	1.0	0.176	0.285	0.097	0.097	0.543	0.175	0.043	0.14
Silver	mg/l	5.0	<0.01	<0.01	<0.01	<0.01	0.02	0.015	0.01	0.01
ORGANICS:	--	--	Organics Analyzed[5]		--	--	--	--	Organics Detected[6]	

NOTES:

(1) The H-salt samples were collected from random drums which were not numbered. The CG salt samples were collected from random drums numbered drum #11 and drum #5. The samples were analyzed as split samples by Waterways Experiment Station, Vicksburg, Mississippi.

(2) CG = Phosgene; H = Mustard

(3) From 40 CFR § 261.24.

(4) The pH was determined from a 10:1 (water/waste, by volume) deionized water extract of the waste material.

(5) No organics compounds were detected.

(6) The following organic compounds were detected, however, the concentrations were very small and were not quantified: p-chlorophenylmethyl sulfone, 2-cyclohexen-1-one, and 4-chlorocyclohexanol.

*Exceeds the RCRA concentration limits.

"--" = Not determined.

TABLE 3.3

CHEMICAL COMPOSITIONS OF
GB SPRAY DRIED SCRUBBER SALTS

PARAMETER:	UNITS	567-457-468	709 651-649	947-955-970	JUNE-JULY 1975 1	2	3	4	AUGUST, OCTOBER 1975 1	3	4	5	6	7	8	9	2-3-2	3-2-2	10-15	4B-2-2	10	12	16	17	18	19
Na_2CO_3	%	16.9	8.3	15.3	28.7	31.0	27.7	19.0	30.1	32.4	32.3	34.4	33.8	21.9	28.7	32.3	18.3	26.9	19.7	24.4	25.2	29.9	26.5	27.5	26.4	25.9
NaF	%	16.4	20.6	19.9	15.2	12.7	13.2	11.7	13.1	13.2	15.2	12.2	12.2	15.6	15.2	14.6	17.9	13.5	25.5	13.7	21.9	17.0	15.1	14.5	15.5	14.6
NaIMP	%	38.0	54.2	58.5	48.1	49.8	49.8	59.6	45.8	53.4	37.4	46.0	48.0	32.5	44.4	45.0	41.2	52.0	28.5	48.9	39.8	44.7	46.4	46.5	45.4	46.6
Na_2MP	%	32.0	14.5	5.5	5.3	3.9	4.2	6.8	1.8	–	12.6	1.4	–	17.2	6.5	6.1	14.7	2.6	26.7	5.2	6.0	1.6	2.2	8.6	9.5	7.8
NaOH	%	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.2	4.2	<0.5	–	–	–	2.0	–	–	–
Volatiles	%	6.5	4.0	4.5	1.0	0.4	1.0	2.0	1.6	2.3	1.4	2.0	1.8	2.4	1.8	2.2	<0.1	<0.1	–	<0.1	1.9	2.0	2.4	2.7	1.7	1.8
Sulfur	%	–	–	–	–	–	–	–	0.008	0.05	–	0.18	–	–	0.008	–	0.02	–	–	–	0.05	<0.01	0.30	0.32	0.36	0.38
pH(1)	s.u.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13.3	13.0	13.6	12.7	13.3	13.2	13.2	13.2	13.1	13.2
DIMP	µg/g	242	40	29	<0.38	5	<2.5	<4.2	2.0	5	59	4	<1.2	0.15	1.8	19	<0.08	<0.07	<0.01	<0.02	0.6	0.1	0.2	<0.1	<0.07	<0.08
TBA(2)	µg/g	–	–	–	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	99	<0.001	100	<0.01	<0.01	<0.01	94	49	195	240	100	100
DICDI(2)	µg/g	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	700	–	–	–	–	–	–	–	–	–

(1) Determined on a slurry of 30 gm salts to 100 ml of deionized water.
(2) Stabilizers
"–" = Not analyzed.

TABLE 3.4

RESULTS OF ANALYSES OF EXTRACTS FROM EP TESTS
HYDRAZINE SUMP WATER, WHEAT AND GB SALTS[1]

PARAMETERS	UNITS	RCRA CONCENTRATION LIMITS[2]	HYDRAZINE SUMP	WHEAT 42	WHEAT 1	GB SALT	GB SALT DICIDI[3]
pH[4]	s.u.	--[4]	--	--	--	--	--
TRACE METALS:							
Arsenic	mg/1	5.0	0.007	<0.005	<0.005	--	--
Barium	mg/1	100	--	1.37	0.075	--	--
Cadmium	mg/1	1.0	0.0022	0.0023	0.0011	0.0272	0.0021
Chromium	mg/1	5.0	<0.001	0.007	0.001	<0.001	0.001
Lead	mg/1	5.0	0.001	0.029	0.003	2.5	0.042
Mercury	mg/1	0.2	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	mg/1	1.0	<0.0004	0.0254	0.0154	0.0096	0.0011
Silver	mg/1	5.0	0.002	0.002	0.002	0.002	<0.001
ORGANICS:							
Endrin	µg/1	20[5]	<0.01	<0.01	<0.01	<0.02	<0.02
Lindane	µg/1	400[5]	<0.01	<0.01	<0.01	<0.4	<0.4
Methoxychlor	µg/1	10,000[5]	<0.2	<0.2	<0.2	<0.5	<0.5
Toxaphene	µg/1	500[5]	<0.01	<0.01	<0.01	<10	<10
2, 4-D	µg/1	10,000[5]	0.5	<0.1	0.5	0.2	<0.1
2, 4, 5-TP (Silvex)	µg/1	1,000[5]	<0.1	0.3	<0.1	0.3	<0.1

(1) The samples were analyzed by Environmental Laboratory Analytical Laboratory Group, Waterways Experiment Station, Vicksburg, Mississippi.

(2) From 40 CFR § 261.24.

(3) Stabilizer.

(4) "--" = Not determined.

(5) Values are reported in 40 CFR § 261.24 in mg/1 but were converted to µg/1 to be directly comparable to data.

TABLE 3.5

AGENT COMPOSITION OF CHEMICAL AGENT SETS K945, K955, K941, K942, AND K951/952[1]

MATERIAL	QUANTITY (LB)				
	K945	K955	K941	K942	K951/952
Mustard (H or HD)	0.003	0.14	7.9	8.82	0.07
Nitrogen Mustard (HN-1)	-	-	-	-	-
Nitrogen Mustard (HN-3)	-	-	-	-	-
Lewisite (L)	0.012	0.10	-	-	0.10
Chloropicrin (PS)	-	0.09	-	-	0.87
Phosgene (CG)	-	-	-	-	1.46
Cyanogen Chloride (CK)	-	-	-	-	-
Sarin (GB)	0.029	-	-	-	-
Chloracetophenone (CN)	-	0.03	-	-	-
Adamsite (DM)	-	0.03	-	-	-
Chloroform	-	-	-	-	3.81
GA Simulant[2]	-	-	-	-	-
AC Simulant - KCN	0.013	-	-	-	-
G Simulant[3]	0.041	-	-	-	-
V Simulant[4]	0.051	-	-	-	-
H Simulant[5]	0.046	-	-	-	-
CG Simulant[6]	0.011	0.01	-	-	-
Activated Charcoal	-	0.36	-	-	-
Polystyrene Pellets	0.07	-	-	-	-
TOTAL	0.28	0.76	7.9	8.82	6.31

(1)From Scott et al. (1979).

(2)Mixture of ethyl malonate, oenanthic ether and benzonitrile.

(3)Mixture of hexylene glycol and methoxyethanol.

(4)Mixture of tetrahydrofurfuryl alcohol, N-methylglucamine, and diethylene glycol.

(5)Isoamylsalicylate.

(6)Mixture of triphosgene and phosgene.

TABLE 3.6

COMPOSITION OF X-SETS[1]

MATERIAL	QUANTITY (LB) X302	X545	X547	X548	X550	X551	X552
Nitrogen Mustard (HN-1)	0.060	-	-	-	0.120	-	-
Nitrogen Mustard (HN-3)	0.068	-	-	-	-	0.137	-
CG Simulant	-	0.013	-	-	-	-	-
Mustard (H)	-	-	0.140	-	-	-	-
Lewisite (L)	-	-	-	0.208	-	-	-
Chloropicrin (PS)	-	-	-	-	-	-	0.182
Activated Charcoal	0.179	-	0.179	0.179	0.179	0.179	0.179
TOTAL	0.31	0.013	0.32	0.39	0.30	0.32	0.36

(1) From Scott et al. (1979).

TABLE 3.7

COMPOSITION OF K953/954 SETS[1]

MATERIAL	QUANTITY (LB) ALT. 1	ALT.2	ALT.3
Mustard (H)	0.04	0.09	0.07
Lewisite (L)	0.07	0.07	0.10
Phosgene (CG)	0.97	0.97	1.46
Cyanogen Chloride (CK)	0.83	0.83	1.25
Nitrogen Mustard (HN-1)	0.08	0.08	-
GA Simulant[2]	0.67	-	-
Chloroform	2.99	4.01	3.01
TOTAL	5.65	6.05	5.89

(1)From Scott et al. (1979).

(2)Mixture of ethyl malonate, oenanthic ether and benzonitrile.

TABLE 3.8

CHEMICAL AGENT SET CONSTITUENTS[1]

CHEMICAL AGENT SET	QUANTITY (LB)					
	K941	K942[2]	K945	K951/4[3]	K955	X
Agent (includes $CHCl_3$)	7.9(35.8%)	8.82(38.2%)	0.28(2.4%)[4]	6.31(32.8%)[3]	0.76(6.3%)[5]	0.31(1.9%)[5]
Metal	4.00(18.0%)	4.00(17.3%)	0.35(3.1%)	4.63(24.0%)[6]	8.30(68.3%)	1.53(9.2%)
Glass	4.76(21.4%)	4.76(20.6%)	1.53(13.4%)	4.70(24.4%)	3.10(25.4%)	0.75(4.5%)
Plastic	-	-	1.36(11.9%)	-	-	-
Wood/Sawdust	3.5(15.8%)	-	7.50(65.7%)	-	-[7]	14.00(84.4%)
Cardboard/Cotton	2.00(9%)	8.8(23.8%)	0.40(3.5%)	3.62(18.8%)	-	-
TOTAL SETS	22.16(100%)	26.38(100%)	11.42(100%)	19.26(100%)	12.16(100%)	16.59(100%)

(1) From Scott et al. (1979).

(2) Does not include outer steel drum.

(3) The actual quantity of agent in K953/954 differs slightly from those in K951/952. All other components are identical and since the K951/952 sets make up over 95% of the total, their composition is shown here.

(4) Includes plastic pellets.

(5) Includes activated charcoal.

(6) Does not include shipping containers.

(7) Does not include outer wooden box.

TABLE 3.9

COMPOSITIONS OF CAIS SALTS AND RESIDUES[1]

SAMPLE NO. PARAMETERS:	UNITS	SPRAY DRIER SCRUBBER SALTS: DRIER #1 FIRST BARREL FROM K945 TYPE SETS[2]	SPRAY DRIER SCRUBBER SALTS: DRIER #2 LAST BARREL FROM K945 TYPE SETS[2]	ELECTROSTATIC PRECIPITATOR RESIDUE: DRUM 12 INLET #1 FROM K945 TYPE SETS[2]	ELECTROSTATIC PRECIPITATOR RESIDUE: DRUM 14 INLET #1 FROM X458 TYPE SETS[2]	QUENCH RESIDUE: Q1 FROM K951 TYPE SETS[2]
Carbonate	wt%	50.5	49.2	19.2	18.5	36.1
Chlorine	wt%	6.38	6.79	22.32	18.12	6.0
Iron	wt%	1.75	0.10	1.22	3.64	--
Organic Carbon	wt%	2.6	3.2	3.0	0.9	0.87
Sodium	wt%	37.2	39.4	37.0	32.6	39.6
Sulfate	wt%	0.17	0.42	14.37	21.1	9.7
pH	s.u.	--	--	--	--	9.7
TRACE METALS:						
Arsenic	g/g	440	187	3280	7260	320
Cadmium	g/g	18	1	160	75	--
Chromium	g/g	17	6	25	45	--
Copper	g/g	33	8	67	197	--
Lead	g/g	154	29	1280	2500	--
Mercury	g/g	1.56	0.20	0.69	1.02	--
Manganese	g/g	95	9	87	240	--
Nitrate	g/g	3380	3650	3330	9060	1730
Potassium	g/g	740	580	890	1700	--
Silver	g/g	6	3	3	5	--
Sulfide	g/g	--	--	--	--	<2
Zinc	g/g	230	62	1530	2980	--

(1) Analyses performed by the Denver Research Institute and reported in Scott et al. (1979).

(2) Type of set being incinerated before sampling occurred (see Table 4.4). The scrubber and quench solutions were actually collected over the entire Phase I program and then spray dried.

TABLE 3.10

RESULTS OF ANALYSES OF EXTRACTS FROM EP TESTS
CAIS SPRAY DRIED SCRUBBER SALTS[1]

PARAMETERS:	UNITS	RCRA CONCENTRATION LIMITS[2]																SD-D1[3]		SD-D2[3]	
SAMPLE NO.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
DRUM NO.			4	M-6	M-7	7	M-8	8	M-9	26	27	98	M-1	M-2	M-3	M-4	M-5	Split A	Split B	Split A	Split B
pH[4]	s.u.		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.3		10.2	
TRACE METALS:																					
Arsenic	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	3.1	3.0	<0.5	4.7	4.0	14.3*	14.4*	13.6*	12.5*
Barium	mg/l	100	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	0.06	0.065	0.02	0.025
Cadmium	mg/l	1.0	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	0.19	0.20	0.20	0.20	0.21	0.21	0.21	0.22	0.20	0.016	0.014	0.0068	0.0061
Chromium	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.025	<0.025	<0.025	<0.025
Lead	mg/l	5.0	<0.5	<0.5	0.54	<0.5	0.92	<0.5	0.76	<0.5	<0.5	<0.5	2.7	2.7	2.9	2.5	2.5	0.146	0.158	0.074	0.067
Mercury	mg/l	0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.0003	0.0003	<0.0002	<0.0002
Selenium	mg/l	1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.291	0.333	0.332	0.202
Silver	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01
ORGANICS:	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Organics Detected[5]		--	--

NOTES:

(1)The numbered samples were analyzed by the U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland.

(2)From 40 CFR 261.24.

(3)Samples were collected from random drums which were not numbered. The samples were analyzed as split samples by the Waterways Experiment Station, Vicksburg, Mississippi.

(4)The pH was determined from a 10:1 (water/waste, by volume) deionized water extract of the waste materials.

(5)The following organic compounds were detected in Sample SD-D1, however, the concentrations were very low and were not quantified: 4-chlorocyclohexanol and 2-bromocyclohexanol.

* Exceeds RCRA concentration limits for arsenic.

"--" = Not determined.

TABLE 3.11

RESULTS OF ANALYSES OF EXTRACTS FROM EP TESTS
CAIS ELECTROSTATIC PRECIPITATOR RESIDUE[(1)]

PARAMETERS	UNITS	RCRA CONCENTRATION LIMITS[(2)]													D1[(3)]		D2[(3)]	
SAMPLE NO.			26	27	28	29	30	31	32	33	34	35	36	37				
DRUM NO.			9	10	12	13	14	15	16	21	26	27	11	22	SPLIT A	SPLIT B	SPLIT A	SPLIT B
pH[(4)]	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	9.8		9.4	
TRACE METALS:																		
Arsenic	mg/l	5.0	2.5	1.8	1.3	1.6	4.1	<0.5	2.7	<0.5	1.1	1.1	<0.5	3.4	31.6*	34.9*	30.3	29.5
Barium	mg/l	100	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	0.17	0.275	0.045	0.075
Cadmium	mg/l	1.0	0.30	0.59	0.94	0.57	2.54*	0.44	0.77	0.17	0.26	1.42*	<0.1	0.88	0.75	0.686	1.65*	1.49*
Chromium	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.025	<0.025	0.035	0.04
Lead	mg/l	5.0	0.99	0.95	3.02	4.78	1.08	8.7	9.5*	1.39	3.93	1.92	<0.5	1.89	0.391	0.451	3.67	3.42
Mercury	mg/l	0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.199	<0.02	0.0053	0.0048	0.0042	0.0035
Selenium	mg/l	1.0	<0.1	<0.1	0.17	0.16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.092	0.083	0.085	0.106
Silver	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.105	0.045	0.065	0.05
ORGANICS:	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Organics Detected[(5)]		Organics Detected[(6)]	

NOTES:

(1)The numbered samples were analyzed by the U.S. Army and Environmental Hygiene Agency, Aberdeen Proving Grounds, Maryland.

(2)From 40 CFR § 261.24.

(3)Samples were collected from random drums which were not numbered. The samples were analyzed as split samples by the Waterways Experiment Station, Vicksburg, Mississippi.

(4)The pH was determined from a 10:1 (water/waste by volume) deionized water extract of the waste material.

(5)The following organic compounds were detected in ESP-D1; but, the concentrations were very low and were not quantified: 4-chlorocyclohexanol, 1-bromo-2-chlorocyclohexanol, and 2-bromocyclohexanol.

(6)The following organic compounds were detected in ESP-D2, however, the concentrations were very low and were not quantified: Benzo[c]cinnoline, 4-chlorocyclohexanol, 1-bromo-2-chlorocyclohexanol, and 2-bromocyclohexanol.

*Exceeds the RCRA concentration limits.

"--" - Not determined.

TABLE 3.12

RESULTS OF ANALYSES
OF EXTRACTS FROM EP TESTS
CAIS FURNACE RESIDU"[1]

PARAMETERS SAMPLE NO. DRUM NO.	UNITS	RCRA CONCENTRATION LIMITS[2]	16 25	17 81	18 89	19 86	20 87	21 90	22 91	23 31	24 30	25 58	SPLIT A[3]	SPLIT B[3]
pH[4]	s.u.	--	--	--	--	--	--	--	--	--	--	--		
TRACE METALS:														
Arsenic	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.447	0.288
Barium	mg/l	100	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	0.525	0.385
Cadmium	mg/l	1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.75	1.03
Chromium	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.045	0.035
Lead	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	33.8*	12.1*
Mercury	mg/l	0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002
Selenium	mg/l	1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.068	0.033
Silver	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01
ORGANICS:	--	--	--	--	--	--	--	--	--	--	--	--	Organics Detected[5]	

NOTES:

(1) The numbered samples were analyzed by the U.S. Army and Environmental Hygiene Agency, Aberdeen Proving Grounds, Maryland.

(2) From 40 CFR § 261.24.

(3) Samples were collected from random drums which were not numbered. The samples were analyzed as split samples by the Waterways Experiment Station, Vicksburg, Mississippi.

(4) The pH was determined from a 10:1 (water/waste by volume) deionized water extract of the waste material.

(5) The following organic compound was detected, however, the concentration was very low and was not quantified: 2-bromo-cyclohexanol.

*Exceeds RCRA concentration limits for lead.

"--" = Not determined.

TABLE 3.13

RESULTS OF ANALYSES
OF EXTRACTS FROM EP TESTS
CAIS QUENCH RESIDUE(1)

PARAMETERS	UNITS	RCRA CONCENTRATION LIMITS(2)							
SAMPLE NO.			38	39	40	41	42	--	--
DRUM NO.			6	7	8	19	45	SPLIT A(3)	SPLIT B(3)
pH(4)	s.u.	--	--	--	--	--	--	10.3	
TRACE METALS:									
Arsenic	mg/l	5.0	<0.5	<0.5	1.0	2.3	0.60	14.5*	15.7*
Barium	mg/l	100	<10	<10	<10	<10	<10	0.025	<0.01
Cadmium	mg/l	1.0	1:53*	0.13	<0.1	<0.1	<0.1	0.016	0.017
Chromium	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.025	<0.025
Lead	mg/l	5.0	0.73	<0.5	<0.5	<0.5	<0.5	0.02	0.013
Mercury	mg/l	0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.0002	<0.0002
Selenium	mg/l	1.0	<0.1	<0.1	<0.1	<0.1	<0.1	0.182	0.127
Silver	mg/l	5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01
ORGANICS:	--	--	--	--	--	--	--	Organics Analyzed(5)	

NOTES:

(1)The numbered samples were analyzed by the U.S. Army and Environmental Hygiene Agency, Aberdeen Proving Grounds, Maryland.

(2)From 40 CFR § 261.24.

(3)Samples were collected from random drums which were not numbered. The samples were analyzed as split samples by the Waterways Experiment Station, Vicksburg, Mississippi.

(4)The pH was determined from a 10:1 (water/waste by volume) deionized water extract of the waste material.

(5)No organic compounds were detected.

*Exceeds RCRA concentration limits.

TABLE 3.14

CONSTITUENTS OF M60 AMMUNITION[1]

CONSTITUENT	GRAMS/ROUND
Brass Case	11.99
Bullet (Ball)	9.72
Propellant	3.05
Unspecified	0 32
TOTAL	25.08
Bullet	
Jacket (Guilding Metal)	3.69
Core (Steel)	3.56
Filler-Point (Lead-Tin)	1.56
Filler-Base (Lead-Tin)	0.91
TOTAL	9.72

(1) M60 ammunition is one of the three types contaminated with DDT.

TABLE 3.15

CHEMICAL COMPOUNDS IN ADAMSITE (DM) GRENADES

M6		M25A2		M6AI	
COMPOUND	WEIGHT (gm)	COMPOUND	WEIGHT (gm)	COMPOUND	WEIGHT (gm)
Nitrocellulose	128.80	DM	61.80	DM	68.20
DM	60.90	Silica Aerogel	3.20(1)	Potassium Chlorate	66.80(1)
CN	60.90	Lead Azide	0.65(1)	Sugar	45.90
Potassium Nitrate	16.30(1)	Tetryl	0.52(1)	CN	40.60
Barium Nitrate	12.80(1)	Potassium Nitrate	0.48(1)	Potassium Bicarbonate	35.00(1)
Magnesium Oxide	7.50(1)	Lead Styphnate	0.20	Diatomaceous Earth	7.00(1)
Starch	4.42	Sulfur	0.07	Magnesium Oxide	6.50(1)
Diphenylamine	1.20	Charcoal	0.01	Potassium Nitrate	3.50(1)
Red Lead	0.83(1)			Charcoal	1.40
Charcoal	0.70			Red Lead	0.80
Sulfur	0.50			Nitrocellulose	0.25
Aurine	0.40			Silicon	0.24(1)
Silicon	0.24(1)			Titanium	0.13(1)
Titanium	0.13(1)			Iron Oxide	0.09(1)
Iron Oxide	0.09(1)			Zirconium	0.03(1)
Zirconium	0.03(1)				

SUMMARY:

	M6	M25A2	M6AI
Filler Total (gm)	296	66.9	276
(lbs)	0.652	0.148	0.610
(1)Non-Volatiles (gm)	37.9	5.05	120
(lbs)	0.083	0.011	0.264
As_2O_3 from DM (lbs)*	0.048	0.049	0.054

*For each pound of DM that is incinerated, 0.356 pound of As_2O_3 is produced.

TABLE 4.1

SUMMARY OF CONTAINER STORAGE FACILITIES AND CONTENTS

BUILDING IDENTIFICATION	BUILDING NO.	BUILDING CONTENTS[1]
Contaminated Wheat Storage Building	354	Ceresan treated wheat, misc. equipment and materials
Storage Warehouses equipment	785	CAIS salts and residue, misc. and materials
	786	GB salts
	787	GB salts
	788	Mustard salts and residue
	791	Mustard salts and residue
	793	Phosgene salts, misc. equipment and materials
	794	Mustard salts and residue and CAIS salts and residue
	795	Mustard salts and residue
	796	Mustard salts and residue
	797	GB salts
	798	GB salts
Concrete Storage Huts	871A-D	Empty
	872A-D	Empty
	873A-C	Empty
	874A-D	Empty
Storage Bunkers	881	DDT-contaminated ammunition
	882	Adamsite grenades and bulk
	883	Blasting fuses
	884	DDT-contaminated ammunition
	885	DDT-contaminated ammunition, adamsite grenades
	886	Adamsite grenades and bulk

TABLE 4.1
(Continued)

BUILDING IDENTIFICATION	BUILDING NO.	BUILDING CONTENTS
Concrete Magazine Igloos	1605	Ammunition
	1608	Mustard ammunition
	1609	Ammunition and fuses
	1610	Mustard, phosgene and lewisite samples
Storage Sheds		
3 Sheds	Plot 1	Empty
2 Sheds	Plot 2	Empty
2 Sheds	Plot 3	GB salts
2 Sheds	Plot 4	Empty
2 Sheds	Plot 5	GB salts
2 Sheds	Plot 6	GB salts
3 Sheds	Plot 7	GB salts
3 Sheds	Plot 8	GB salts
3 Sheds	Plot 9	GB salts
3 Sheds	Plot 10	GB salts
3 Sheds	Plot 11	GB salts
3 Sheds	Plot 12	Empty
2 Sheds	Plot 27	GB salts
3 Sheds	Plot 28	GB salts

(1) GB = Nerve agent sarin
CAIS = Chemical Agent Identification Sets.

TABLE 4.2

RMA CONTAINER STORAGE AND MISCELLANEOUS EQUIPMENT INVENTORY
1983 SURVEY(1)

BUILDING NO.	NUMBER OF DRUMS CONTAINING WASTE MATERIAL(2): CG SALTS STEEL	CG SALTS FIBER	H SALTS STEEL	H SALTS FIBER	CAIS RESIDUE STEEL	CAIS RESIDUE FIBER	GB SALTS STEEL	GB SALTS FIBER	CERESAN TREATED WHEAT STEEL	CERESAN TREATED WHEAT FIBER	TOTAL DRUMS	DDT AND ADAMSITE MATERIAL (TONS): DDT	ADAMSITE	MISCELLANEOUS EQUIPMENT	% VOLUME OF FACILITY OCCUPIED BY DRUMS AND MISC. EQUIP.
354									7	250	257	-	-	Lumber, Pall Rings, Polyvinyl Alcohol, Paraffin Chloride	11
785					3,324	253					3,577	-	-	Laundry Equipment, Lumber	24
786							705	1,204			1,909	-	-	Lumber, Pallets	19
787							2,532	3,232			5,764	-	-	---	61
788			5,853								5,853	-	-	---	63
791				5,793							5,793	-	-	---	52
793		1,378									1,378	-	-	Lumber, Empty Drums	26
794			1,998			20					2,018	-	-	---	20
795			5,945								5,945	-	-	---	62
796			5,924								5,924	-	-	---	62
797							2,916	236			3,152	-	-	---	34
798							4,040	16			4,056	-	-	---	47
871A-D											0	-	-	---	0
872A-D											0	-	-	---	0
873A-C											0	-	-	---	0
874A-D											0	-	-	---	0
881											0	266	-	---	60
882											0	-	4	---	70
883											0	-	-	Blasting Fuses	5
884											0	305	-	---	80
885											0	280	1	---	95
886											0	-	606	---	95
1605											0	-	-	Ammunition	10
1608											0	-	-	Classified Items	5
1609											0	-	-	Ammunition, Fuses	5
1610											0	-	-	Classified Items	5
P1-S1-3											0	-	-	---	0
P2-S1-3											0	-	-	---	0

TABLE 4.2
(Continued)

BUILDING NO.	NUMBER OF DRUMS CONTAINING WASTE MATERIAL[2]: CG SALTS		H SALTS		CAIS RESIDUE		GB SALTS		CERESAN TREATED WHEAT		TOTAL DRUMS	DDT AND ADAMSITE MATERIAL (TONS)		MISCELLANEOUS EQUIPMENT	% VOLUME OF FACILITY OCCUPIED BY DRUMS AND MISC. EQUIP.
	STEEL	FIBER	STEEL	FIBER	STEEL	FIBER	STEEL	FIBER	STEEL	FIBER		DDT	ADAMSITE		
P3-S1-2							1,559				1,559	-	-	Clothing and Materials	70
P4-S1-2											0	-	-	Air Force Carrier Box, Aluminum Siding	5
P5-S1-2							3,297				3,297	-	-	---	70
P6-S1-2							3,276				3,276	-	-	---	70
P7-S1-3							3,801				3,801	-	-	---	70
P8-S1-3								3,044			3,044	-	-	Decontamination Agent	60
P9-S1-3								3,157			3,157	-	-	---	65
P10-S1-3								3,236			3,236	-	-	---	70
P11-S1-3							1,816	871			2,687	-	-	---	60
P12-S1-3											0	-	-	---	0
P27-S1-2							442	2,259			2,701	-	-	---	70
P28-S1-3								1,158			1,158	-	-	---	20
TOTAL	0	1,378	19,720	5,793	3,324	273	24,384	18,413	7	250	73,542[3]	851	611		39
TOTAL (BY TYPE)	1,378		25,513		3,597		42,797		257						

(1)Results from survey in November 1982 and January and February 1983 and RMA inventory records.

(2)Legend: CG=Phosgene, H=Mustard, CAIS=Chemical Agent Identification Set, GB=Nerve Agent Sarin.

(3)Total of 73,542 includes 73,285 drums in buildings which are managed by the Plant Operations Branch and 257 drums (wheat) in building 354 which is managed by the Supply Division.

TABLE 4.3

MEASURED AND DESIGN AIRFLOWS
AUGUST 1979
BUILDING 1611[1]

TRAVERSE POINT	LOCATION	MEASURED TEMPERATURE °F	ACTUAL FLOW (ACFM)	DESIGN FLOW (ACFM)
SC-1	Scrubber No. 1	96	24480	19025
SC-1	Scrubber No. 1	96	24428	19025
SC-2	Scrubber No. 2	100	22302	19025
SC-2	Scrubber No. 2	98	22356	19025
PTE-2	Deactivation Furnace	455	5474	7745
PTE-2	Deactivation Furnace	430	9376	7745
PTE-2	Deactivation Furnace	360	5990	7745
PTE-9	Decontamination Furnace	72	1300	1000
PTE-15	Decontamination Room	66	6120	2000
PTE-15	Decontamination Room	68	5878	2000
PTE-18	Suit & Shower Rooms No. 1 & 2	70	2037	1300
PTE-30	Airlock No. 1	66	516	1150
PTE-31	Airlock No. 2	65	571	580
PTE-32	Airlock No. 3	65	1258	580
PTE-33	Airlock No. 4	68	653	580
PTE-40	Decontamination Module	66	3311	450
PTE-42	Glove Box	68	465	600
PTE-42	Glove Box	68	696	600
PTE-42	Glove Box	70	874	600
PTE-43	Disassembly Room	65	3252	3228
PTE-44	Disassembly Room	65	3503	3228
PTE-48	Total From Main Building	70	18812	15832
PTE-49	Deactivation Furnace Room	135	12687	10165
PTE-49	Deactivation Furnace Room	182	11040	10165
PTE-51	Electrostatic Precipitator	208	27204	18235
PTE-57	Disassembly Room	64	2322	2736
PTE-60	Airlock No. 7	62	2855	1000

TABLE 4.3
(Continued)

TRAVERSE POINT	LOCATION	MEASURED TEMPERATURE °F	ACTUAL FLOW (ACFM)	DESIGN FLOW (ACFM)
PTE-61	Exit Shroud	62	1929	200
PTE-62	Residue Handling	70	1401	700
	SUPPLY VENTILATION TO BUILDING 1611			
PTS-3	Receiving Room	62	8672	8625
PTS-6	Suit & Shower Room No. 1	62	704	650
PTS-16	Suit & Shower Room No. 2	66	589	650
PTS-30	Decontamination Furnace Room and PTS-62 and PTS-16	62	4153	3650
PTS-37	Disassembly Room and Airlocks 1, 3, and 4	62	7592	8310
PTS-38	Disassembly Room and Airlock 2	62	8052	6030
PTS-32	Deactivation Furnace Bearings	80	423	_(2)
PTS-33	Deactivation Furnace Bearings	80	484	_(2)
PTS-53	Afterburner Combustion Air	94	1222	1550
PTS-55	Deactivation Furnace Combustion Air	120	259	600

(1) From Scott et al. (1979).

(2) _ = No original design values given.

TABLE 4.4

MEASURED AND DESIGN AIRFLOWS
SEPTEMBER 3, 1981
BUILDING 1611[1]

TRAVERSE POINT	LOCATION	MEASURED TEMPERATURE °F	ACTUAL FLOW (ACFM)	DESIGN FLOW (ACFM)
PTE-SC-1	Scrubber No. 1	101	24363	19025
PTE-SC-2	Scrubber No. 2	104	17092	19025
PTE-2	Deactivation Furnace	420	6983	7745
PTE-2	Deactivation Furnace	440	6135	7745
PTE-9	Conveyor Room	83	2199	1000
PTE-18	Suit and Shower Rooms Nos. 1 & 2	75	1247	1300
PTE-30	Airlock No. 1	71	1568	1150
PTE-31	Airlock No. 2	71	831	580
PTE-32[2]	Airlock No. 3	-	-	-
PTE-33	Airlock No. 4	63	833	500
PTE-40	Decontamination Module	105	3241	450
PTE-41	Refuse Handling (Total Flow PTE 60, 61 & 62)	74	4771	1000
PTE-42	Glove Box	72	834	600
PTE-43	Disassembly Room	62	2976	3228
PTE-44	Disassembly Room	61	3715	3228
PTE-48	Total From Main Building	76	21406	15832
PTE-49	Deactivation Furnace Room	174	10664	10165
PTE-51	Electrostatic Precipitation	162	25792	18235
PTE-57	Disassembly Room	60	2293	2736
PTE-60	Airlock No. 7	72	2325	1000
PTE-61	Exist Shroud	73	1648	200
PTE-62	Residue Handling	74	889	700

TABLE 4.4
(Continued)

TRAVERSE POINT	LOCATION	MEASURED TEMPERATURE °F	ACTUAL FLOW (ACFM)	DESIGN FLOW (ACFM)
	SUPPLY VENTILATION			
PTS-3	Receiving Room	74	9221	8625
PTS-6	Suit & Shower Room No. 1	70	636	650
PTS-10	Airlock No. 2	64	650	580
PTS-11	Airlock No. 1	63	1358	1150
PTS-13	Airlock No. 4	62	723	580
PTS-16	Suit & Shower Room No. 2	75	583	650
PTS-30	Decontamination Furnace and Suite and Shower Room No. 2	60	3910	3650
PTS-31	Exhaust Flow Receiving Room Supplying Air to Deactivation Furnace Room and Conveyor Room	74	8999	-(4)
PTS-32	Deactivation Furnace Bearings	76	363	-(4)
PTS-33	Deactivation Furnace Bearings	80	460	-(4)
PTS-37	Disassembly Room and Airlocks No. 1, 3, & 4	52	7823	8310
PTS-38	Disassembly Room and Airlock No. 2	62	7452	6030
PTS-53(3)	Afterburner Combustion Air	-	-(5)	1550
PTS-55(3)	Deactivation Furnace Combustion Air	-	-(5)	600

(1)From Stearns-Roger (1980).

(2)Damper Closed.

(3)Values assumed to be ACFM at normal system operating temperatures.

(4)No original design values given.

(5)Unable to measure due to high velocity pressure.

TABLE 4.5

CHEMICAL AGENT/COMPOUND SAMPLING METHODOLOGY
CAIS TRIAL BURN[1]

AGENT/COMPOUND	COLLECTION DEVICE/ SAMPLING RATE	ANALYTICAL TECHNIQUE	SAMPLE TIME (MIN)	MINIMUM DETECTABLE (mg/m^3)
CG - Phosgene	Wilks MIRAN Model 80	IR Spectroscopy	2	0.1 (0.03 ppm)
$CHCl_3$ - Chloroform	Wilks MIRAN Model 80	IR Spectroscopy	2	0.5 (0.13 ppm)
CK - Cyanogen Chloride	Disposable Plastic Bubbler 1 liter/minute (1pm)	Photometric	60	0.01
CN - Chloroaceto-phenone	Disposable Plastic Bubbler 2 1pm	Dinitrobenzene/ Photometric	120	0.04
GB - Sarin	Glass Beaded Bubbler 2 1pm	Enzymatic/ Photometric	120	0.00002
H,HN-1,HN-3-Mustard	Glass Beaded Bubbler 6 1pm	DB_3/Photometric	120	0.001
L - Lewisite	Glass Beaded Bubbler 1 1pm	15% NaOH/ GC for acetylene	120	0.006
PS - Chloropicrin	Disposable Plastic Bubbler 2 1pm	Photometric	120	0.25 (0.05 ppm)
As - Inorganic Arsenic	Glass Fiber Filter and Glass Beaded Bubbler 10 1pm or 2 1pm	Atomic Absorp-tion	120 @ 10 1pm or 8 Hr @ 2 1pm	0.0004
NO_x - Nitrogen Oxides	Dynasciences Stack Sampling System 5 1pm	Electrochemical	Continuous	(5 ppm)
SO_2 - Sulfur Dioxide	Dynasciences Stack Sampling System 5 1pm	Electrochemical	Continuous	(5 ppm)

(1) From Scott et al. (1979).

TABLE 4.6

CAIS PILOT TEST PHASE I SCHEDULE[1]

DATE	TEST NO.	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
Oct. 1, 1979	1	X545	CG-sim	24
	2	X546	CN	24
Oct. 2, 1979	3	X302	HN-1,HN-3	23
	4	X550	HN-1	23
Oct. 3, 1979	6	K951/952	H,L,PS,CG	30
Oct. 4, 1979	7	K951/952	H,L,PS,CG	30
Oct. 5, 1979	9	X547	H	24
	10	K951/952	H,L,PS,CG	30
Oct. 9, 1979	11	K951/952	H,L,PS,CG	30
	12	X547	H	24
Oct. 10, 1979	13	X302	HN-1,HN-3	25
	5	X302	HN-1,HN-3	24
Oct. 11, 1979	14	K941/942	H	17
Oct. 12, 1979	15	X552	PS	24
	16	K951/952	H,L,PS,CG	29
Oct. 15, 1979	17	K953/954	H,L,CG,CK,HN-1,GA-sim	19
Oct. 16, 1979	19	K955	H,L,PS,CG,CN,DM	3
	20	X548	L	24
Oct. 17, 1979	21	K955	H,L,PS,CG,CN,DM	3
	22	X549	DM	23
Oct. 18, 1979	8	X547	H	24
	18	X551	HN-3	24
Oct. 19, 1979	32	Spray Dryer	--	--
Oct. 20, 1979	32	Spray Dryer	--	--
Oct. 22, 1979	27	K945	H,L,GB	72
Oct. 23, 1979	30	K951/952	H,L,PS,CG	47
Oct. 24, 1979	30	K951/952	H,L,PS,CG	40
Oct. 26, 1979	28	K945	H,L,GB	54
Oct. 30, 1979	29	K945	H,L,GB	78
Oct. 31, 1979	31	K951/952	H,L,PS,CG	92
Nov. 1, 1979	24/26	X458	L	78

TABLE 4.6
(Continued)

DATE	TEST NO.	TYPE SET	AGENT INVOLVED	TOTAL SETS
Nov. 3, 1979	32	Spray Dryer	--	--
Nov. 5, 1979	23/25	K945	H,L,GB	48
Nov. 6, 1979	32	Spray Dryer	--	--
Nov. 7, 1979	32	Spray Dryer	--	--
Nov. 8, 1979	32	Spray Dryer	--	--

(1)From Scott et al. (1979).

(2)Agent abbreviations:

CG = Phosgene
CN = Chloroacetophenone
H, HN-1, HN-3 = Mustard
L = Lewisite
PS = Chloropicrin
CK = Cyanogen Chloride
GA = Tabun
DM = Adamsite
GB = Sarin
sim = simulant

TABLE 4.7

CAIS PILOT TEST PHASE II SCHEDULE(1)

DATE	TEST NO.	TYPE SET	AGENT INVOLVED(2)	TOTAL SETS
Nov. 6, 1979	34	K955	H,L,PS,CN,DM,CG(sim)	3
Nov. 7, 1979	34	K955	H,L,PS,CN,DM,CG(sim)	3
Nov. 8, 1979	34	K955	H,L,PS,CN,DM,CG(sim)	6
Nov. 9, 1979	33	X547	H	46
Nov. 13, 1979	33	X551	HN-3	10
		X548	L	40
		X547	H	20
Nov. 14, 1979	35	K951/952	H,L,PS,CG	59
Nov. 15, 1979	34	K955	H,L,PS,CN,DM,CG(sim)	6
Nov. 16, 1979	35	K951/952	H,L,PS,CG	77
Nov. 19, 1979	34	K955	H,L,PS,CN,DM,CG(sim)	6
		K550	HN-1	1
		X549	DM	1
	36	Spray Dryer	--	--
Nov. 20, 1979	35	K951/952	H,L,PS,CG	20
Nov. 27, 1979	35	K951/952	H,L,PS,CG	70
Nov. 28, 1979	34	K955	H,L,PS,DN,DM,CG(sim)	6
		X551	HN-3	1
Nov. 29, 1979	35	K951/952	H,L,PS,CG	82
Dec. 3, 1979	35	K951/952	H,L,PS,CG	97
Dec. 4, 1979	35	K951/952	H,L,PS,CG	103
Dec. 5, 1979	33/34	K955	H,L,PS,CN,DM,CG(sim)	6
		X549	DM	13
		X550	HN-1	18
		X302	HN-1,HN-3	17
Dec. 6, 1979	Extra	K941	H	11
Dec. 7, 1979	Extra	K941	H	17
		K951/952	H,L,PS,CG	2
		K955	H,L,PS,CN,DM,CG(sim)	8
		X551	HN-3	1
		X547	H	1
Dec. 17, 1979	36	Spray Dryer	--	--

(1)From Scott et al. (1979).

(2)For agent abbreviations, see Tables 4.5 and 4.6.

TABLE 4.8

AGENT DESTRUCTION EFFICIENCY DURING CAIS TRIAL BURN[1]

CAIS TYPE	AGENT/CHEMICAL	UPSET EMISSION (mg/m^3)	NORMAL EMISSION (mg/m^3)	UPSET % DESTRUCTION	NORMAL % DESTRUCTION
K955	Mustard	0.007[2]	.002	99.99	99.99
K955	Chloropicrin	2.22[3]	BMDL[6]	97.47	100.00
K955	Lewisite	0.008[2]	BMDL	99.99	100.00
K955	Phosgene	0.23[2]	BMDL	96.33	100.00
K955	Chloroacetophene	BMDL	BMDL	100.00	100.00
K951/K952	Phosgene	3.3[4]	BMDL	97.16	100.00
K951/K952	Mustard	0.005[4]	BMDL	99.91	100.00
K951/K952	Chloropicrin	0.61[4]	BMDL	99.13	100.00
K951/K952	Lewisite	-	BMDL	-	100.00
K951/K952	Chloroform	9.3[4]	BMDL	-	100.00
K941/K942	Mustard	1.37[5]	0.009	-	99.99
K953/K954	Cyanogen Chloride	-	BMDL	-	100.00
K953/K954	Mustard	-	BMDL	-	100.00
K953/K954	Lewisite	-	BMDL	-	100.00
K953/K954	Chloroform	-	BMDL	-	100.00
K953/K954	Phosgene	-	BMDL	-	100.00
K945 CAITS	Sarin	-	BMDL	-	100.00
K945 CAITS	Mustard	-	BMDL	-	100.00
K945 CAITS	Lewisite (as Arsenic)	-	BMDL	-	100.00
X302	Mustard	-	BMDL	-	100.00
X545	Phosgene	-	BMDL	-	100.00
X546	Chloroacetophene	-	BMDL	-	100.00

TABLE 4.8
(Continued)

CAIS TYPE	AGENT/CHEMICAL	UPSET EMISSION (mg/m^3)	NORMAL EMISSION (mg/m^3)	UPSET % DESTRUCTION	NORMAL % DESTRUCTION
X547	Mustard	-	BMDL	-	100.00
X548	Lewisite (as Arsenic)	-	BMDL	-	100.00
X549	Adamsite (as Arsenic)	-	BMDL	-	100.00
X550	Mustard	-	BMDL	-	100.00
X551	Mustard	-	BMDL	-	100.00
X552	Chloropicrin	-	BMDL	-	100.00

NOTE: "-" = No upset conditions occurred.

(1) Results monitored during CAIS trial burn (Scott et al., 1979). "Normal" indicates normal operating conditions. "Upset" indicates some type of malfunction (see footnote).
(2) Result of ventilation upset that was corrected immediately.
(3) Result of improper MIRAN operation.
(4) Result of afterburner flame out.
(5) Result of start-up problems and short residence time.
(6) BMDL = Below Minimum Detection Limit

TABLE 4.9

CHEMICAL AGENT/COMPOUND SAMPLING METHODOLOGY FOR CAIS OPERATION[1]

AGENT/COMPOUND	COLLECTION DEVICE SAMPLING RATE	REAGENT OR ABSORBENT	ANALYTICAL TECHNIQUE	SAMPLE TIME (MIN)	MINIMUM DETECTABLE (mg/m^3)
CG-Phosgene	Wilks MIRAN Model 80	N/A	IR Spectroscopy	15	0.1(0.03 ppm)
$CHCl_3$-Chloroform	Wilks MIRAN Model 80	N/A	IR Spectroscopy	15	0.5(0.13 ppm)
CK-Cyanogen Chloride	Drager Tube	N/A	N/A	60	0.6
CN - Chloroacetophenone	Disposable Plastic Bubbler-2 liters/minute (1pm)	Propylene Glycol	Dinitrobenzene/ Photometric	120	0.04
GB-Sarin	Glass Beaded Bubbler 2 1pm	pH 4.5 H_2SO_4	Enzymatic/ Photometric	120	0.00002
H,HN-1,HN-3-Mustard	Glass Beaded Bubbler 6 1pm	Diethyl- phthalate	DB_3/Photometric	120	0.001
PS-Chloropicrin	Wilks MIRAN Model 80	N/A	IR Spectroscopy	0.20	0.25(0.05 ppm)
As-Inorganic Arsenic[2]	Glass Fiber Filter and Glass Beaded Bubbler 10 1pm or 2 1pm	2% NaOH	Atomic Absorption	8 Hr @ 2 1pm	0.0004
NO_x-Nitorgen Oxides	Dynasciences Stack Sampling system 5 1pm	N/A	Electrochemical	Continuous	(5 ppm)
SO_2-Sulfur Dioxide	Dynasciences Stack Sampling System 5 1pm	N/A	Electrochemical	Continuous	(5 ppm)

(1)From discussion with RMA personnel.

(2)Levels of arsenic as lewisite verified by lewisite procedure shown in Table 4.5.

TABLE 4.10

SUMMARY OF SETS DESTROYED IN PHASE 1
OF CAIS OPERATION[1]

DATE	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
May 8, 1981	X302	HN-1, HN-3	17
May 11	X302	HN-1, HN-3	28
May 12	X302	HN-1, HN-3	34
May 13	X547	H	2
	X547	H	45
May 14	X547	H	45
May 19	X547	H	20
May 20	X547	H	45
May 21	X547	H	40
May 22	X547	H	45
May 26	K941/K942	H	10
May 27	K941/K942	H	14
May 28	X547	H	15
May 29	X547	H	60
June 1, 1981	X547	H	19
June 4	X547	H	12
June 5	X547	H	50
June 8	K941/K942	H	7
June 9	K941/K942	H	17
June 11	K941/K942	H	16
June 12	X547	H	24
June 17	K941/K942	H	20
June 18	X547	H	64
June 19	X547	H	71
June 22	K941/K942	H	22
June 23	K941/K942	H	22
June 24	K941/K942	H	24
June 25	X547	H	53
June 26	X547	H	79
June 29	K941/K942	H	22
June 30	K941/K942	H	26
July 1, 1981	K941/K942	H	19
July 2	X547	H	60
July 6	K941/K942	H	18
July 7	K941/K942	H	24
July 8	K941/K942	H	18
July 9	X547	H	75
July 10	X547	H	60
July 13	X547	H	15
July 14	X547	H	75
July 15	X547	H	60
July 16	X547	H	60

TABLE 4.10
(Continued)

DATE	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
September 24, 1981	X547	H	15
September 25	X547	H	60
September 28	X547	H	30
	X550	HN-1	30
September 29	X550	HN-1	60
September 30	X550	HN-1	75
October 1, 1981	X550	HN-1	75
October 2	X550	HN-1	60
October 5	X550	HN-1	45
October 6	X550	HN-1	60
October 7	K941/K942	H	11
October 8	K941/K942	H	17
	X550	HN-1	5
October 9	X550	HN-1	60
October 13	K941/K942	H	10
October 14	X550	HN-1	60
October 15	X550	HN-1	45
October 19	X550	HN-1	45
October 20	X550	HN-1	60
October 21	X550	HN-1	21
October 22	X550	HN-1	54
October 23	X550	HN-1	60
October 26	X550	HN-1	45
October 27	X550	HN-1	52
October 28	X550	HN-1	68
October 29	X550	HN-1	75
November 2, 1981	K941/K942	H	14
November 3	K941/K942	H	19
November 4	K941/K942	H	22
November 5	X302	HN-1, HN-3	7
November 6	X550	HN-1	75
November 9	K941/K942	H	17
November 10	K941/K942	H	21
November 12	K941/K942	H	20
November 13	X550	HN-1	75
November 16	K941/K942	H	11
November 17	K941/K942	H	24
November 18	K941/K942	H	25
November 19	K941/K942	H	25
November 20	X550	HN-1	72
November 23	K941/K942	H	20

TABLE 4.10
(Continued)

DATE	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
December 7, 1981	K941/K942	H	19
December 9	K941/K942	H	24
December 10	K941/K942	H	26
December 11	K941/K942	H	27
December 14	K941/K942	H	24
December 15	K941/K942	H	26
December 16	K941/K942	H	28
December 17	K941/K942	H	28
December 18	K941/K942	H	14
December 22	X551	HN-3	45
December 28	X551	HN-3	60
December 29	X551	HN-3	30
December 30	X551	HN-3	90
January 4, 1982	X551	HN-3	75
January 5	K941/K942	H	22
January 6	K941/K942	H	22
January 8	X551	HN-3	75
January 11	X551	HN-3	30
January 12	X551	HN-3	45
January 13	X551	HN-3	90
January 14	X551	HN-3	75
January 15	X551	HN-3	90
January 18	X551	HN-3	70
January 19	X551	HN-3	84
January 20	X551	HN-3	75
January 21	X551	HN-3	90
January 22	X551	HN-3	75
January 25	X551	HN-3	60
January 26	X551	HN-3	59
	X550	HN-1	8
	X547	H	1
January 27	X550	HN-1	22
	X551	HN-3	3
January 28	X551	HN-3	24
TOTAL			4,634[3]

(1) From CAIS Operation Phase 1 report currently in preparation.

(2) H, HN-1, HN-3 = Mustard

(3) Comprised of:

	K941/K942	802
	X302	82
	X547	1202
	X550	1302
	X551	1246

TABLE 4.11

SUMMARY OF SETS DESTROYED IN PHASE 2 OF CAIS OPERATIONS(1)

DATE	TYPE SET	AGENT INVOLVED(2)	TOTAL SETS
February 2, 1982	X548	L	60
February 4	X548	L	75
February 9	X546	CN	8
	X546	CN	17
February 10	X548	L	60
February 11	X548	L	75
February 12	X548	L	75
February 17	X548	L	60
February 18	X548	L	75
February 19	X548	L	75
February 22	X548	L	60
February 23	X548	L	74
February 24	X549	DM	39
	X548	L	34
February 25	X548	L	1
	X549	DM	11
February 26	X546	CN	80
March 1, 1982	X546	CN	70
March 2	X546	CN	50
March 3	X546	CN	80
March 4	X546	CN	27
	X549	DM	1
	X545	CG	19
March 5	X546	CG	75
	X545	CN	1
March 8	X545	CG	80
March 9	X545	CG	85
March 10	X545	CG	55
March 11	X545	CG	75
March 12	X545	CG	75
March 15	X545	CG	61
March 17	K945	H,L,GB	42
March 18	K945	H,L,GB	72
March 19	K945	H,L,GB	72
March 22	K945	H,L,GB	72
March 23	K945	H,L,GB	72
March 24	K945	H,L,GB	72
March 25	K945	H,L,GB	38
March 26	K945	H,L,GB	72
March 29	K945	H,L,GB	65
March 30	K945	H,L,GB	72
March 31	K945	H,L,GB	79

TABLE 4.11
(Continued)

DATE	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
April 1, 1982	K945	H,L,GB	72
April 2	K945	H,L,GB	72
April 5	K945	H,L,GB	58
April 6	K945	H,L,GB	72
April 8	K945	H,L,GB	84
April 9	K945	H,L,GB	60
April 12	K945	H,L,GB	70
April 13	K945	H,L,GB	62
April 14	K945	H,L,GB	13
April 15	K945	H,L,GB	14
April 19	K945	H,L,GB	30
			2968[3]

(1)From CAIS Operation Phase 2 report currently in preparation.

(2)Agent abbreviations: DM = Adamsite; H = Mustard; L = Lewisite; CG = Phosgene; CN = Chloroacetophenone; GB = Sarin.

(3)Comprised of:

	X548	724
	X549	51
	X545	525
	X546	333
	K945	1335

TABLE 4.12

SUMMARY OF SETS DESTROYED IN PHASE 3 OF CAIS OPERATION(1)

DATE	TYPE SET	AGENT INVOLVED(2)	TOTAL SETS
April 22, 1982	K951	H,L,PS,CG	20
April 23	K951	H,L,PS,CG	76
April 26	K951	H,L,PS,CG	72
April 27	K951	H,L,PS,CG	60
April 28	K951	H,L,PS,CG	80
April 29	K951	H,L,PS,CG	16
April 30	K951	H,L,PS,CG	37
May 3, 1982	K951	H,L,PS,CG	72
May 4	K951	H,L,PS,CG	82
May 5	K951	H,L,PS,CG	83
May 6	K951	H,L,PS,CG	42
May 7	K951	H,L,PS,CG	64
May 10	K951	H,L,PS,CG	39
May 11	K951	H,L,PS,CG	73
May 12	K951	H,L,PS,CG	88
May 13	K951	H,L,PS,CG	40
May 14	K951	H,L,PS,CG	64
May 17	K951	H,L,PS,CG	36
May 18	K951	H,L,PS,CG	92
May 19	K951	H,L,PS,CG	80
May 20	K951	H,L,PS,CG	80
May 21	K951	H,L,PS,CG	8
May 25	K955	H,L,PS,CG,CN,DM	9
May 26	K955	H,L,PS,CG,CN,DM	9
May 27	K955	H,L,PS,CG,CN,DM	6
May 28	K955	H,L,PS,CG,CN,DM	3
June 1, 1982	K955	H,L,PS,CG,CN,DM	6
June 2	K955	H,L,PS,CG,CN,DM	6
June 3	K955	H,L,PS,CG,CN,DM	8
June 4	K955	H,L,PS,CG,CN,DM	10
June 7	K955	H,L,PS,CG,CN,DM	20
June 8	K951	H,L,PS,CG	60
June 9	K951	H,L,PS,CG	22
June 10	K955	H,L,PS,CG,CN,DM	11
June 11	K951	H,L,PS,CG	16
June 14	K951	H,L,PS,CG	102

TABLE 4.12
(Continued)

DATE	TYPE SET	AGENT INVOLVED(2)	TOTAL SETS
June 16	X552	PS	30
June 17	X552	PS	10
June 18	X552	PS	32
June 22	K951	H,L,PS,CG	80
June 23	K951	H,L,PS,CG	48
June 24	K951	H,L,PS,CG	96
June 25	K951	H,L,PS,CG	103
June 28	K951	H,L,PS,CG	89
June 29	K951	H,L,PS,CG	112
June 30	K951	H,L,PS,CG	20
	K955	H,L,PS,CG,CN,DM	6
July 1, 1982	K951	H,L,PS,CG	96
July 2	K951	H,L,PS,CG	70
July 6	K951	H,L,PS,CG	48
July 7	K951	H,L,PS,CG	15
July 9	K951	H,L,PS,CG	75
July 13	K951	H,L,PS,CG	32
July 14	K951	H,L,PS,CG	64
July 15	K951	H,L,PS,CG	19
July 16	K951	H,L,PS,CG	77
July 19	K951	H,L,PS,CG	80
July 20	K951	H,L,PS,CG	80
July 21	K951	H,L,PS,CG	64
July 22	K951	H,L,PS,CG	32
July 27	K954	H,L,HN-1,CG,CK,GA(sim)	64
July 28	K954	H,L,HN-1,CG,CK,GA(sim)	48
	K953	H,L,HN-1,CG,CK,GA(sim)	47
	K941	H	1
July 29	K953	H,L,HN-1,CG,CK,GA(sim)	96
August 2, 1982	K953	H,L,HN-1,CG,CK,GA(sim)	57
August 3	K953	H,L,HN-1,CG,CK,GA(sim)	43
	K954	H,L,HN-1,CG,CK,GA(sim)	8
August 4	K954	H,L,HN-1,CG,CK,GA(sim)	24
August 5	K954	H,L,HN-1,CG,CK,GA(sim)	74
August 6	K954	H,L,HN-1,CG,CK,GA(sim)	36
	K951	H,L,PS,CG	32
August 10	K951	H,L,PS,CG	28
August 11	K951	H,L,PS,CG	51
August 12	K951	H,L,PS,CG	24
August 13	K951	H,L,PS,CG	64
August 16	K951	H,L,PS,CG	72
August 17	K951	H,L,PS,CG	32

TABLE 4.12
(Continued)

DATE	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
August 18	K951	H,L,PS,CG	96
August 19	K951	H,L,PS,CG	70
August 20	K951	H,L,PS,CG	32
August 23	K951	H,L,PS,CG	96
August 24	K951	H,L,PS,CG	87
August 25	K951	H,L,PS,CG	25
August 26	K951	H,L,PS,CG	96
August 27	K951	H,L,PS,CG	64
August 30	K951	H,L,PS,CG	96
August 31	K951	H,L,PS,CG	112
September 1, 1982	K951	H,L,PS,CG	80
September 2	K951	H,L,PS,CG	96
September 3	K951	H,L,PS,CG	96
September 7	K951	H,L,PS,CG	96
September 8	K951	H,L,PS,CG	96
September 9	K951	H,L,PS,CG	101
September 10	K951	H,L,PS,CG	96
September 14	K951	H,L,PS,CG	96
September 15	K951	H,L,PS,CG	69
September 16	K951	H,L,PS,CG	90
September 17	K951	H,L,PS,CG	96
September 20	K951	H,L,PS,CG	80
September 21	K951	H,L,PS,CG	96
September 22	K951	H,L,PS,CG	96
September 23	K951	H,L,PS,CG	96
September 24	K951	H,L,PS,CG	80
September 27	K951	H,L,PS,CG	80
September 28	K951	H,L,PS,CG	32
September 29	K951	H,L,PS,CG	64
September 30	K951	H,L,PS,CG	96
October 1, 1982	K951	H,L,PS,CG	112
October 4	K951	H,L,PS,CG	112
October 5	K951	H,L,PS,CG	144
October 6	K951	H,L,PS,CG	144
October 7	K951	H,L,PS,CG	144
October 8	K951	H,L,PS,CG	112
October 12	K951	H,L,PS,CG	64
October 13	K951	H,L,PS,CG	143
October 14	K951	H,L,PS,CG	144
October 15	K951	H,L,PS,CG	112
October 18	K951	H,L,PS,CG	80
October 19	K952	H,L,PS,CG	128

TABLE 4.12
(Continued)

DATE	TYPE SET	AGENT INVOLVED(2)	TOTAL SETS
October 20	K952	H,L,PS,CG	128
	K951	H,L,PS,CG	16
October 21	K952	H,L,PS,CG	150
October 22	K952	H,L,PS,CG	151
	K951	H,L,PS,CG	1
October 25	K952	H,L,PS,CG	144
October 26	K952	H,L,PS,CG	144
October 27	K952	H,L,PS,CG	144
October 28	K952	H,L,PS,CG	144
October 29	K952	H,L,PS,CG	145
November 2, 1982	K952	H,L,PS,CG	96
November 3	K952	H,L,PS,CG	96
November 4	K952	H,L,PS,CG	112
November 5	K952	H,L,PS,CG	112
November 8	K952	H,L,PS,CG	112
November 9	K952	H,L,PS,CG	112
November 10	K952	H,L,PS,CG	80
November 15	K952	H,L,PS,CG	64
November 16	K952	H,L,PS,CG	128
November 17	K952	H,L,PS,CG	128
November 18	K952	H,L,PS,CG	96
November 19	K952	H,L,PS,CG	35
November 23	K952	H,L,PS,CG	128
November 24	K952	H,L,PS,CG	128
November 29	K952	H,L,PS,CG	144
November 30	K952	H,L,PS,CG	96
December 1, 1982	K952	H,L,PS,CG	96
December 2	K952	H,L,PS,CG	96
December 3	K952	H,L,PS,CG	96
December 6	K952	H,L,PS,CG	112
December 7	K952	H,L,PS,CG	63
	K941	H	1
December 8	K952	H,L,PS,CG	86
December 9	K952	H,L,PS,CG	96
December 10	K952	H,L,PS,CG	111
	K941	H	1
December 13	K951	H,L,PS,CG	54
	K952	H,L,PS,CG	102
December 14	X552	PS	96
December 15	X552	PS	106
December 16	X552	PS	113

TABLE 4.12
(Continued)

DATE	TYPE SET	AGENT INVOLVED[2]	TOTAL SETS
December 20	X552	PS	120
	K941	H	1
	K952	H,L,PS,CG	1
December 21	X552	PS	153
December 22	X552	PS	41
			12,095[3]

[1]From CAIS Operation Phase 3 report currently in preparation.

[2]For agent abbreviations, see Table 4.5.

[3]Comprised of:

X552	701
K941	4
K951	6,995
K952	3,804
K953	243
K954	254
K955	94

TABLE 4.13

SUMMARY OF STACK EMISSIONS FROM INCINERATION OF K951 CAIS
OCTOBER, 1982

		CG (ppm)	$CHCl_3$ (ppm)	H ($\mu g/m^3$)	PS (ppm)	CN (mg/m^3)
Week of 10/4/82	High	0.08	0.15	<1.0	0.14	--
	Low	<0.03	<0.13	<1.0	<0.05	--
	Average	0.03	0.13	<1.0	0.07	--
Week of 10/11/82	High	0.13	<0.13	<1.0	0.21	--
	Low	<0.03	<0.13	<1.0	<0.05	--
	Average	0.04	<0.13	<1.0	0.07	--
Week of 10/18/82	High	0.05	0.23	<1.0	0.16	--
	Low	<0.03	<0.13	<1.0	<0.05	--
	Average	0.03	0.13	<1.0	0.08	--
Week of 10/25/82	High	0.17	1.31	--	0.22	<0.04
	Low	<0.03	<0.13	--	<0.05	<0.04
	Average	0.04	0.16	--	0.09	<0.04

NOTES: "--" = Not measured.

MDL = Minimum detectable level =

COMPOUND	MDL
CG	0.03 ppm
$CHCl_3$	0.13 ppm
H	1.0 $\mu g/m^3$
PS	0.05 ppm
CN	0.04 mg/m^3

TABLE 4.14

CHEMICAL AGENT/COMPOUND SAMPLING METHODOLOGY
FOR DDT-CONTAMINATED AMMUNITION INCINERATION PROGRAM(1)

AGENT/COMPOUND	COLLECTION DEVICE	REAGENT OR ABSORBENT	ANALYTICAL TECHNIQUE	SAMPLE TIME	MINIMUM DETECTABLE (mg/m^3)
DDT	Solid Adsorbent Tube	Chromasorb 102	GC (FID), extracted with Chloroform	Continuous	0.52
DDE	Solid Adsorbent Tube	Chromasorb 102	GC (FID), extracted with Chloroform	Continuous	0.52
HMT-Hexamethylene Tetramine	Solid Adsorbent Tube	Chromasorb 102	GC (FID), extracted with Chloroform	Continuous	0.52
PCP-Pentachlorophenol	Solid Adsorbent Tube	Chromasorb 102	GC (EC), extracted with Hexane	Continuous	0.26
CO	Wilks MIRAN Model 80	N/A	IR Spectroscopy	2 Minutes	25 ppm
Acid (HCl)	Bubbler	Water	Titration	8 Hours	1.5

(1)From discussion with RMA personnel.

TABLE 4.15

SUMMARY OF STACK EMISSIONS FROM INCINERATION OF DDT-CONTAMINATED AMMUNITION

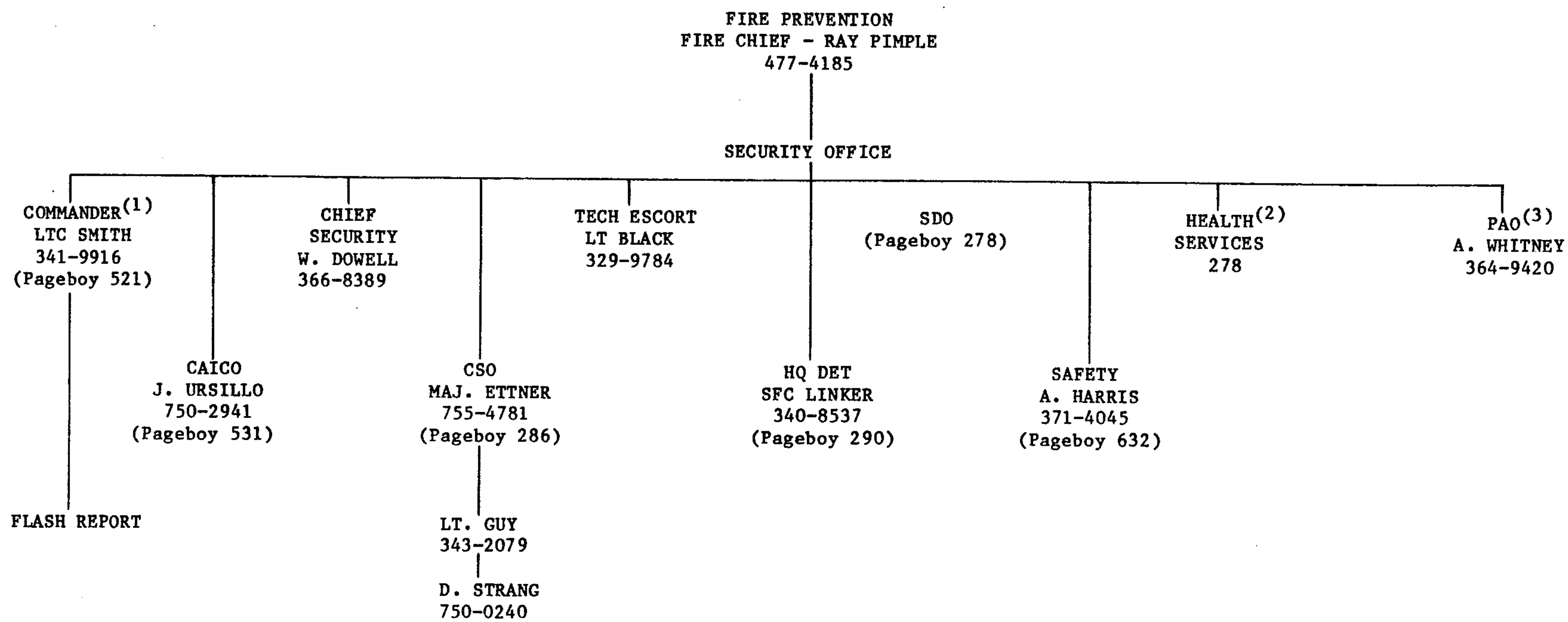
		DDT (mg/m^3)	DDE (mg/m^3)	PCP (mg/m^3)	HMT (mg/m^3)	CO (ppm)	ACIDITY (mg/m^3 HCl)
Week of 2/7/83	High	<0.52	<0.52	<0.26	<0.52	--	<1.5
	Low	<0.52	<0.52	<0.26	<0.52	--	<1.5
	Average	<0.52	<0.52	<0.26	<0.52	--	<1.5
Week of 2/14/83	High	<0.52	<0.52	<0.26	<0.52	<25	<1.5
	Low	<0.52	<0.52	<0.26	<0.52	<25	<1.5
	Average	<0.52	<0.52	<0.26	<0.52	<25	<1.5
Week of 2/21/83	High	<0.52	<0.52	<0.26	<0.52	27	<1.5
	Low	<0.52	<0.52	<0.26	<0.52	<25	<1.5
	Average	<0.52	<0.52	<0.26	<0.52	25	<1.5
Week of 2/28/83	High	<0.52	<0.52	<0.26	<0.52	<25	<1.5
	Low	<0.52	<0.52	<0.26	<0.52	<25	<1.5
	Average	<0.52	<0.52	<0.26	<0.52	<25	<1.5
Week of 3/7/83	High	<0.52	<0.52	<0.26	<0.52	<25	--
	Low	<0.52	<0.52	<0.26	<0.52	<25	--
	Average	<0.52	<0.52	<0.26	<0.52	<25	--
Week of 3/14/83	High	<0.52	<0.52	<0.26	<0.52	<25	--
	Low	<0.52	<0.52	<0.26	<0.52	<25	--
	Average	<0.52	<0.52	<0.26	<0.52	<25	--

NOTES: "--" = Not measured.
MDL = Minimum detectable level =

COMPOUND	MDL
DDT	0.52 mg/m^3
DDE	0.52 mg/m^3
PCP	0.26 mg/m^3
HMT	0.52 mg/m^3
CO	25 ppm
Acidity	1.5 mg/m^3 as HCl

TABLE 7.1

NON-DUTY EMERGENCY NOTIFICATION



(1) Or his designed representative.

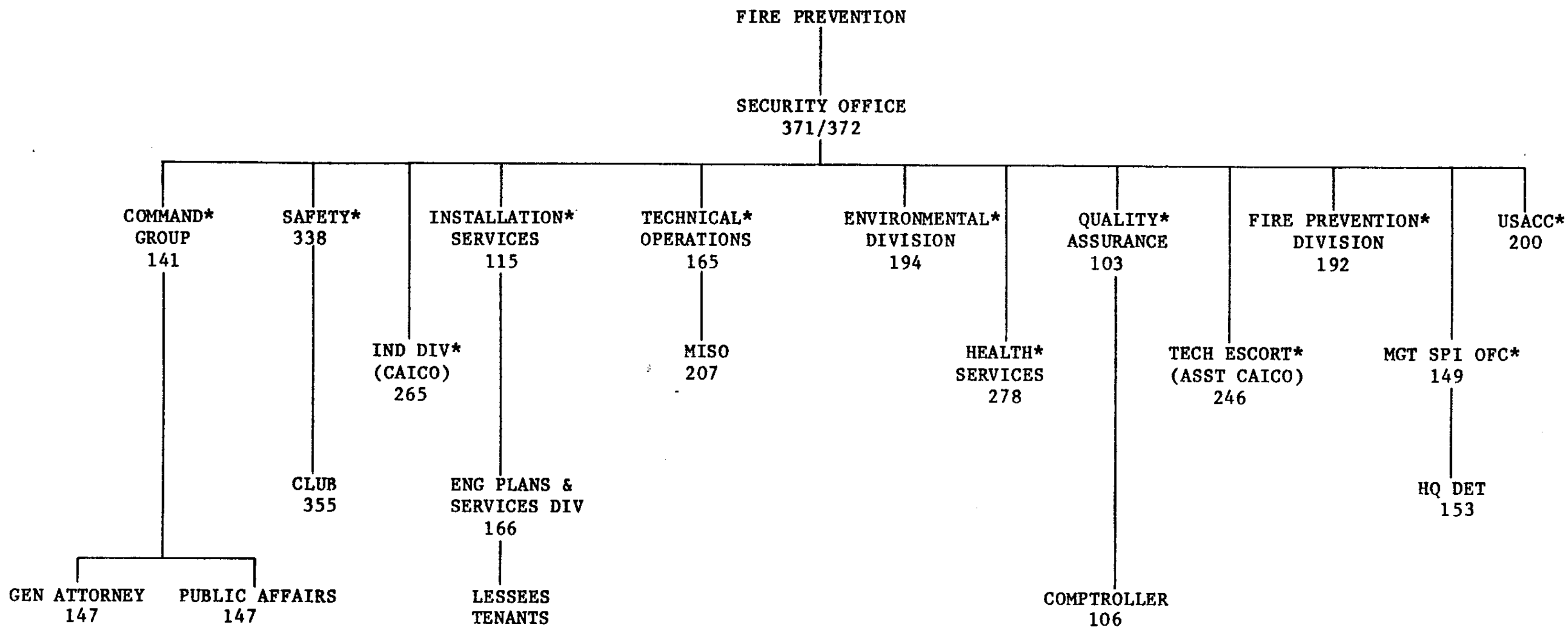
(2) If no answer, call Dr. Lewis 758-9152.

(3) Call others as directed.

NOTE: Priority of notification is left to right. Dial Ext. 187 for messages to be dispatched via pageboy.

TABLE 7.2

ON-DUTY EMERGENCY NOTIFICATION
(DUTY HOURS 0730-1600)



*RED PHONE

NOTE: Notification by the Security Office will be made immediately to the thirteen (13) stations included in the Emergency Telephone Network (Red Phone). Any station not initially reached will be contained as soon as possible by regular telephone. Each organization is responsible for internal notifications.

TABLE 7.3

EMERGENCY NOTIFICATION FORMAT

Date:______________________________ Time:__________________

_____ THIS IS AN EMERGENCY TRAINING EXCERCISE.

or

_____ THIS IS AN EMERGENCY TRAINING EXERCISE (COMMUNICATIONS ONLY)

or

_____ THIS IS AN ACTUAL EMERGENCY ALERT.

The Emergency Contingency Plan is now in effect.

EMERGENCY IS:____

LOCATION:____

AGENT IS:____________________. RELEASED?________________
(Yes, No., or Unknown)

CASUALTIES:__________________.

ACCESS TO SCENE:_______________________________________

____

SPECIAL INSTRUCTIONS:__________________________________

____

_____ THIS IS AN EMERGENCY TRAINING EXERCISE.

or

_____ THIS IS AN EMERGENCY TRAINING EXERCISE (COMMUNICATIONS ONLY).

or

_____ THIS IS AN ACTUAL EMERGENCY ALERT.

TABLE 7.4

EMERGENCY WARNING TO CIVILIAN POPULATION

This is Rocky Mountain Arsenal - attention all news media, attention all news media. This is an urgent request to immediately broadcast and repeat at three-minute intervals for fifteen minutes, the important message that will follow in thirty seconds.

An accident has occurred at Rocky Mountain Arsenal which may have resulted in the release of a hazardous chemical material. As a safety precaution, all citizens in the areas bounded on the north by _____, on the east by _____, on the south by ______, and on the west by ______ are urged to promptly go inside the nearest home, store, or any nearby building. All householders are asked to check nearby and bring indoors any children or anyone in the streets. Alert neighbors that are out-of-doors. Business establishments are urged to get or keep customers indoors. If you are driving, park at the nearest building and go inside. The important thing to do is to get indoors and remain there. Once inside, close all doors and windows. Shut off vent fans and air conditioning units. Get into an interior room with the least number of windows. Seal the doors and windows with tape, wet paper, towels or bedding. Take a radio and wait until further instructions are announced over this station. This should be a matter of a few hours. Do not attempt to evacuate the area, simply go indoors. All citizens outside the described area are urged to keep away. As quickly as further information develops it will be broadcast.

End of message.

TABLE 8.1

ROCKY MOUNTAIN ARSENAL
ORGANIZATION CHART

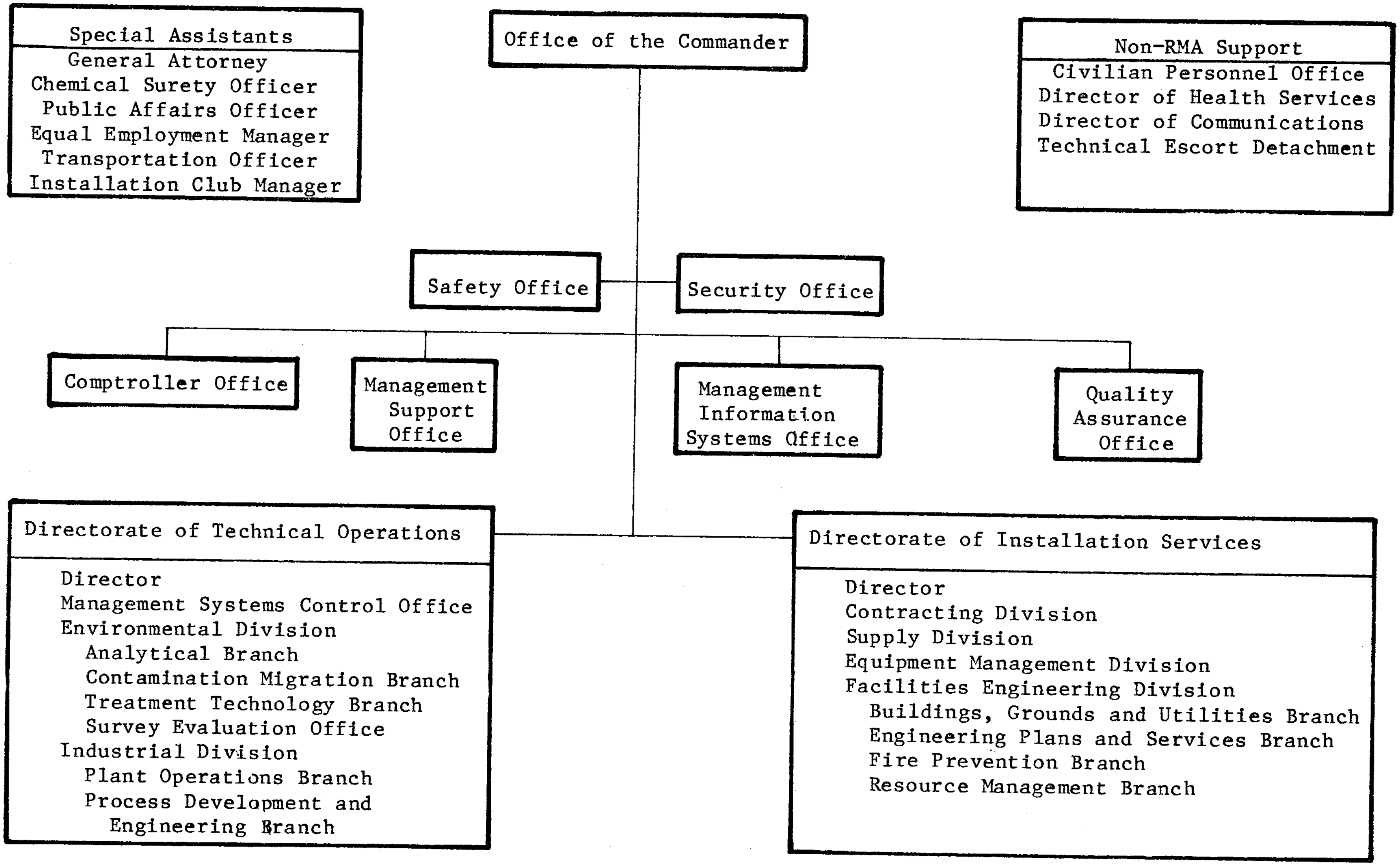


TABLE 8.2

LIST OF STAFF[1]

CIVILIAN STAFF

DIRECTORATE OF TECHNICAL OPERATIONS

Director's Office

Director, Physical Science Administrator

Management Systems Control Office

Chief, Program Analysis Officer

Program Analyst

Environmental Protection Specialist

Technical Manuals Writer

Environmental Division

Analytical Systems Branch

Chief Supervisory Chemist

Supervisory Chemist (4)

Chemist (12)

Supervisory Physical Scientist

Physical Scientist

Physical Science Technician (3)

Contamination Migration Branch

Soil Scientist

Hydraulic Engineer

Hydrological Technician

Biologist

Geologist

TABLE 8.2
(Continued)

Treatment Technology Branch

Supervisory Chemical Engineer

Chemical Engineer

Environmental (Sanitary) Engineer

Survey Evaluation Office

Supervisory Physical Scientist

Physical Scientist

Chemist (2)

Physical Science Technician (4)

Industrial Division

Supervisory General Engineer

Plant Operations Branch

Supervisory Chemical Engineer/Chief

Mechanical Engineer

Electronics Technician

Chemical Plant Operator Foreman (2)

Chemical Plant Operator Leader (7)

Chemical Plant Operator (22)

Toxic/Explosives Material Handler Foreman (1)

Toxic/Explosives Material Handler (5)

Clothing Treatment Plant Operator (3)

Crane Operator

Process Development and Engineering Branch

General Engineer

Chemical Engineer

Electrical Engineer

Mechanical Engineer

TABLE 8.2
(Continued)

DIRECTORATE OF INSTALLATION SERVICES

Director's Office

Director

Equipment Management Division

Supervisory Equipment Specialist

Equipment Specialist (2)

Mobile Equipment Servicer

Mobile Equipment Maintenance Foreman

Heavy Mobil Equipment Repair Inspector

Auto Mechanic (2)

Rate Specialist

Facilities Engineering Division

Chief, Supervisory General Engineer

Environmental Engineer

Engineering Plans and Services Branch

Supervisory General Engineer

Electrical Engineer

Mechanical Engineer

Civil Engineer

Engineering Technician

Resource Management Branch

Chief, Supervisory Industrial Engineer

Maintenance Scheduler

Program Assistant

TABLE 8.2
(Continued)

Buildings, Grounds and Utilities Branch

Maintenance General Foreman
Equipment Repair Specialist
Pest Controller
Carpenter (2)
Engineering Equipment Operator (4)
Crane Operator
Mobil Equipment Operator Foreman
Painter
Maintenance Leader
Welder (2)
Ind. Equipment Mechanic (6)
Heating Equipment Mechanic (3)
Pipefitter (2)
Sheet Metal Mechanic
Electrician Foreman
Instrument Mechanic (2)
Electrician (4)

Fire Prevention Branch

Fire Chief
Lead Firefighter (5)
Firefighter (10)

QUALITY ASSURANCE OFFICE

Supervisory QA Specialist
Chemical Engineer
Supervisory QI Specialist
QI Specialist (4)
QI Specialist (Metrology)

TABLE 8.2
(Continued)

SECURITY OFFICE

Security Officer

Guard Supervisor (7)

Lead Guard (10)

Guard (65)

Guard (Training Specialist)

Guard (Instructor)

SAFETY OFFICE

Safety and Health Manager

Safety Engineer

Safety and Occupational Health Specialist

NON-RMA SUPPORT STAFF

Director of Health Services

SPECIAL ASSISTANTS

Public Affairs/Alcohol and Drug Abuse Control Officer

ARMY STAFF

OFFICE OF THE COMMANDER

Commander

Deputy Commander

Assistant Chief of Plant Operations Branch

SPECIAL ASSISTANTS

Chemical Surety Officer

TABLE 8.2
(Continued)

HEADQUARTERS DETACHMENT

Headquarters Detachment Commander

Chemical Operations Specialist (1)

Chemical Laboratory Specialist (3)

Heavy Construction Operator

TECHNICAL ESCORT DETACHMENT

Officer

Enlisted Personnel (7)

(1) Includes only divisions and staff which may deal with hazardous waste. Clerks and secretaries are not included. Numbers in parenthesis indicate number of persons employed at a particular position (included only if more than one person employed).

TABLE 8.3

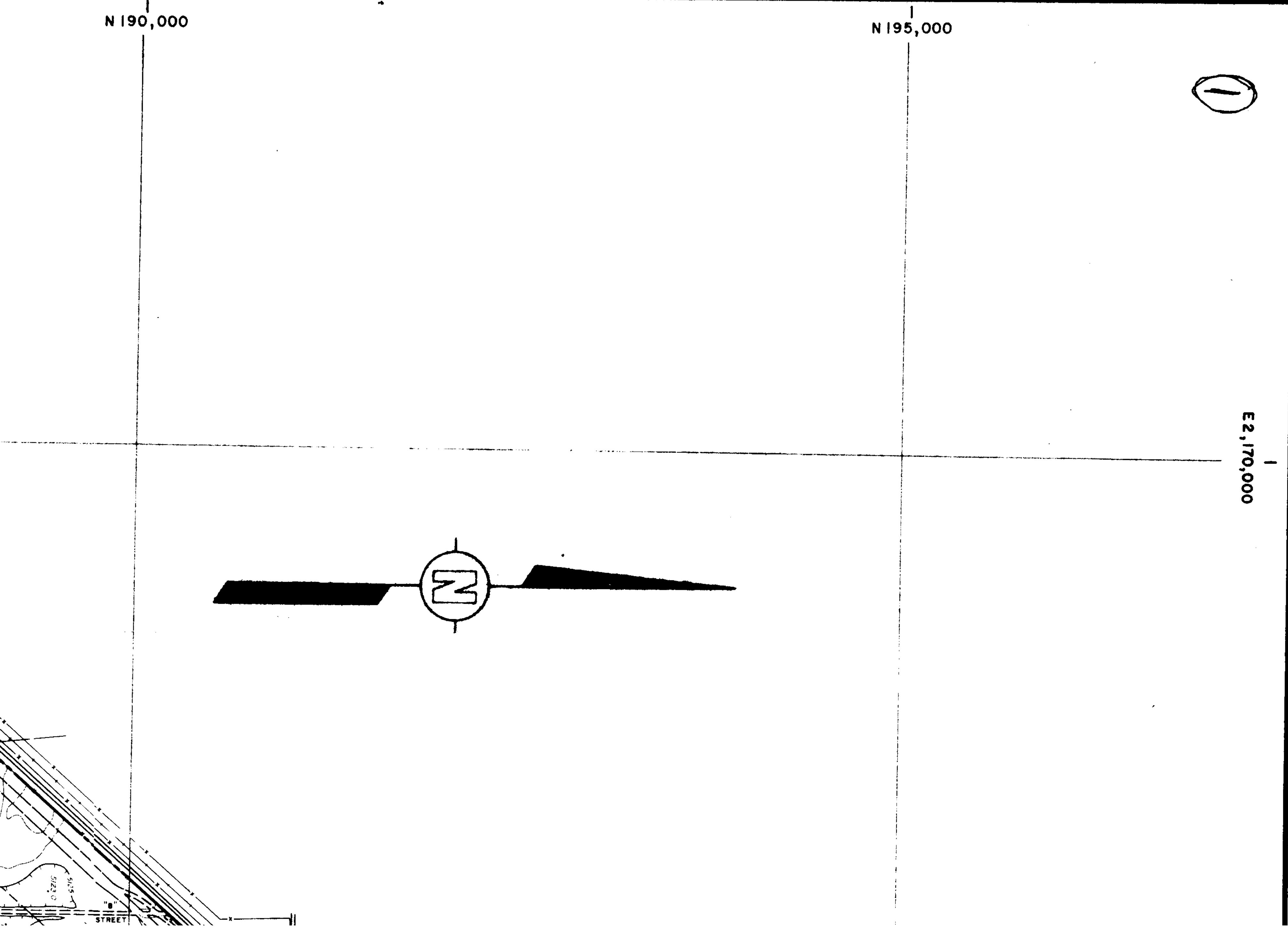
TRAINING PROGRAMS

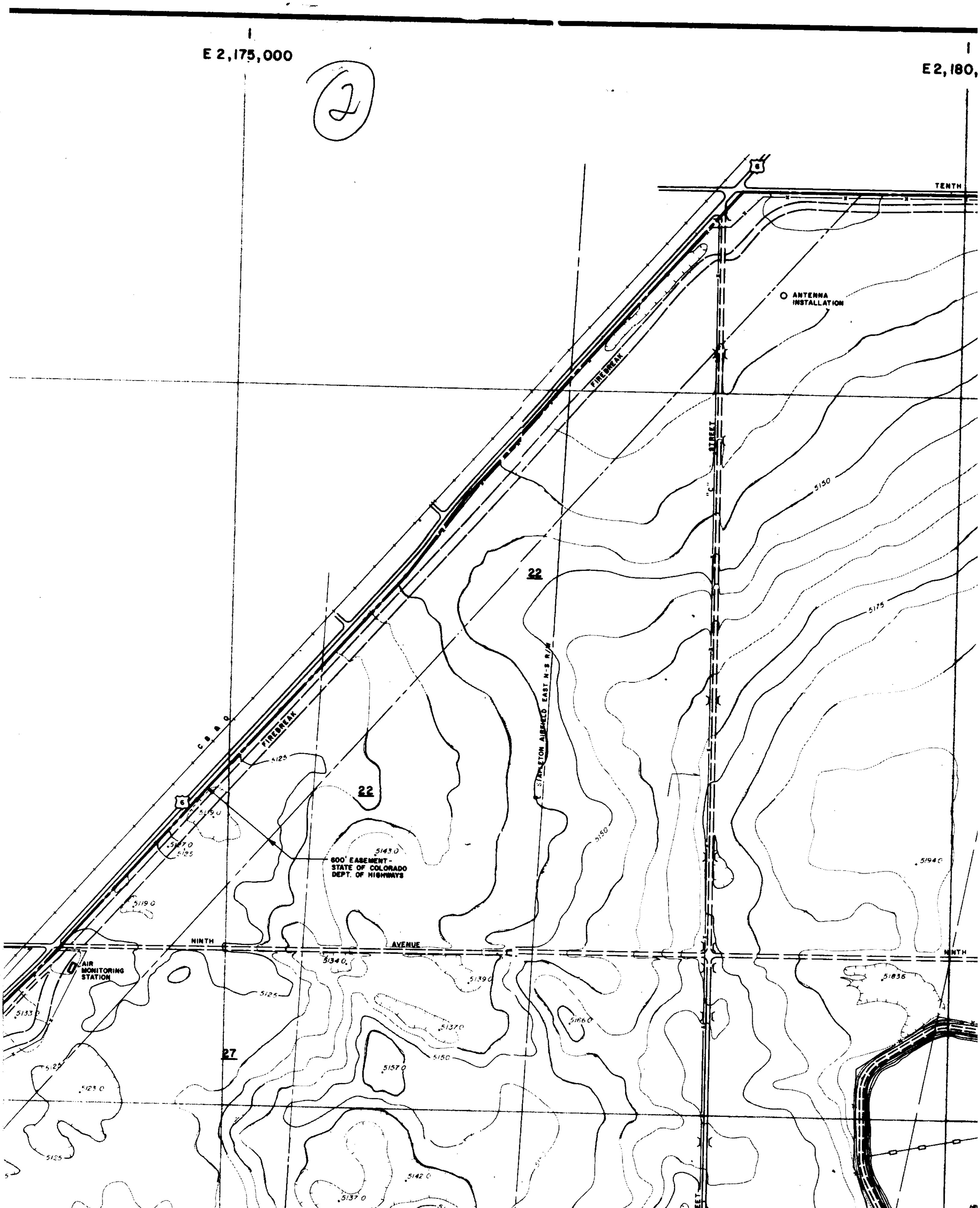
TRAINING PROGRAM TITLE	CONTENT DESCRIPTION
Introduction to Hazardous Materials & Substances	A broad and in-depth overview of the EPA/DOT regulations for hazardous materials and substances. This program is designed as the keystone for any in-company training program.
Classes of Hazardous Materials & Waste	An overview of the EPA/DOT criteria for determing if any material or waste meets the definition of the hazardous material or waste. It also outlines the interrelationship between DOT hazardous material classifications and EPA hazardous waste classifications.
Introduction to Hazardous Waste	A comprehensive overview of the current DOT/EPA hazardous waste regulations for generators and transporters with specific attention devoted to reporting responsibilities.
Hazardous Waste Treatment, Storage & Disposal Facility Requirements	A comprehensive review of the regulations covering the operations of a TSD facility and an overview of the requirements for training facility personnel.
Handling Empties/Leakers & Emergency Responses	A basic program on the EPA/DOT regulations for empty containers, leakers, reuse of STC/NRC containers and the required emergency response requirements in the event of hazardous materials, substances or waste releases.
Loading/Unloading & Storing Hazardous Materials, Substances & Wastes	An overview of the EPA/DOT requirements of compatability of mixing hazardous wastes and the loading and storing requirements for hazardous materials, substances and waste in all modes of transportation.
Preparing for a DOT/EPA Hazardous Waste Facility Inspection	This program highlights those aspects of a DOT/EPA compliance inspection based on the RCRA Inspection Manual and provides a detailed look at how inspections will be carried out.

TABLE 8.3
(Continued)

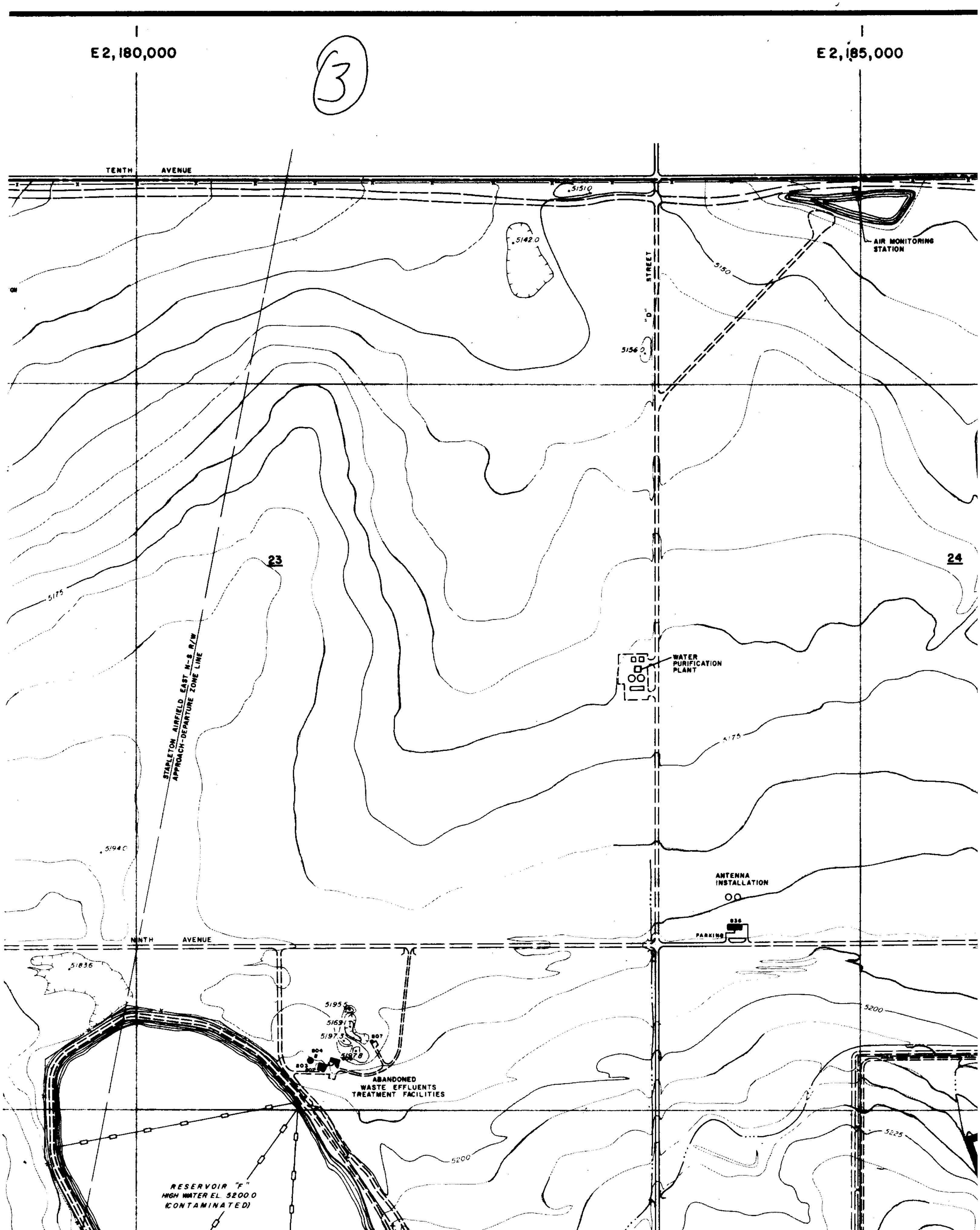
TRAINING PROGRAM TITLE	CONTENT DESCRIPTION
Hazardous Materials/Waste & the Driver	A comprehensive review of the Driver's responsibilities when loading, unloading and transportating hazardous materials, substances and wastes. It also reviews the Federal Motor Carrier Safety regulations related to the transportation of hazardous materials, substances and waste.
Hazardous Waste Labels, Markings & Placarding	This program reviews the specific DOT/EPA regulations for the marking, labeling and placarding of all shipments of manifested and unmanifested hazardous waste.
Hazardous Waste Manifests	An in-depth review of EPA/DOT requirements for hazardous waste manifest information and the specific requirements for providing the EPA/DOT UNIFORM HAZARDOUS WASTE MANIFEST in all modes of transportation

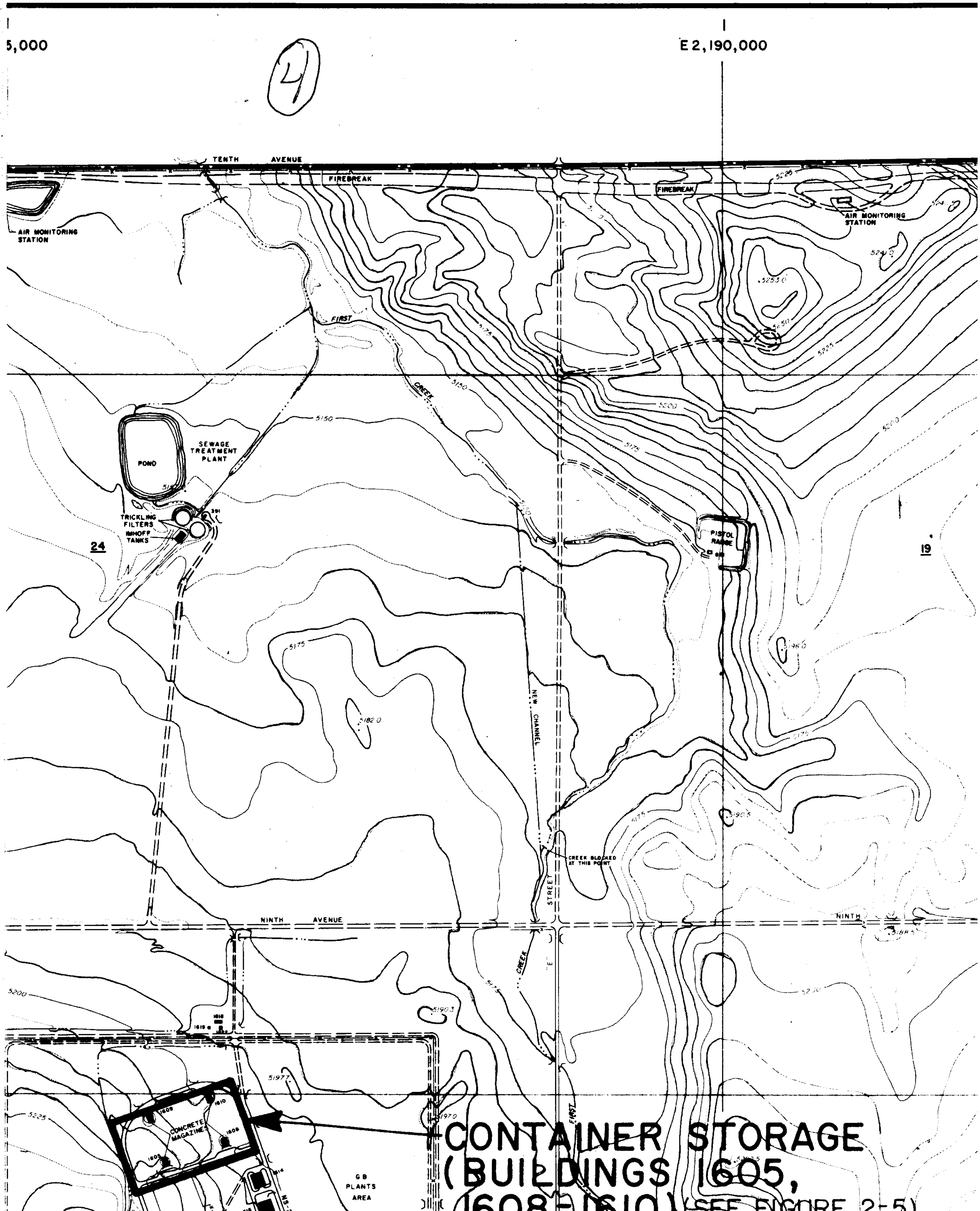
RAWN BY	BKH	CHECKED BY	PRF	2/27/83	DRAWING NUMBER	RM82-1981-M1
	2-2-83	APPROVED BY	JCM	2/27/83		



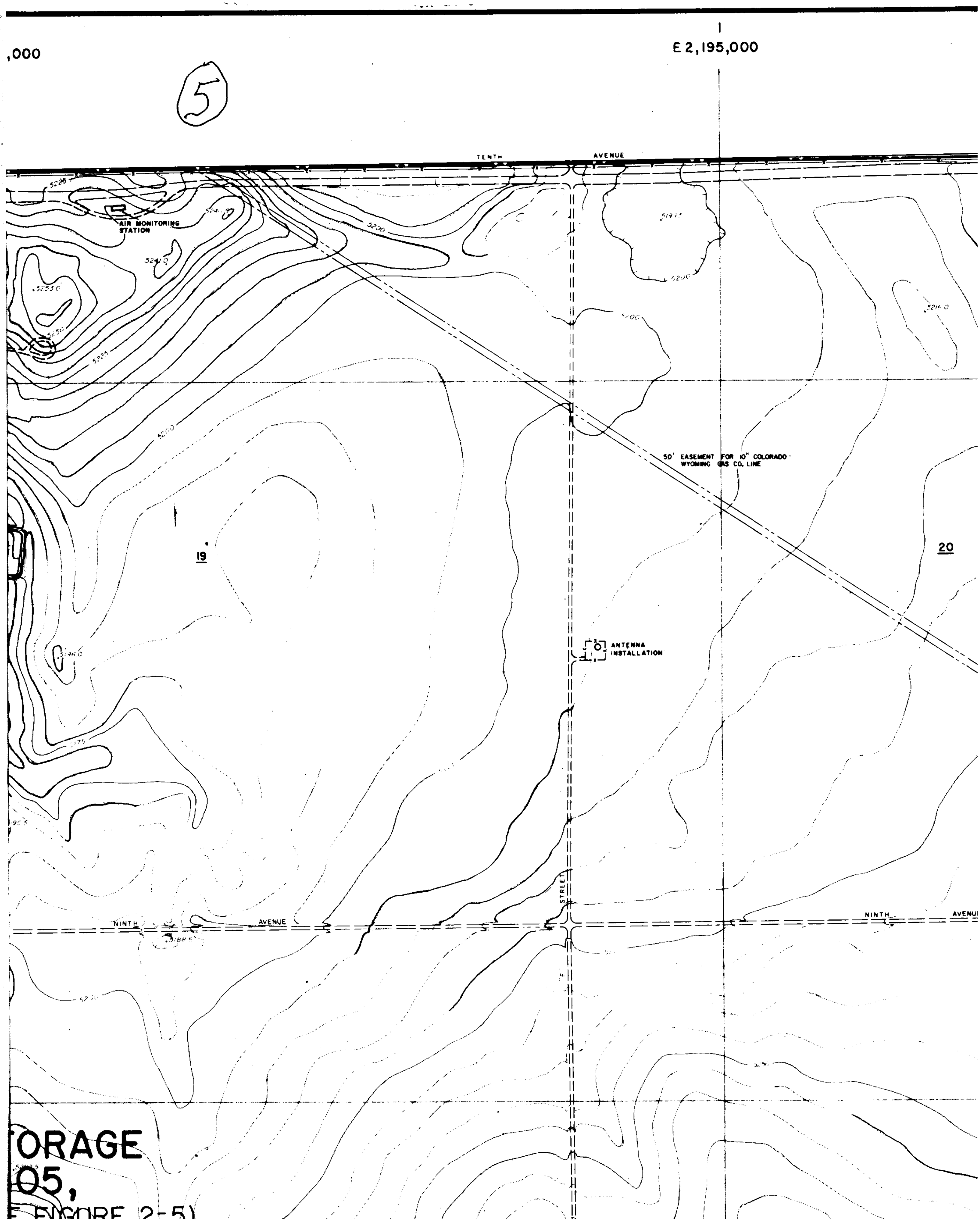


E 2,175,000
E 2,180,
2
TENTH
ANTENNA INSTALLATION
FIREBREAK
"C" STREET
5150
22
5175
STAPLETON AIRFIELD EAST N-S R/W
C B & Q
FIREBREAK
5125
22
5119.0
5127.0
5125
5143.0
600' EASEMENT - STATE OF COLORADO DEPT. OF HIGHWAYS
5150
5194.0
5119.0
NINTH
AVENUE
NINTH
AIR MONITORING STATION
5134.0
5139.0
5183.6
5125
5133.0
5166.0
5137.0
27
5150
5125
5157.0
5123.0
5125
5142.0
5137.0

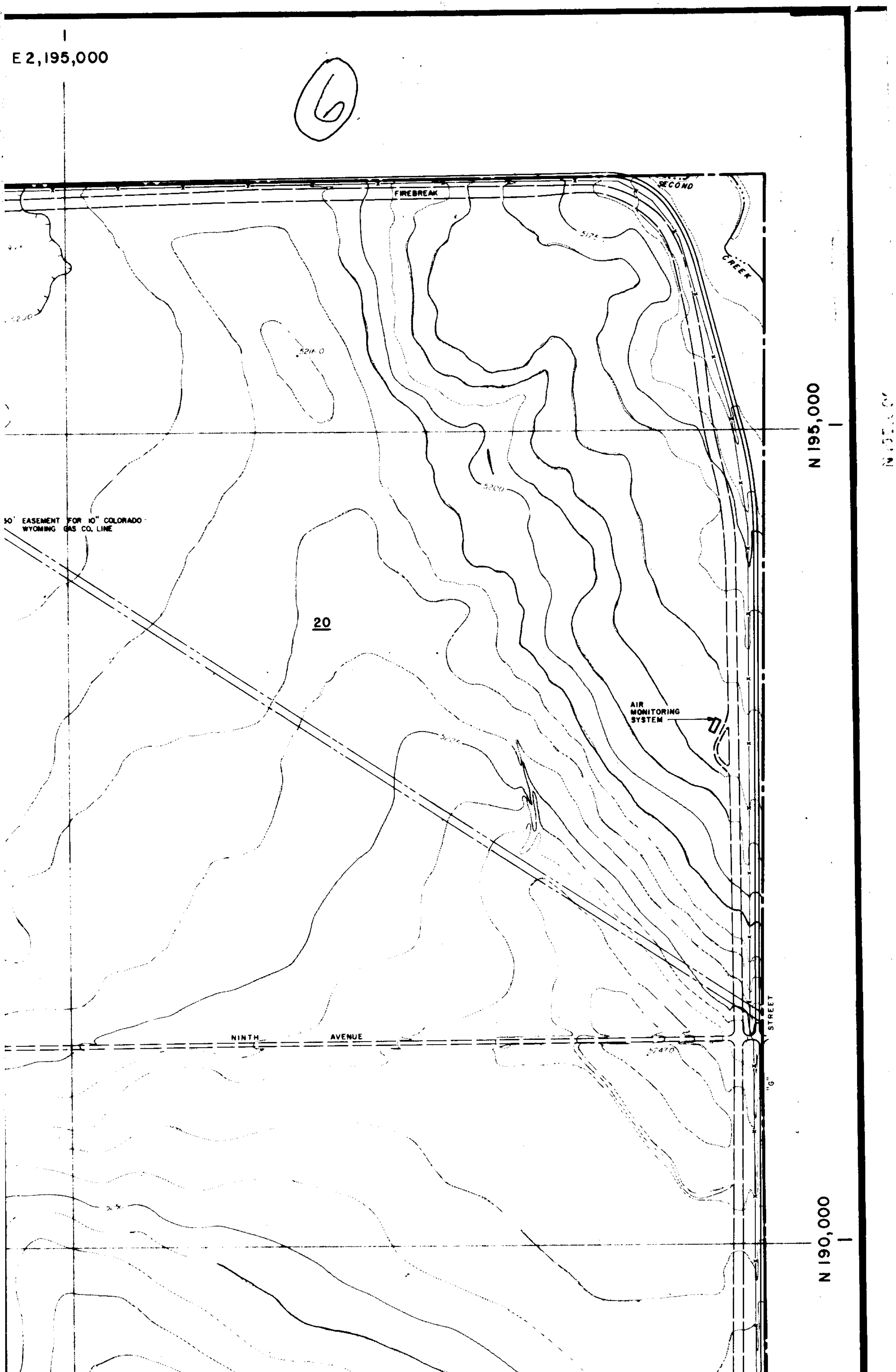

E2,180,000
E2,185,000
TENTH AVENUE
5151.0
5142.0
AIR MONITORING STATION
5150
"D" STREET
5156.0
23
24
5175
WATER PURIFICATION PLANT
STAPLETON AIRFIELD EAST N-S R/W
APPROACH-DEPARTURE ZONE LINE
5194.0
ANTENNA INSTALLATION
NINTH AVENUE
PARKING
5183.6
5200
ABANDONED
WASTE EFFLUENTS
TREATMENT FACILITIES
RESERVOIR "F"
HIGH WATER EL. 5200.0
(CONTAMINATED)
5225



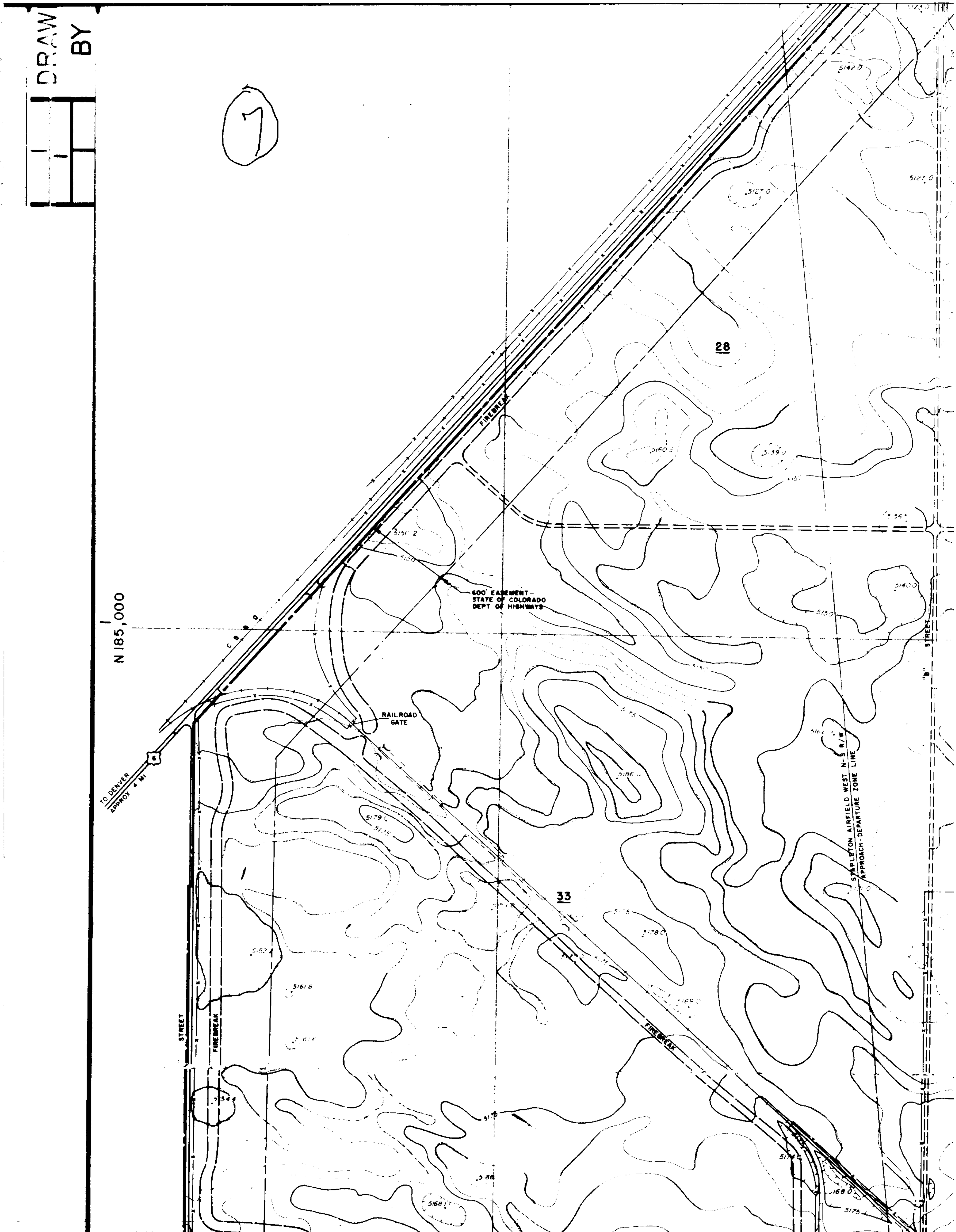
5,000
E 2,190,000
4
TENTH AVENUE
FIREBREAK
FIREBREAK
AIR MONITORING STATION
AIR MONITORING STATION
FIRST
CREEK
SEWAGE TREATMENT PLANT
POND
TRICKLING FILTERS
IMHOFF TANKS
24
19
PISTOL RANGE
NEW CHANNEL
CREEK BLOCKED AT THIS POINT
STREET
NINTH AVENUE
NINTH
CREEK
FIRST
CONCRETE MAGAZINES
1605
1608
1609
1610
G B PLANTS AREA
5150
5175
5200
5225
CONTAINER STORAGE (BUILDINGS 1605, 1608-1610) (SEE FIGURE 2-5)

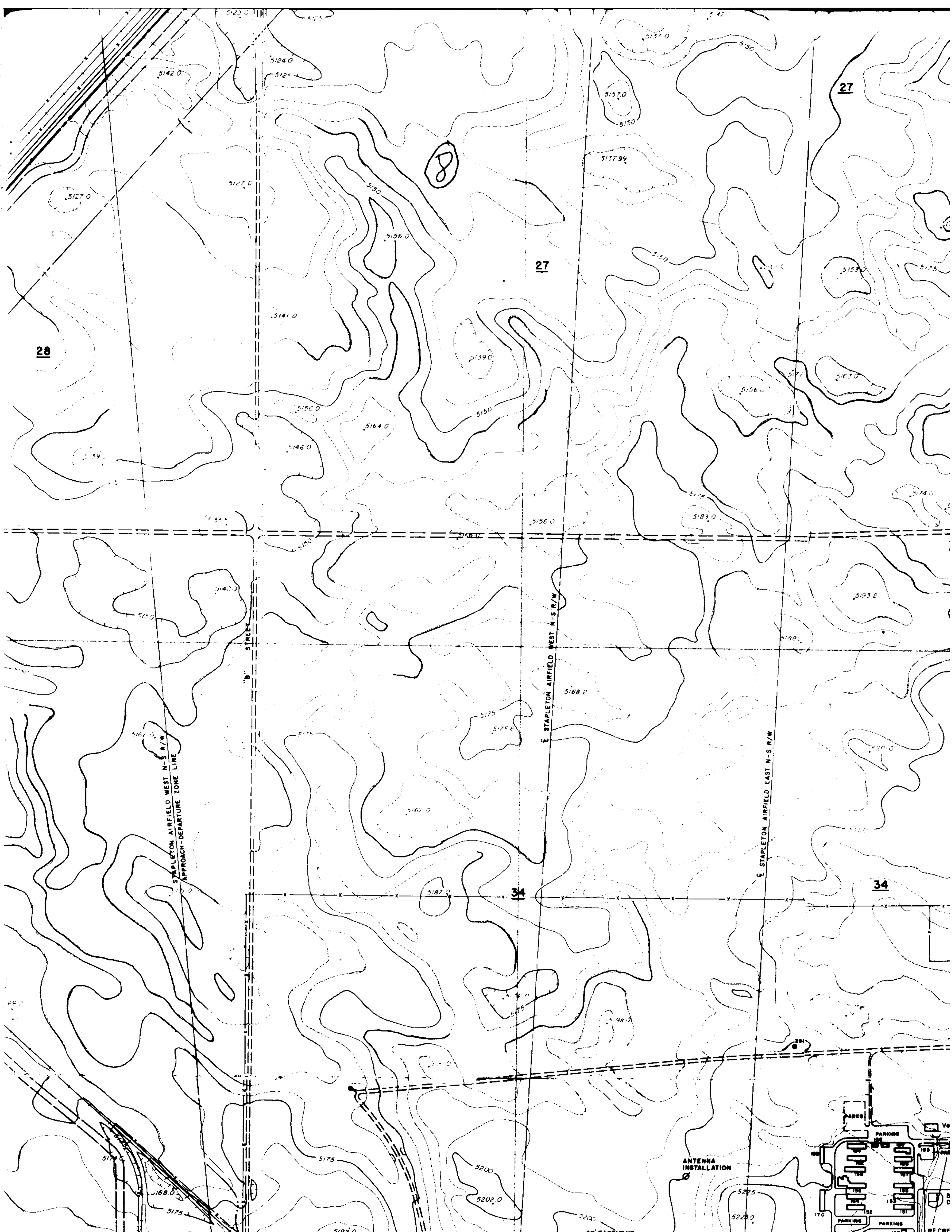


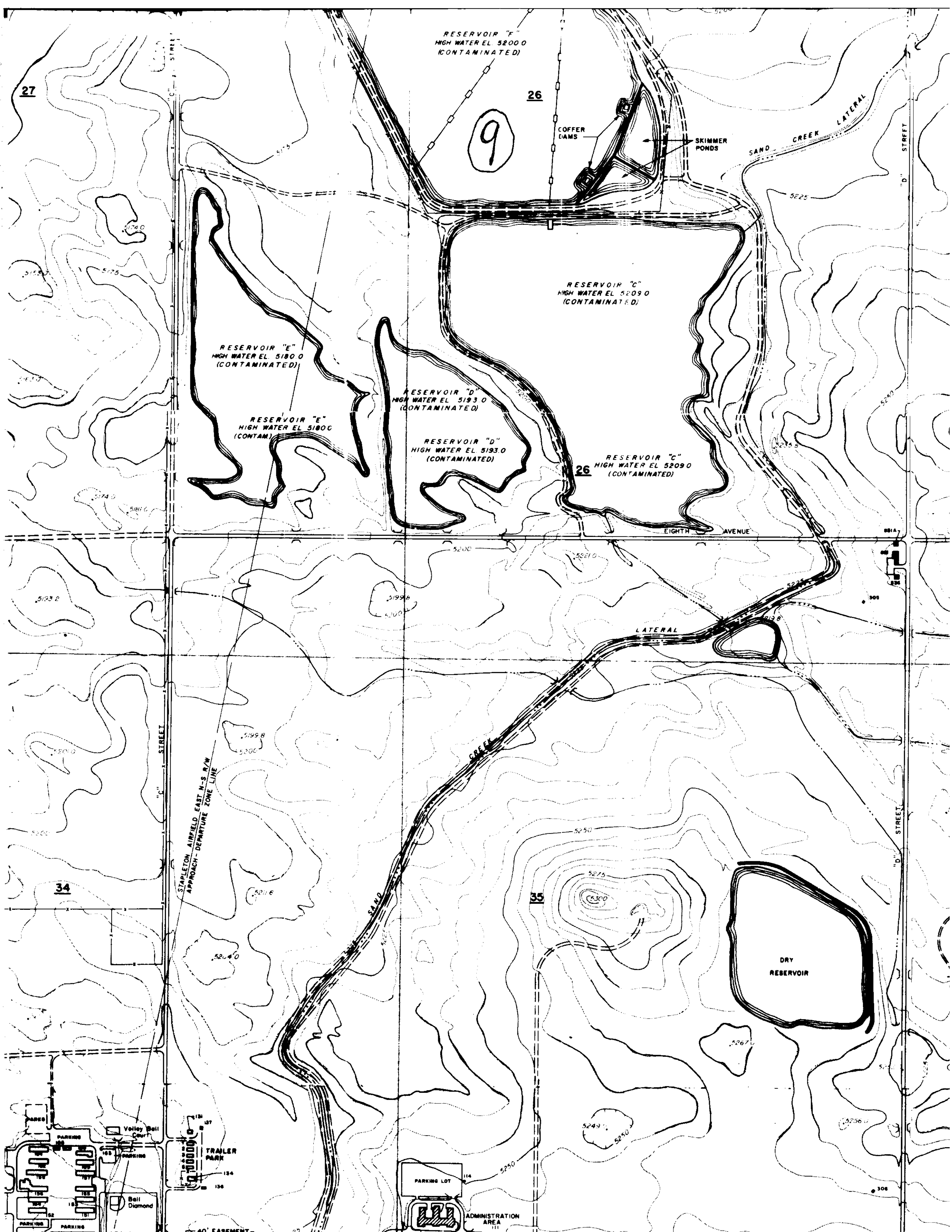
,000
E 2,195,000
5
TENTH AVENUE
AIR MONITORING STATION
5200
5225
5250
5253.0
5240.0
5197.5
5216.0
5196.0
5175
50' EASEMENT FOR 10" COLORADO WYOMING GAS CO. LINE
19
20
ANTENNA INSTALLATION
NINTH AVENUE
NINTH AVENUE
STREET
5188.5
ORAGE
05,
FIGURE 2-5)



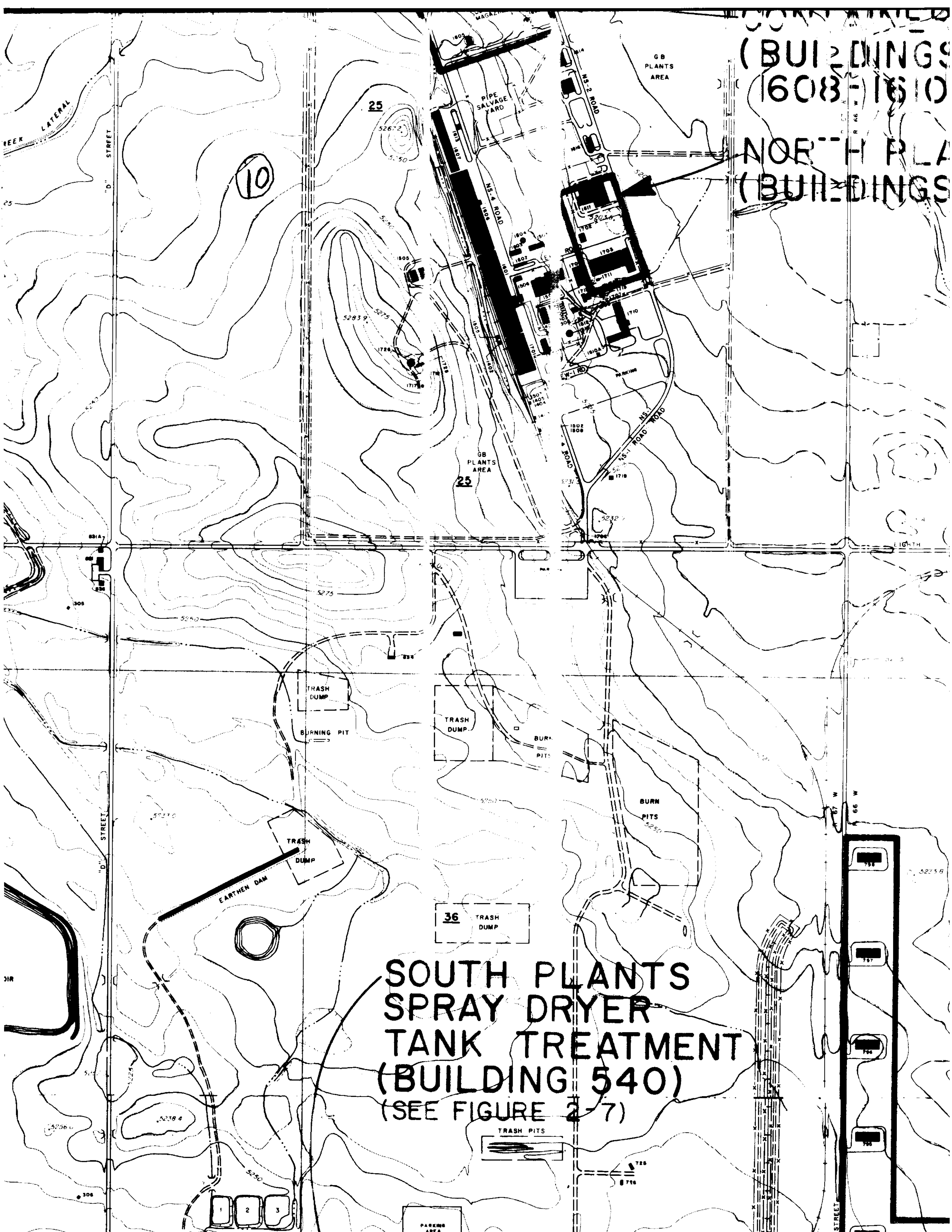
E 2,195,000
6
SECOND
FIREBREAK
CREEK
5175
5210.0
5200
N 195,000
50' EASEMENT FOR 10" COLORADO WYOMING GAS CO. LINE
20
AIR MONITORING SYSTEM
NINTH AVENUE
"G" STREET
N 190,000


DRAWN BY
7
N185,000
C B & Q
TO DENVER APPROX 4 MI
FIREBREAK
600' EASEMENT-
STATE OF COLORADO
DEPT OF HIGHWAYS
RAILROAD GATE
28
33
STREET
FIREBREAK
FIREBREAK
"B" STREET
STAPLETON AIRFIELD WEST N-S R/W
APPROACH-DEPARTURE ZONE LINE

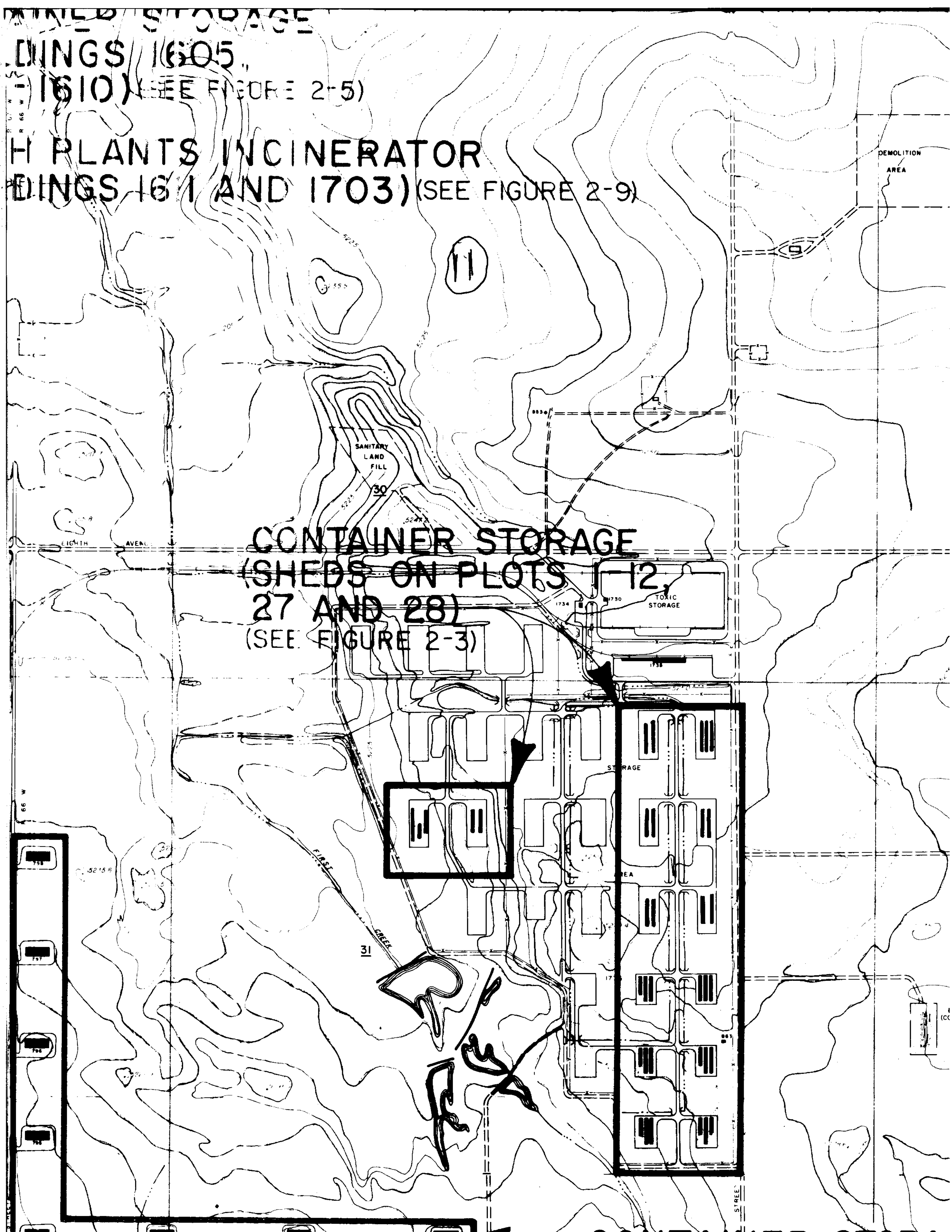

28
27
27
34
34
℄ STAPLETON AIRFIELD WEST N-S R/W
℄ STAPLETON AIRFIELD EAST N-S R/W
℄ STAPLETON AIRFIELD WEST N-S R/W
APPROACH-DEPARTURE ZONE LINE
"B" STREET
ANTENNA
INSTALLATION
PARKING
5150
5156.0
5164.0
5146.0
5141.0
5139.0
5162.0
5168.2
5175
5187.0
5193.0
5193.2
5200
5202.0
5225



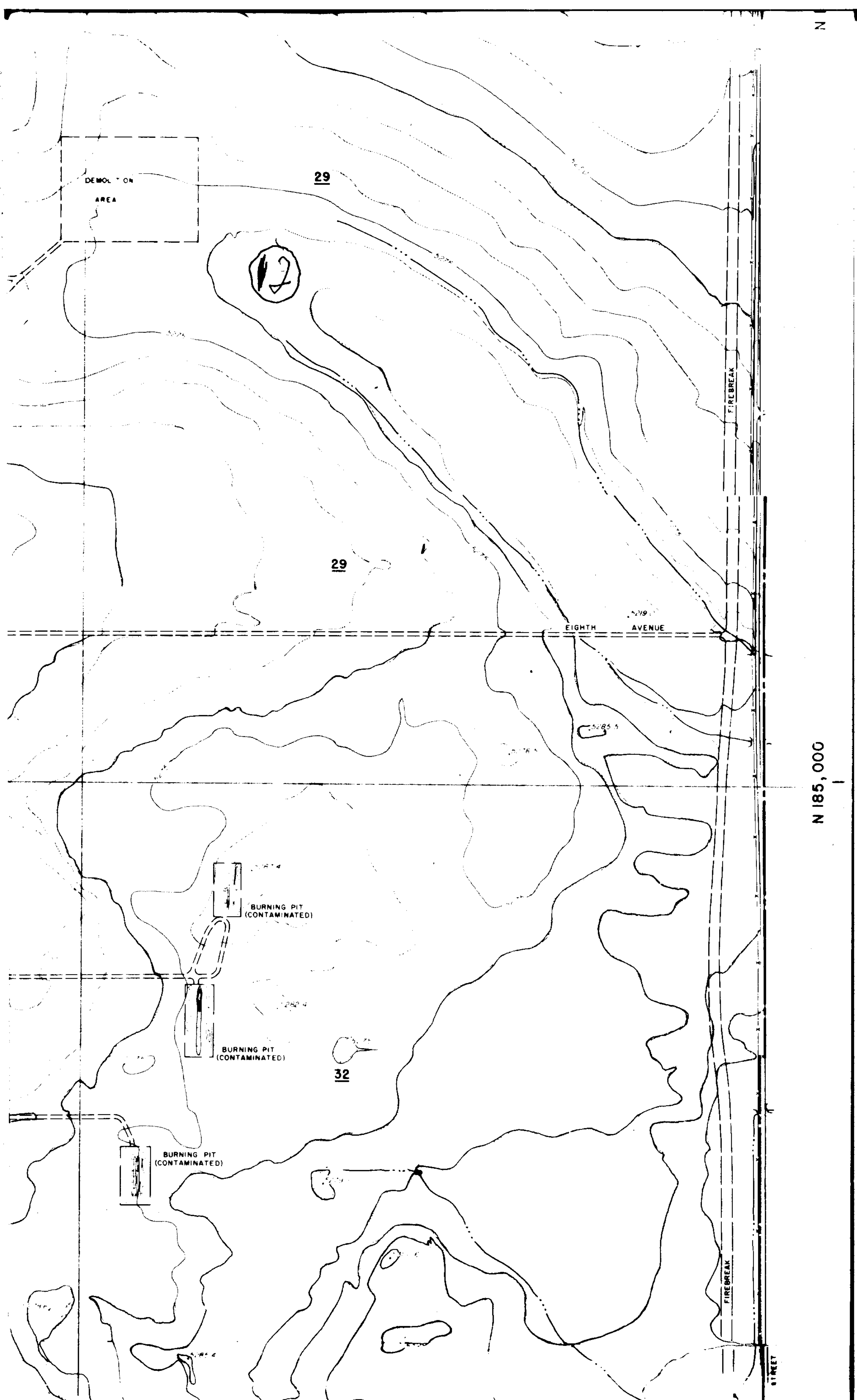
RESERVOIR "F"
HIGH WATER EL. 5200.0
(CONTAMINATED)
26
9
COFFER DAMS
SKIMMER PONDS
SAND CREEK LATERAL
"D" STREET
27
"C" STREET
RESERVOIR "C"
HIGH WATER EL. 5209.0
(CONTAMINATED)
RESERVOIR "E"
HIGH WATER EL. 5180.0
(CONTAMINATED)
RESERVOIR "D"
HIGH WATER EL. 5193.0
(CONTAMINATED)
EIGHTH AVENUE
LATERAL
SAND CREEK
STAPLETON AIRFIELD EAST N-S R/W
APPROACH-DEPARTURE ZONE LINE
34
35
DRY RESERVOIR
TRAILER PARK
Volley Ball Court
Ball Diamond
PARKING
PARKING LOT
ADMINISTRATION AREA
40' EASEMENT



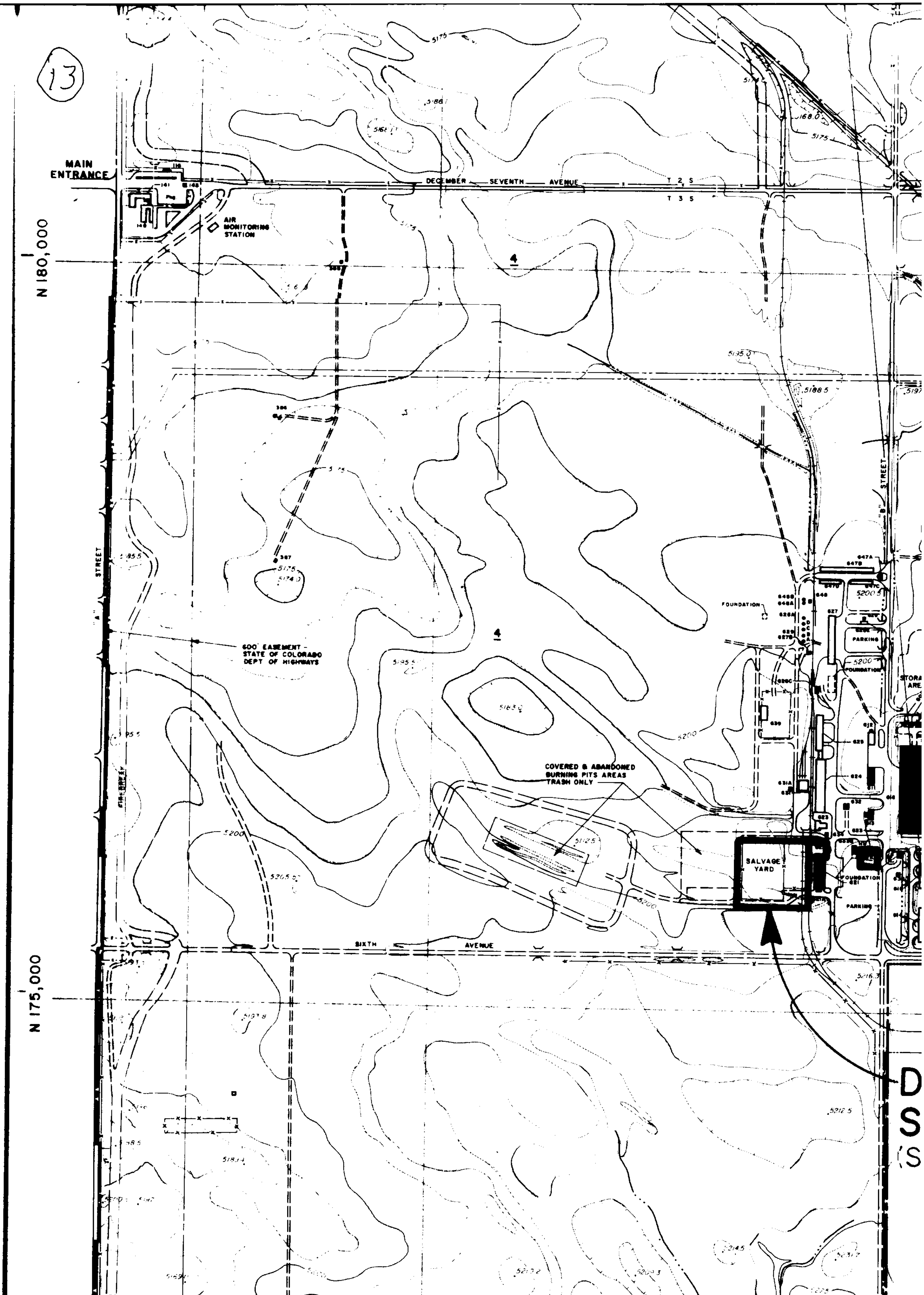
(BUILDINGS
NORTH PL
(BUILDINGS
GB PLANTS AREA
PIPE SALVAGE YARD
NS-2 ROAD
NS-4 ROAD
NS-1 ROAD
EW-1 RD
25
10
"D" STREET
PARKING
TRASH DUMP
BURNING PIT
BURN PITS
EARTHEN DAM
36
TRASH PITS
PARKING AREA
EIGHTH
SOUTH PLANTS
SPRAY DRYER
TANK TREATMENT
(BUILDING 540)
(SEE FIGURE 2-7)

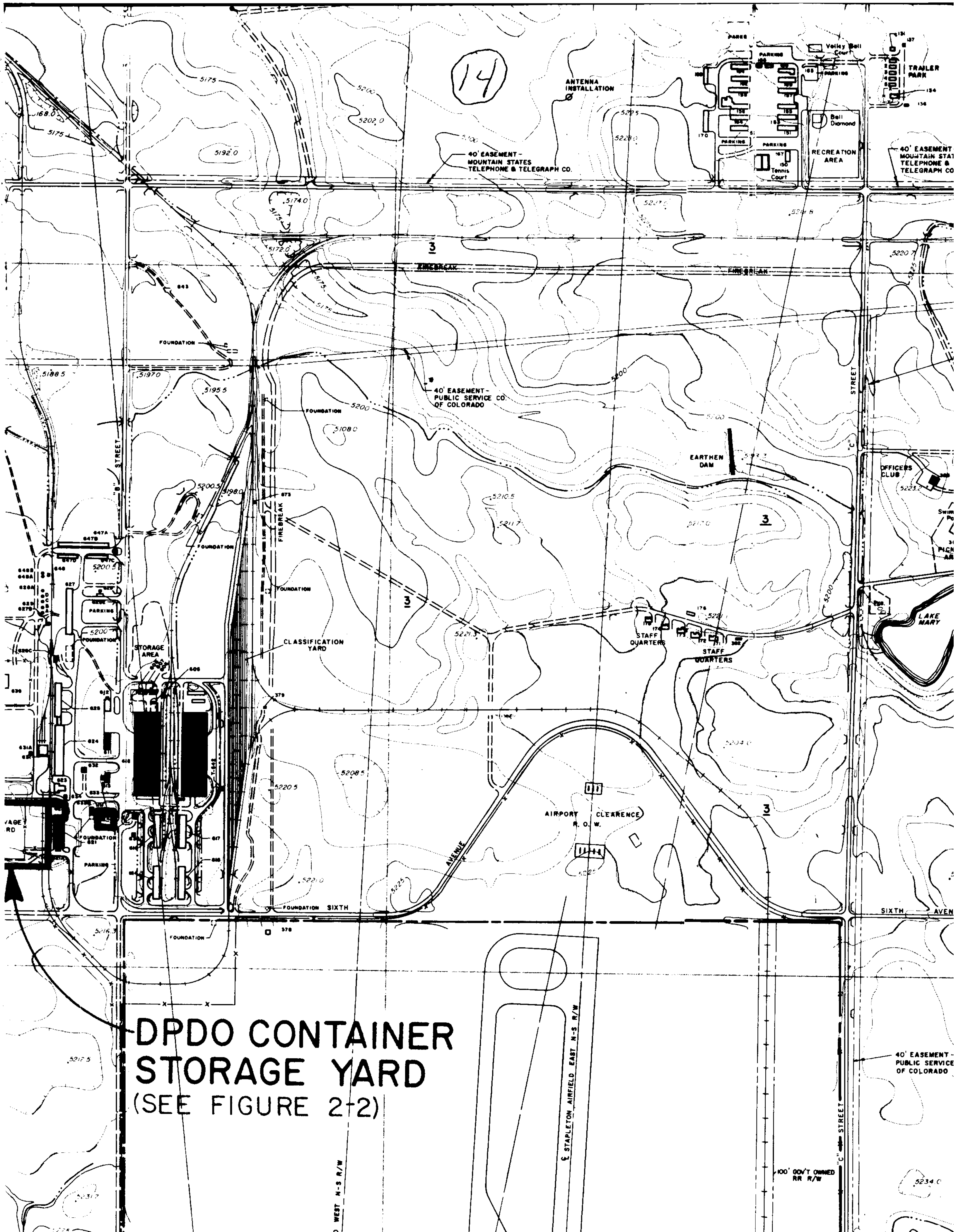


DINGS 1605,
1610) (SEE FIGURE 2-5)
H PLANTS INCINERATOR
DINGS 1611 AND 1703) (SEE FIGURE 2-9)
DEMOLITION AREA
SANITARY LAND FILL
30
EIGHTH AVENUE
CONTAINER STORAGE
(SHEDS ON PLOTS 1-12,
27 AND 28)
(SEE FIGURE 2-3)
1734
1730
TOXIC STORAGE
1736
STORAGE
AREA
FIRST
CREEK
31
798
797
796
795
STREET

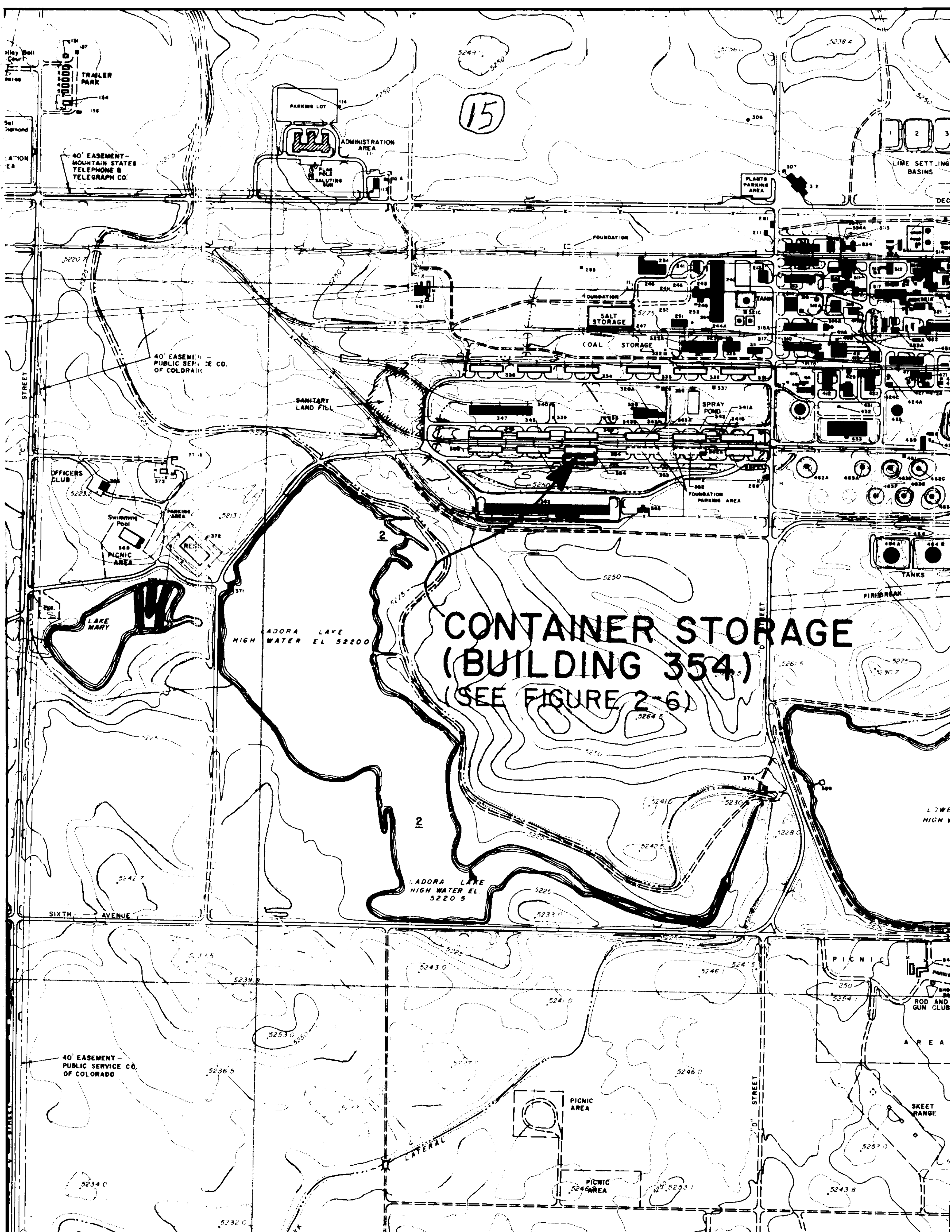


DEMOLITION AREA
29
12
29
EIGHTH AVENUE
FIREBREAK
N 185,000
BURNING PIT (CONTAMINATED)
BURNING PIT (CONTAMINATED)
32
BURNING PIT (CONTAMINATED)
FIREBREAK
STREET

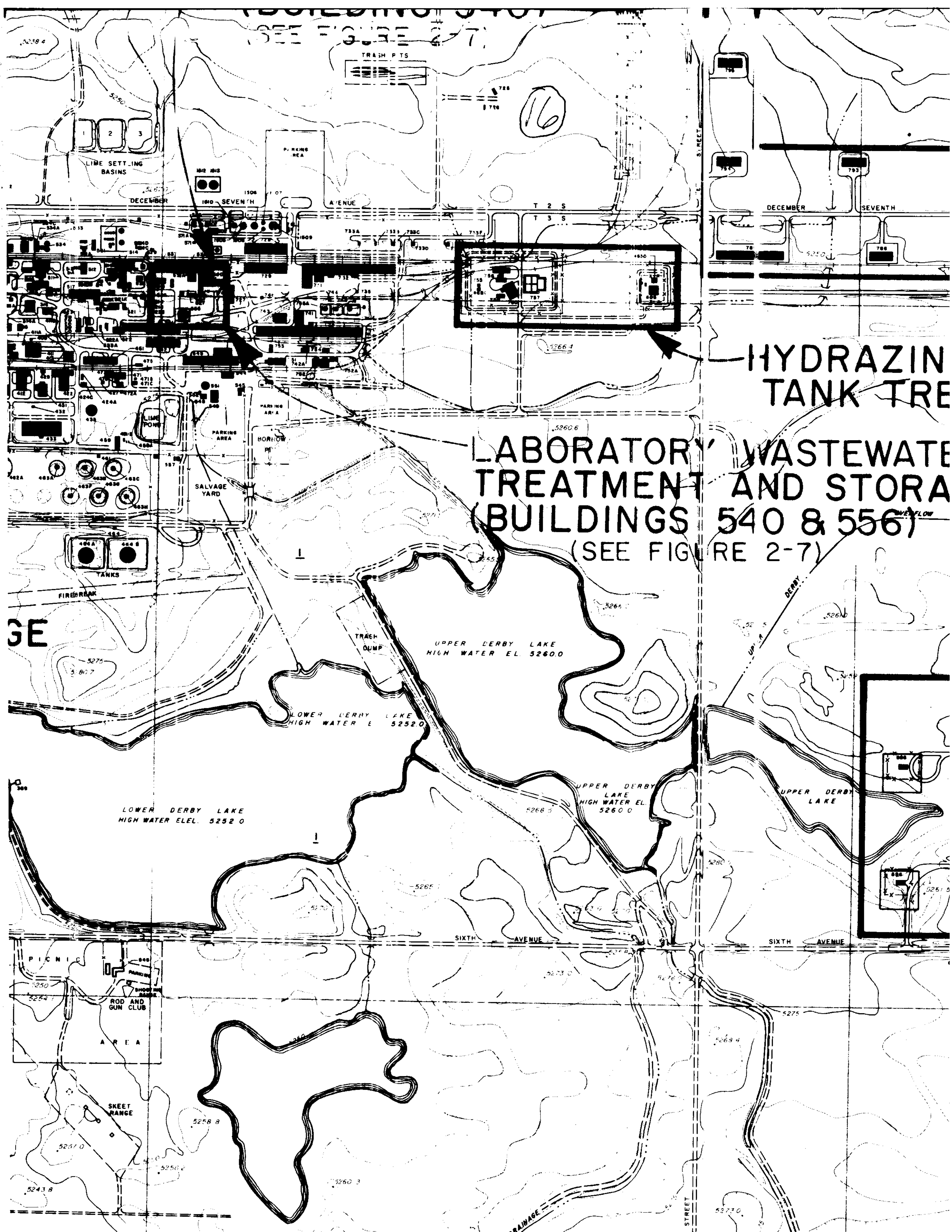

13
MAIN ENTRANCE
DECEMBER SEVENTH AVENUE
T 2 S
T 3 S
AIR MONITORING STATION
N 180,000
N 175,000
"A" STREET
600' EASEMENT - STATE OF COLORADO DEPT OF HIGHWAYS
FOUNDATION
PARKING
COVERED & ABANDONED BURNING PITS AREAS TRASH ONLY
SALVAGE YARD
SIXTH AVENUE
STREET

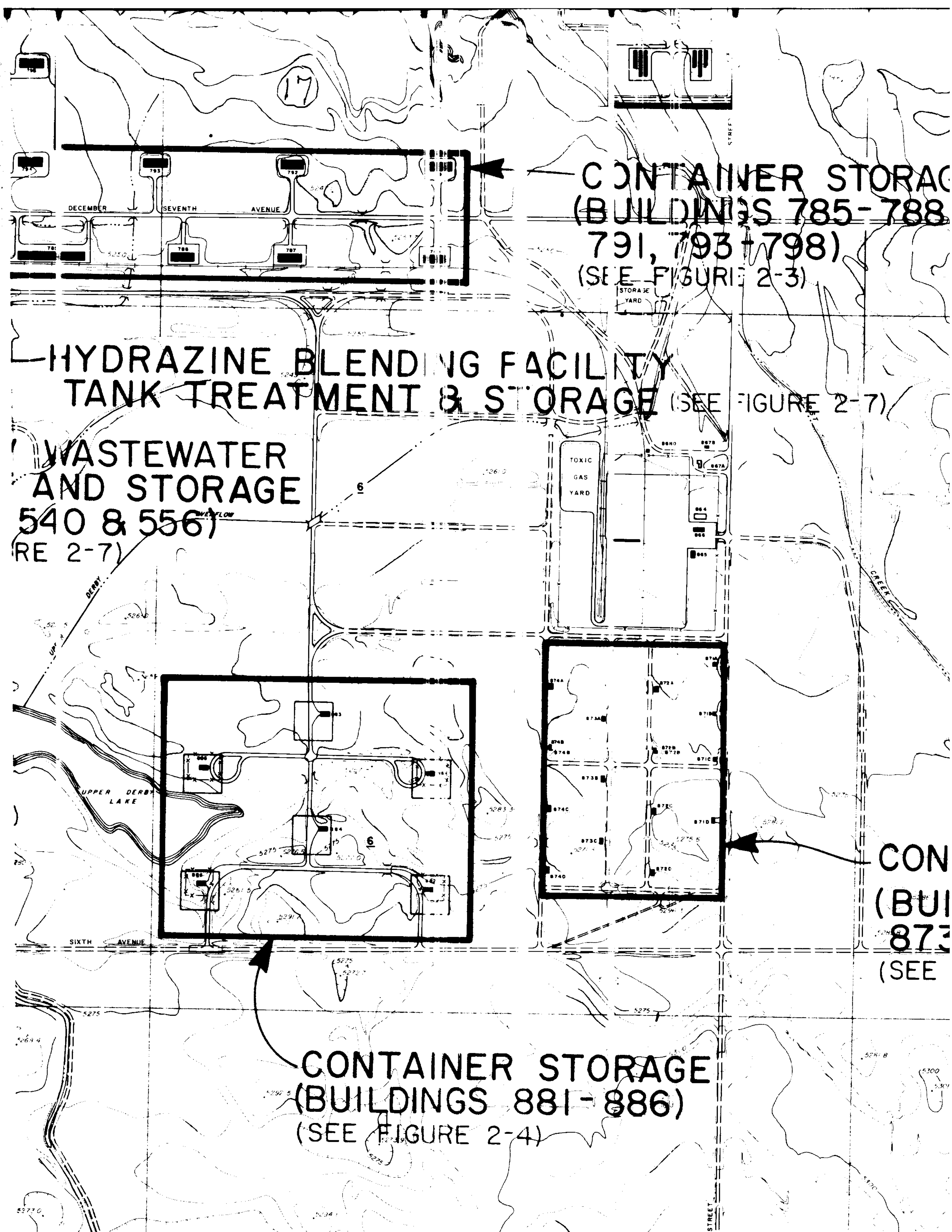


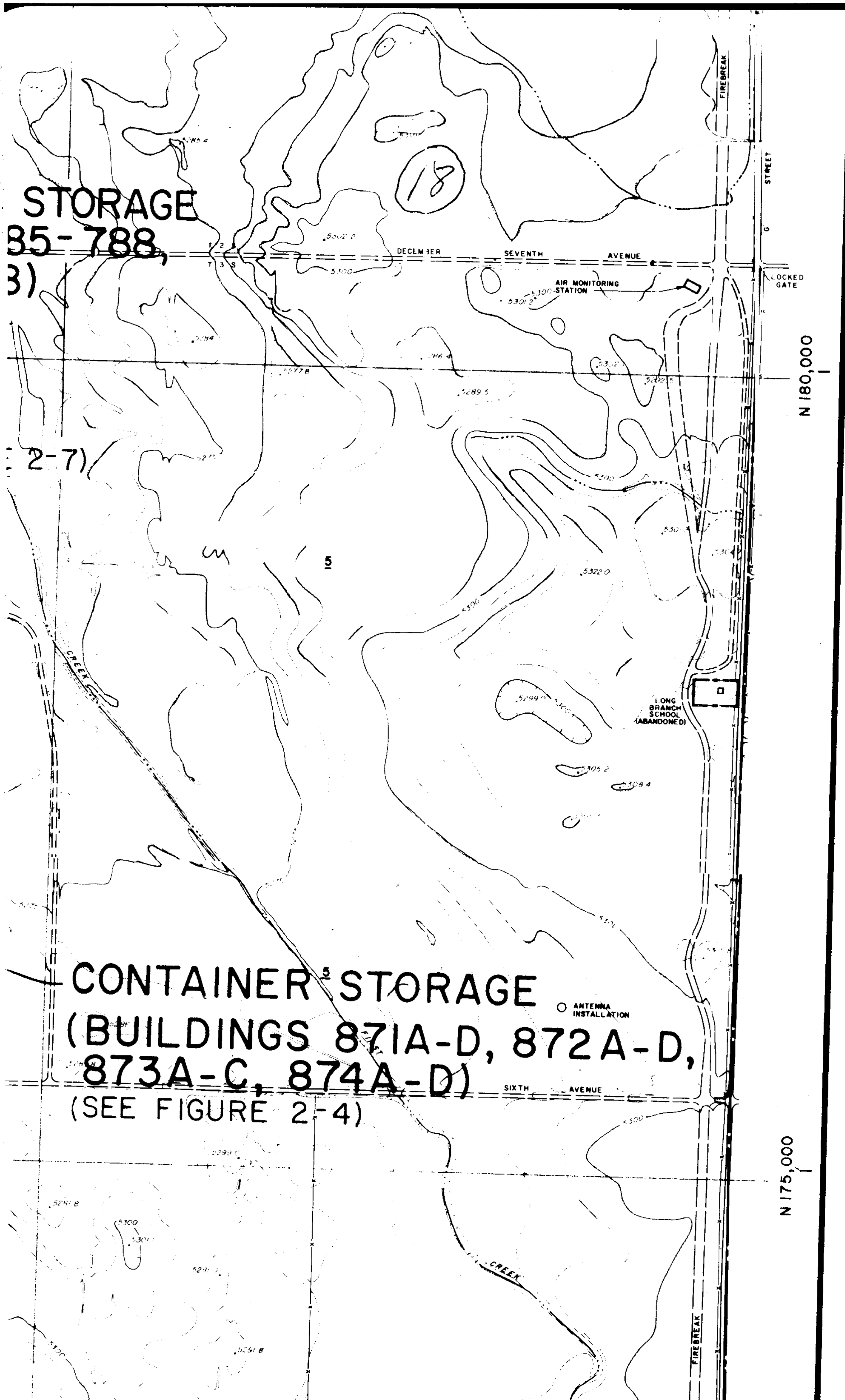
14
ANTENNA INSTALLATION
40' EASEMENT - MOUNTAIN STATES TELEPHONE & TELEGRAPH CO.
TRAILER PARK
Bell Diamond
RECREATION AREA
Tennis Court
PARKING
40' EASEMENT - PUBLIC SERVICE CO. OF COLORADO
FIREBREAK
FOUNDATION
"B" STREET
"C" STREET
EARTHEN DAM
OFFICERS CLUB
LAKE MARY
STAFF QUARTERS
STORAGE AREA
CLASSIFICATION YARD
AIRPORT CLEARENCE R. O. W.
AVENUE
SIXTH
SIXTH AVENUE
€ STAPLETON AIRFIELD EAST N-S R/W
100' GOV'T OWNED RR R/W
DPDO CONTAINER STORAGE YARD
(SEE FIGURE 2-2)



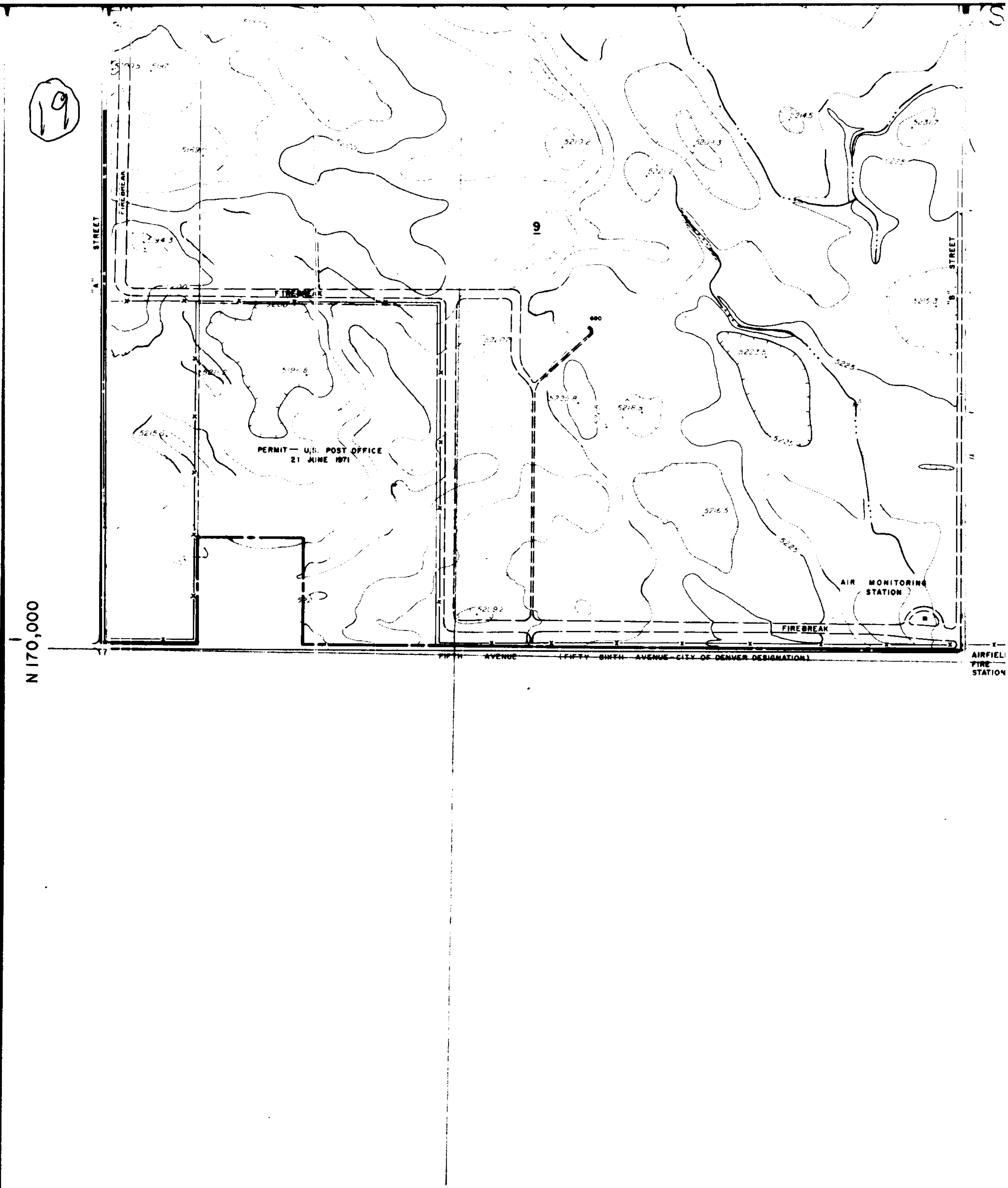
(15)
CONTAINER STORAGE
(BUILDING 354)
(SEE FIGURE 2-6)
TRAILER PARK
PARKING LOT
ADMINISTRATION AREA
FLAG POLE
SALUTING GUN
40' EASEMENT - MOUNTAIN STATES TELEPHONE & TELEGRAPH CO.
PLANTS PARKING AREA
LIME SETTLING BASINS
FOUNDATION
SALT STORAGE
COAL STORAGE
TANK
SANITARY LAND FILL
SPRAY POND
FOUNDATION PARKING AREA
40' EASEMENT - PUBLIC SERVICE CO. OF COLORADO
OFFICERS CLUB
PARKING AREA
Swimming Pool
PICNIC AREA
LAKE MARY
LADORA LAKE HIGH WATER EL 5220.0
LADORA LAKE HIGH WATER EL 5220.5
TANKS
FIREBREAK
"D" STREET
SIXTH AVENUE
STREET
PICNIC AREA
ROD AND GUN CLUB
SKEET RANGE
LATERAL
40' EASEMENT - PUBLIC SERVICE CO. OF COLORADO


(SEE FIGURE 2-7)
TRASH PITS
LIME SETTLING BASINS
DECEMBER
SEVENTH
AVENUE
HYDRAZINE TANK TRE
LABORATORY WASTEWATE
TREATMENT AND STORA
(BUILDINGS 540 & 556)
(SEE FIGURE 2-7)
LIME POND
PARKING AREA
BORROW PIT
SALVAGE YARD
TANKS
FIREBREAK
GE
TRASH DUMP
UPPER DERBY LAKE
HIGH WATER EL. 5260.0
LOWER DERBY LAKE
HIGH WATER EL. 5252.0
LOWER DERBY LAKE
HIGH WATER ELEL. 5252.0
UPPER DERBY LAKE
HIGH WATER EL. 5260.0
UPPER DERBY LAKE
SIXTH AVENUE
SIXTH AVENUE
PICNIC
ROD AND GUN CLUB
AREA
SKEET RANGE
STREET
DRAINAGE

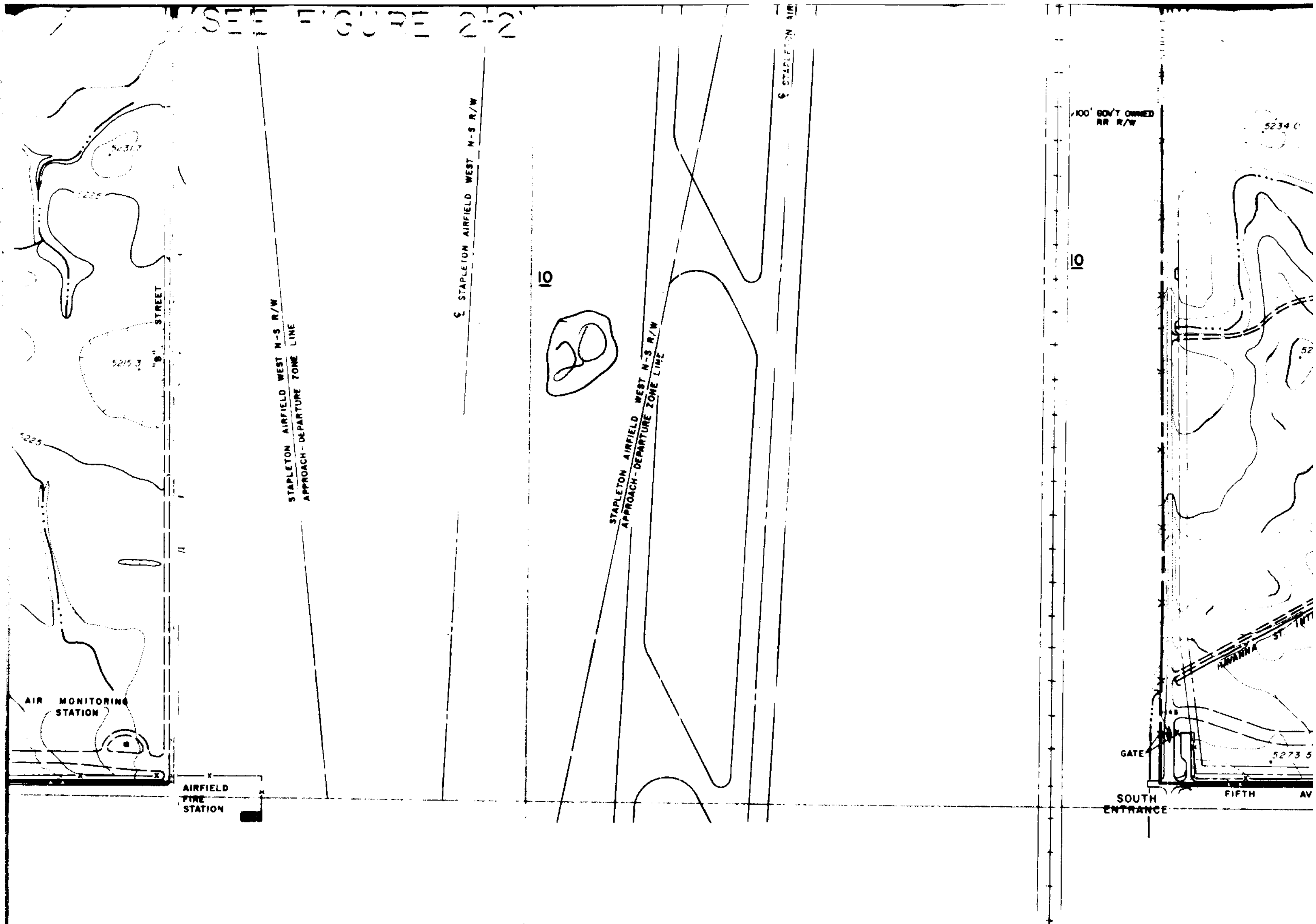

CONTAINER STORAG
(BUILDINGS 785-788
791, 793-798)
(SEE FIGURE 2-3)
STORAGE YARD
DECEMBER
SEVENTH
AVENUE
HYDRAZINE BLENDING FACILITY
TANK TREATMENT & STORAGE (SEE FIGURE 2-7)
WASTEWATER
AND STORAGE
540 & 556)
RE 2-7)
TOXIC GAS YARD
CREEK
DERBY
UPPER DERBY LAKE
SIXTH AVENUE
CON
(BUI
873
(SEE
CONTAINER STORAGE
(BUILDINGS 881-886)
(SEE FIGURE 2-4)
STREET



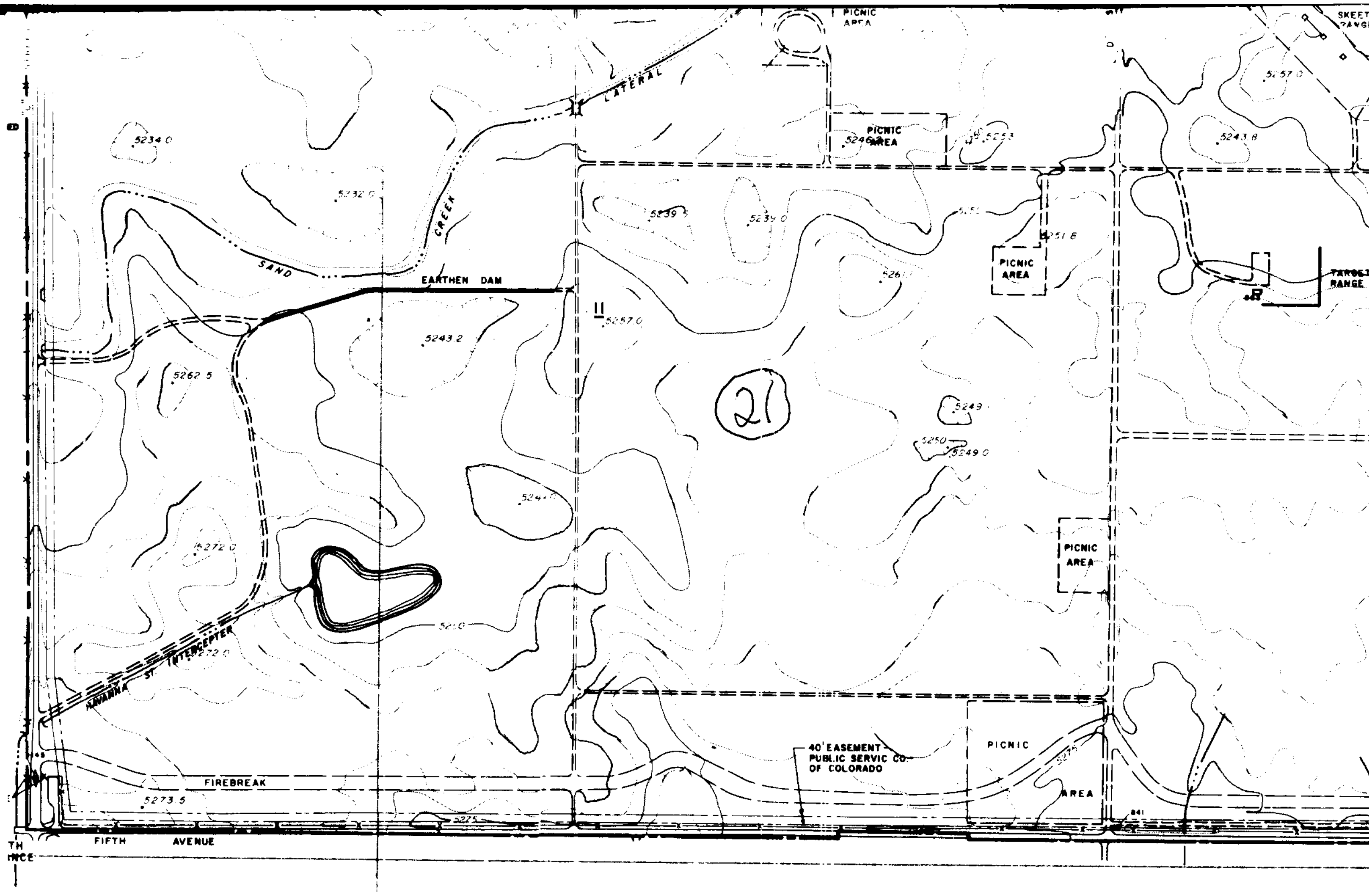
STORAGE
85-788,
3)
2-7)
18
DECEMBER SEVENTH AVENUE
AIR MONITORING STATION
LOCKED GATE
G STREET
FIREBREAK
N 180,000
5
LONG BRANCH SCHOOL (ABANDONED)
CREEK
CONTAINER STORAGE
(BUILDINGS 871A-D, 872A-D,
873A-C, 874A-D)
(SEE FIGURE 2-4)
ANTENNA INSTALLATION
SIXTH AVENUE
N 175,000
CREEK
FIREBREAK

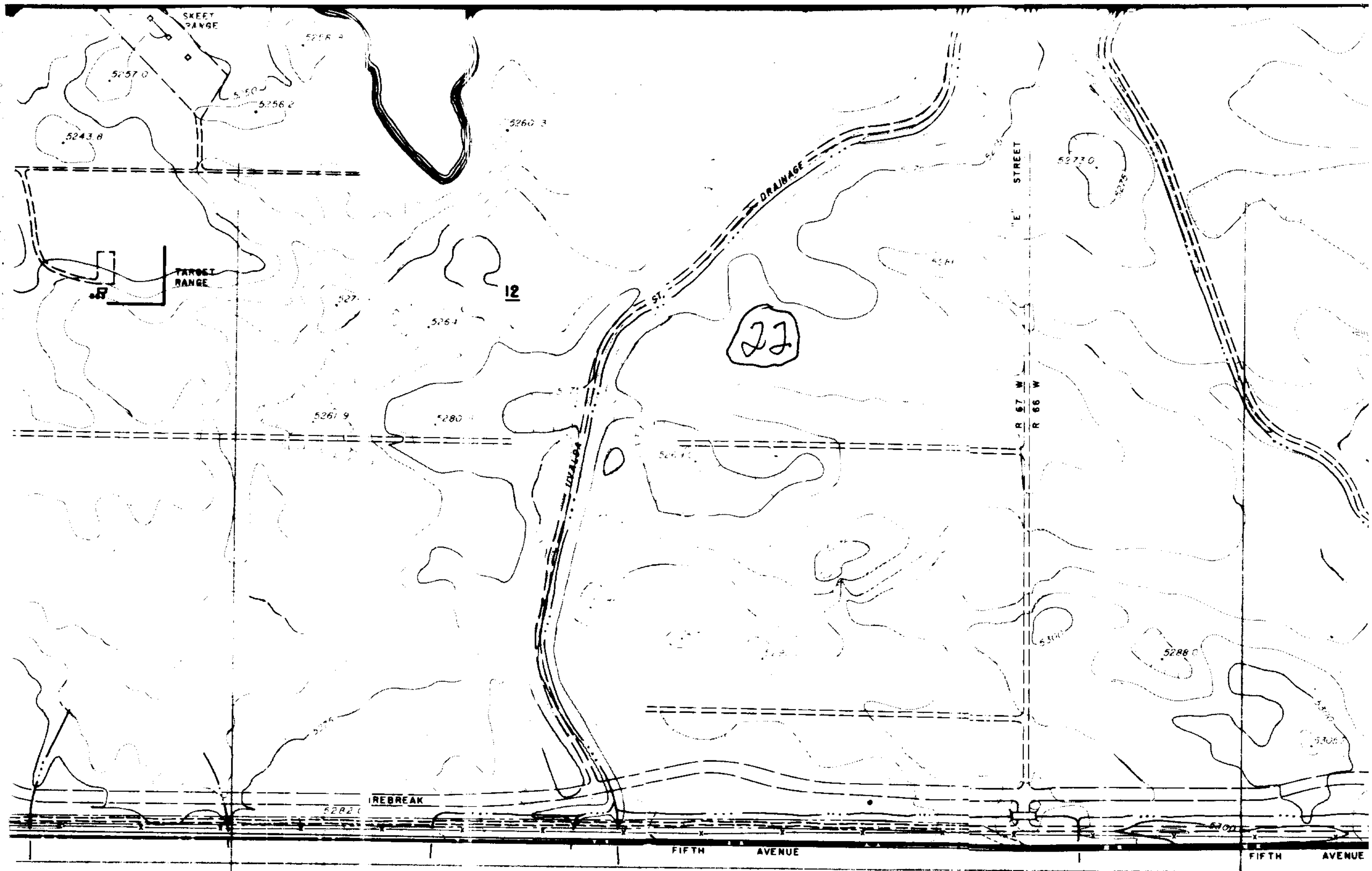


REFERENCE: ROCKY MOUNTAIN ARSENAL
U.S. ARMY ENGINEER DISTRICT,
OMAHA CORPS OF ENGINEERS,



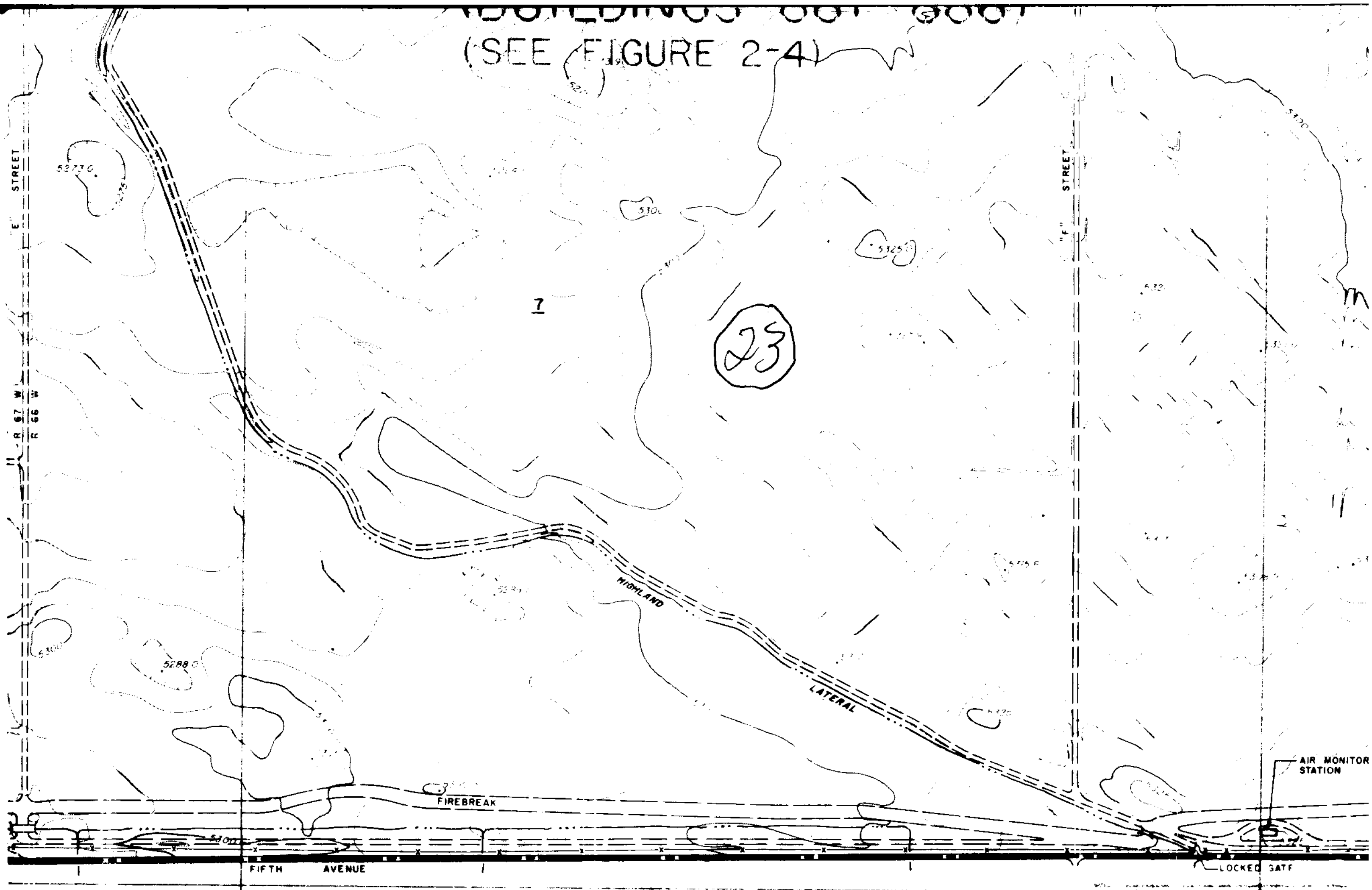
SEE FIGURE 2-2
STREET
5215.3
AIR MONITORING STATION
AIRFIELD FIRE STATION
STAPLETON AIRFIELD WEST N-S R/W APPROACH-DEPARTURE ZONE LINE
℄ STAPLETON AIRFIELD WEST N-S R/W
10
STAPLETON AIRFIELD WEST N-S R/W APPROACH-DEPARTURE ZONE LINE
100' GOV'T OWNED RR R/W
10
5234.0
HAVANNA ST
GATE
SOUTH ENTRANCE
FIFTH


PICNIC AREA
SKEET RANGE
LATERAL
SAND CREEK
EARTHEN DAM
PICNIC AREA
TARGET RANGE
PICNIC AREA
21
PICNIC AREA
HAVANA ST. INTERCEPTER
40' EASEMENT PUBLIC SERVIC CO. OF COLORADO
PICNIC AREA
FIREBREAK
FIFTH AVENUE
5234.0
5232.0
5243.2
5262.5
5272.0
5273.5
5239.5
5239.0
5257.0
5249.0
5243.8



LEGEND:

☐ FACILITIES INCLUDED WITHIN THE PART B PERMIT APPLICATION



FACI

DEPAR
ROCK
COMM

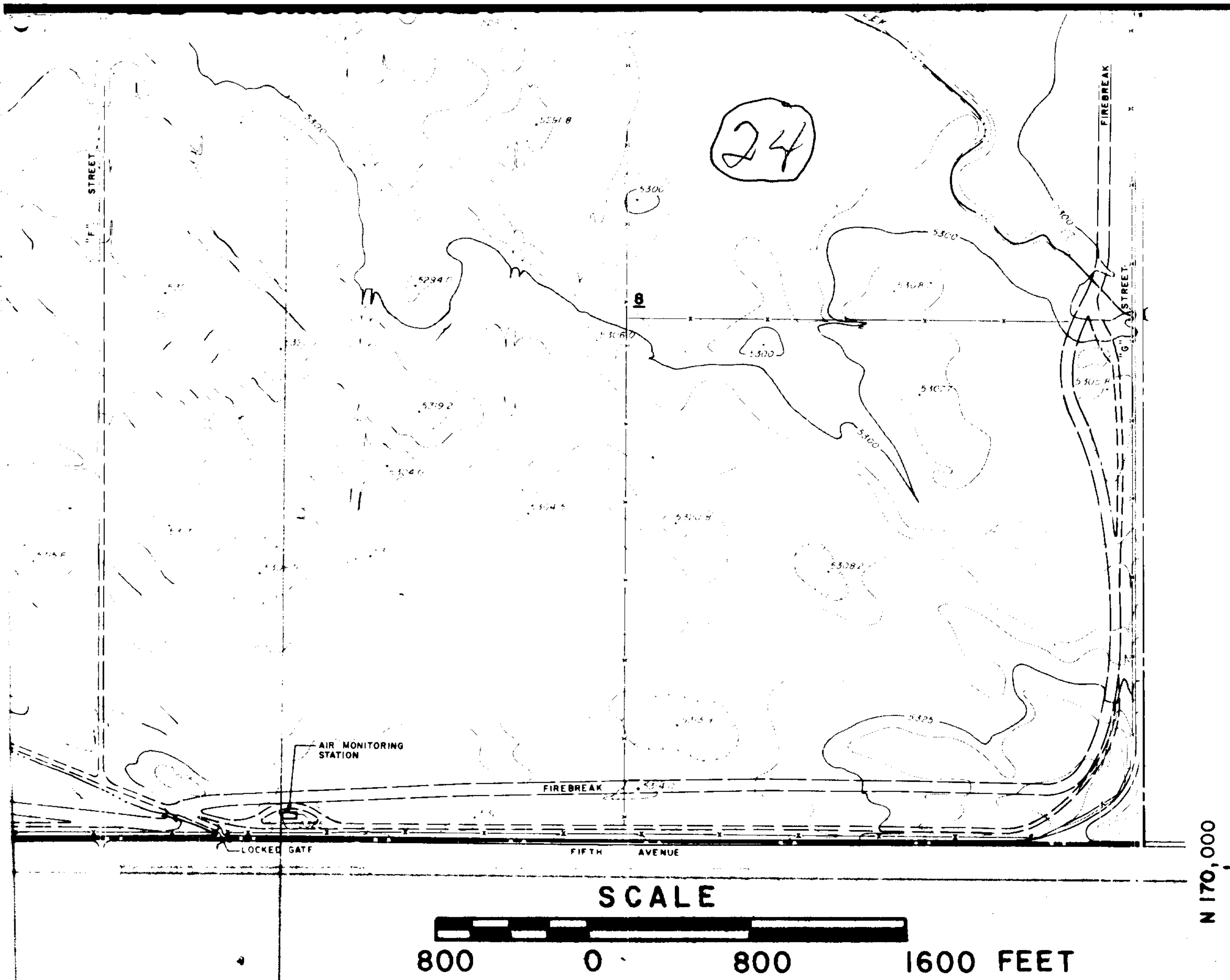


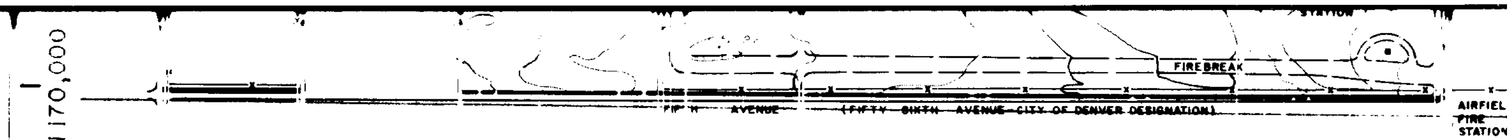
FIGURE 2-1

FACILITIES LOCATION MAP

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

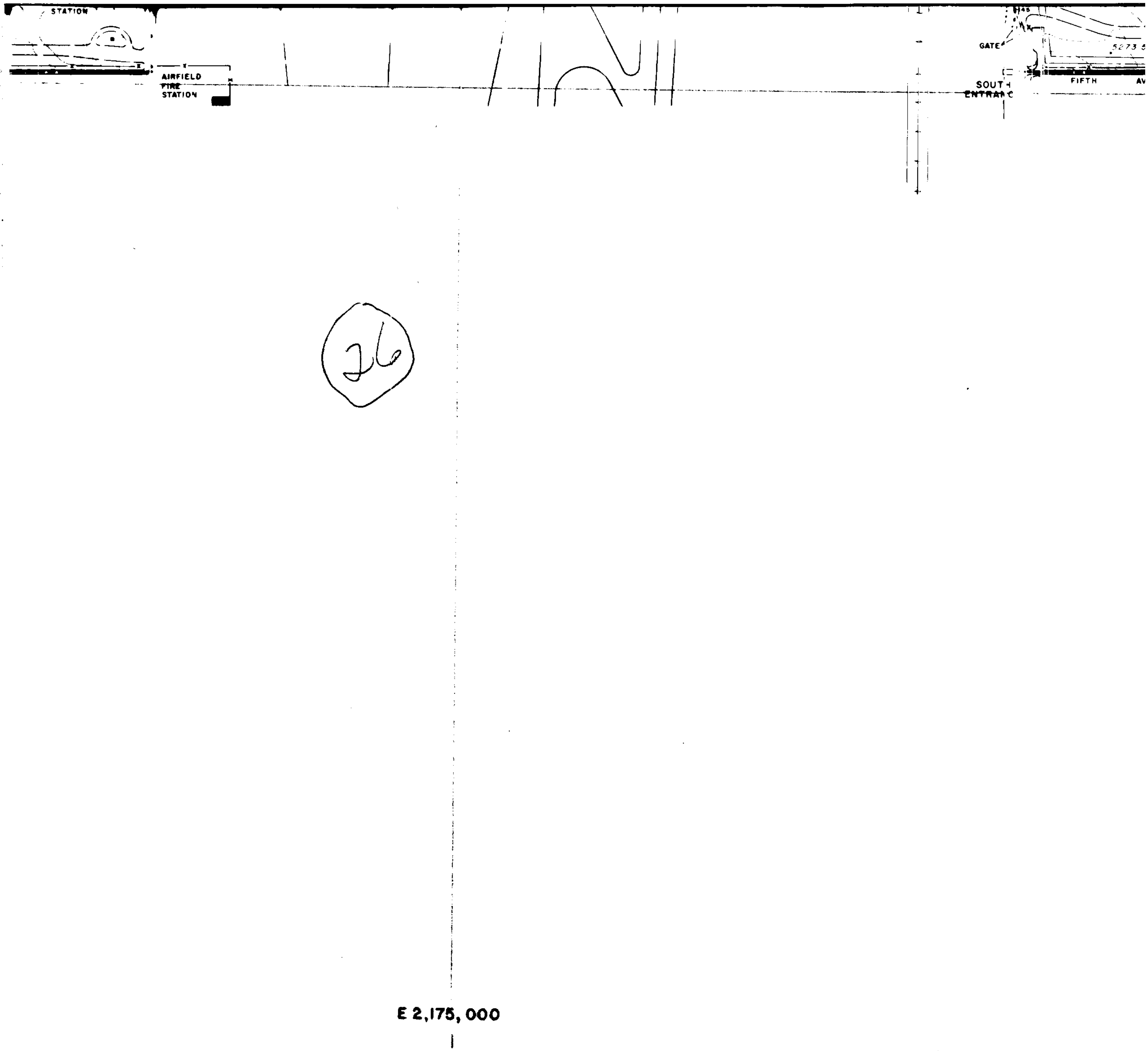
N 170,000

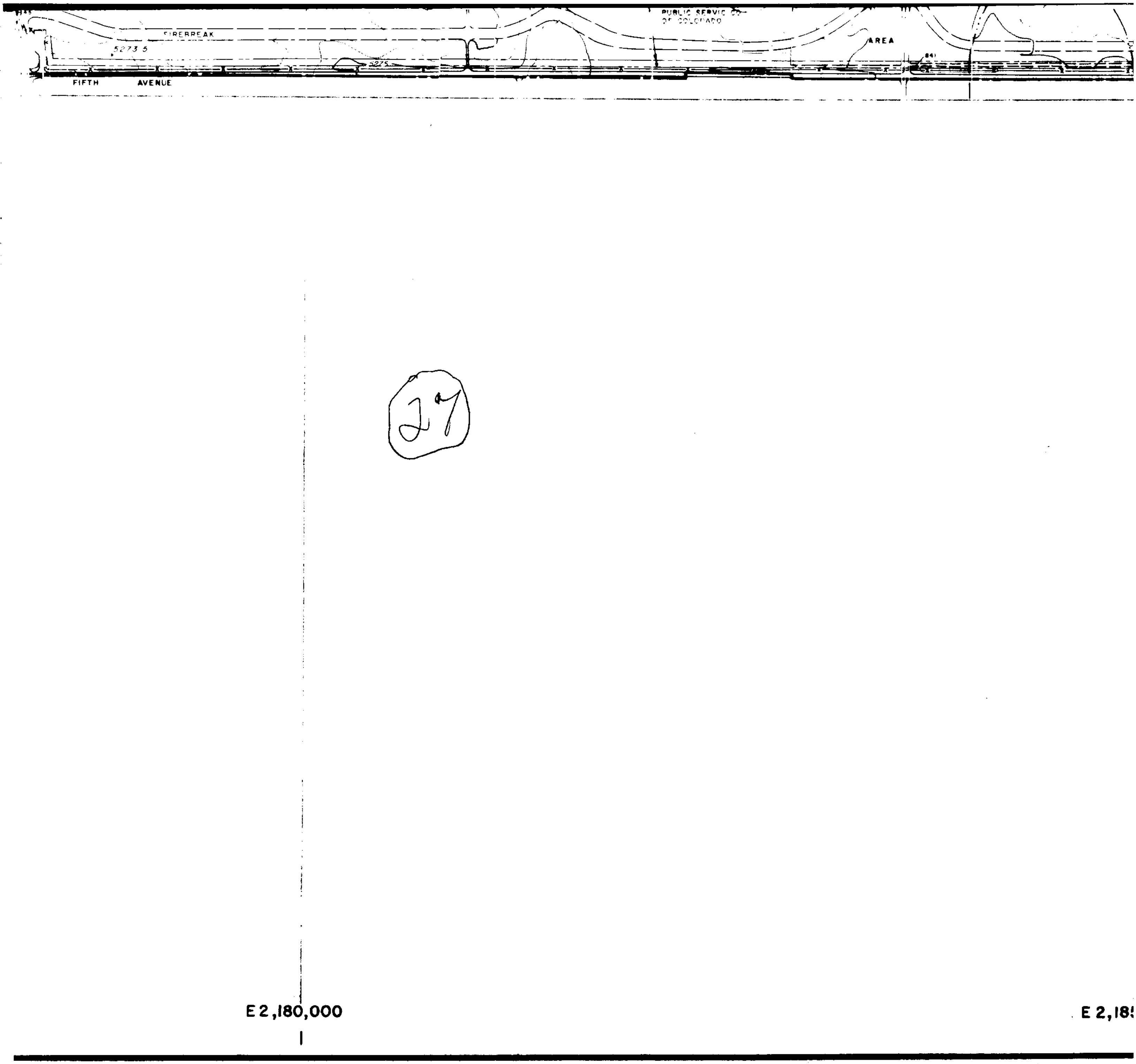


25

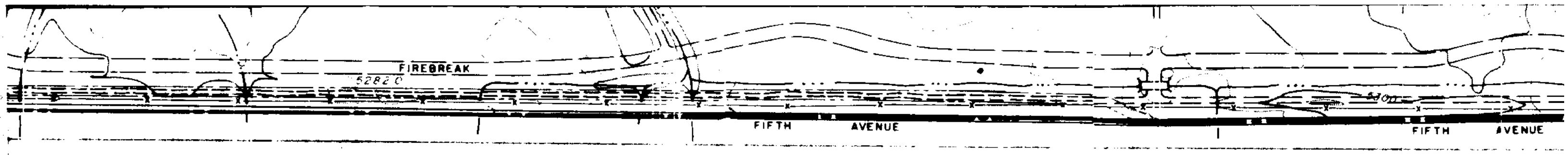
REFERENCE: ROCKY MOUNTAIN ARSENAL
U.S. ARMY ENGINEER DISTRICT,
OMAHA CORPS OF ENGINEERS,
OMAHA, NEBRASKA
DATED: MARCH 15, 1977

E 2,170,000


STATION
AIRFIELD
FIRE
STATION
GATE
FIFTH
26
E 2,175,000



27



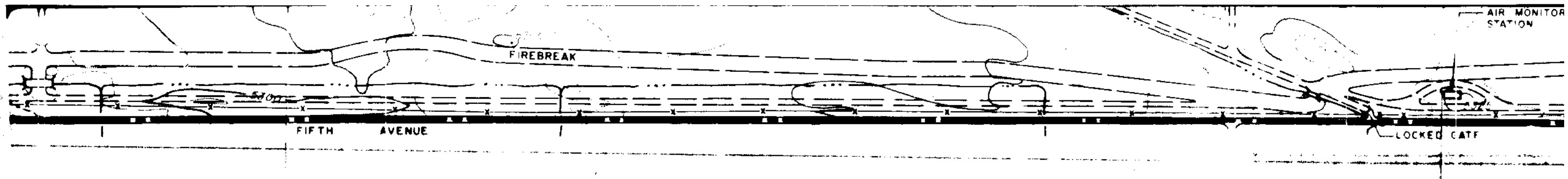
LEGEND:

FACILITIES INCLUDED WITHIN THE PART B PERMIT APPLICATION

28

E 2,185,000

E 2,190,000

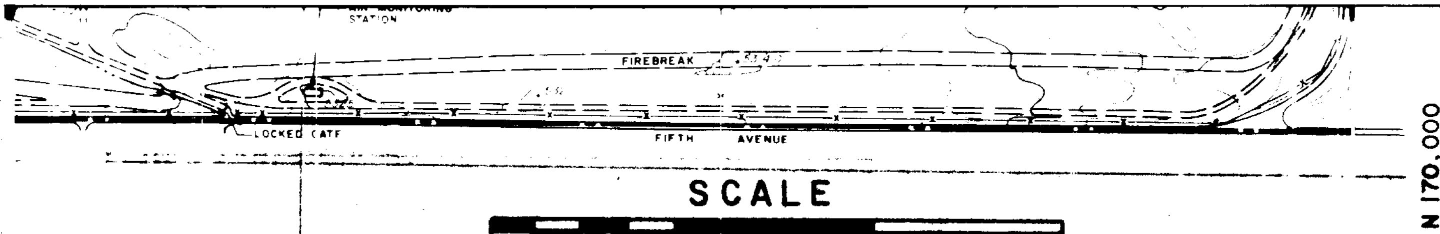


29

FACI

DEPAR
ROCK
COMM

E 2,190,000



SCALE

800 0 800 1600 FEET

30

FIGURE 2-1

FACILITIES LOCATION MAP

PREPARED FOR

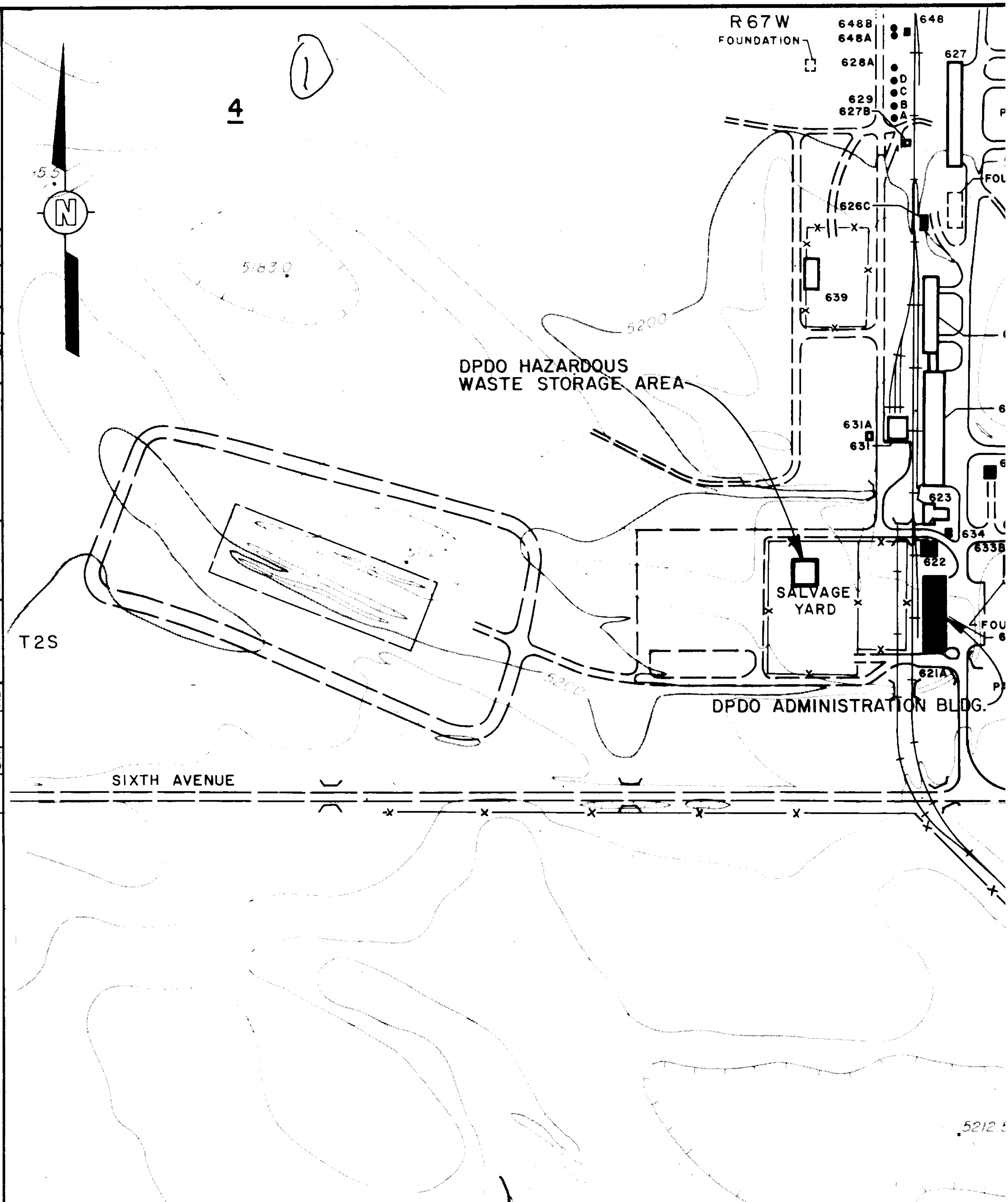
DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

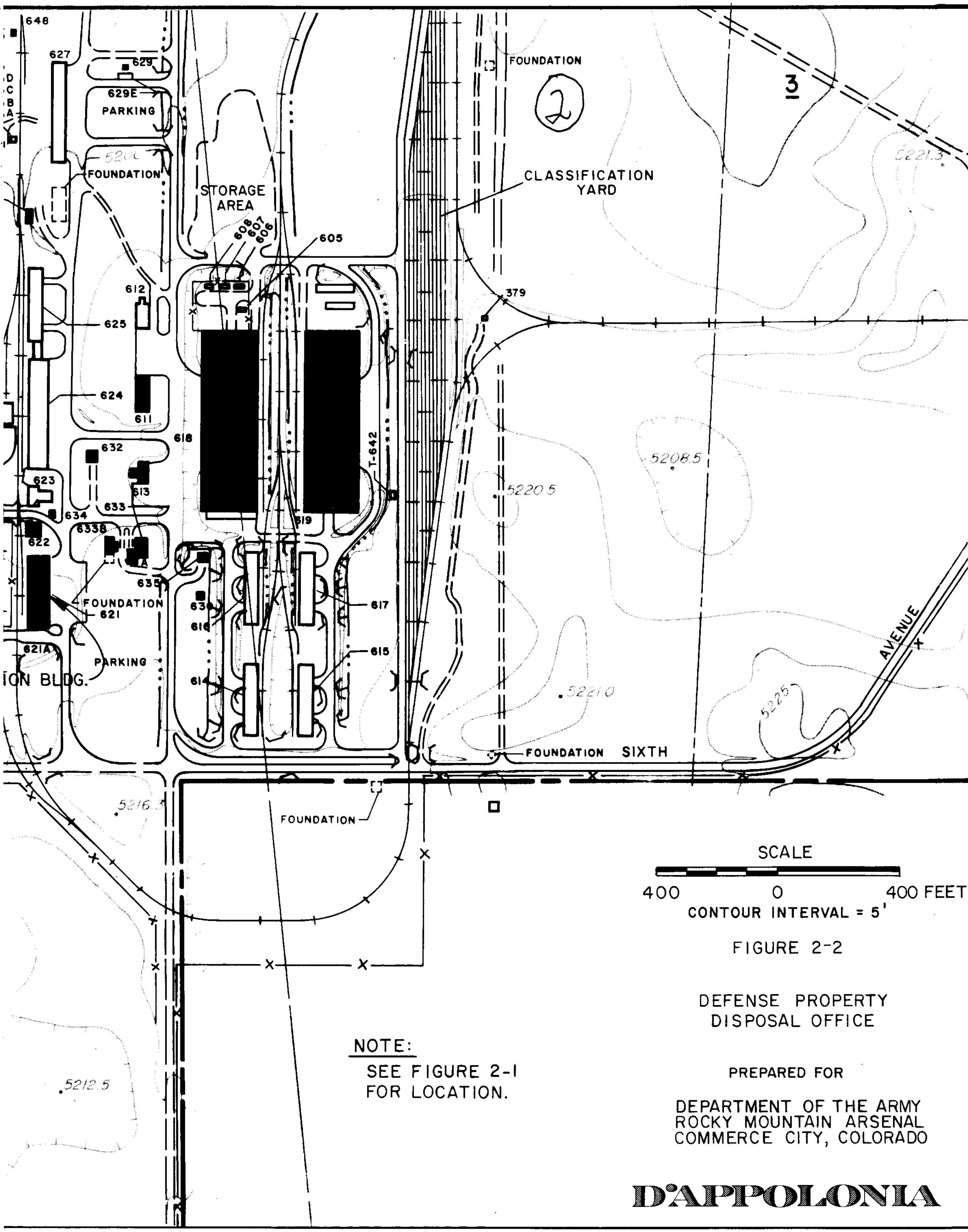
DRAWING NUMBER RM82-1981-B4

DRAWN BY	D.J.Rodriguez 2-10-83
CHECKED BY	PRE 2/27/83
APPROVED BY	JCM 2/27/83

8 8 | 100 BK | 7 7 | 100 RD



REFERENCE:
GENERAL SITE MAP, AREA 7, ROCKY MOUNTAIN ARSENAL, DENVER, CO., DWG. NO. 18-02-01, SHEET NO. 50 OF 67. DATED: 3-1-77. SCALE: 1" = 400.'



NOTE:
SEE FIGURE 2-1 FOR LOCATION.

FIGURE 2-2

DEFENSE PROPERTY DISPOSAL OFFICE

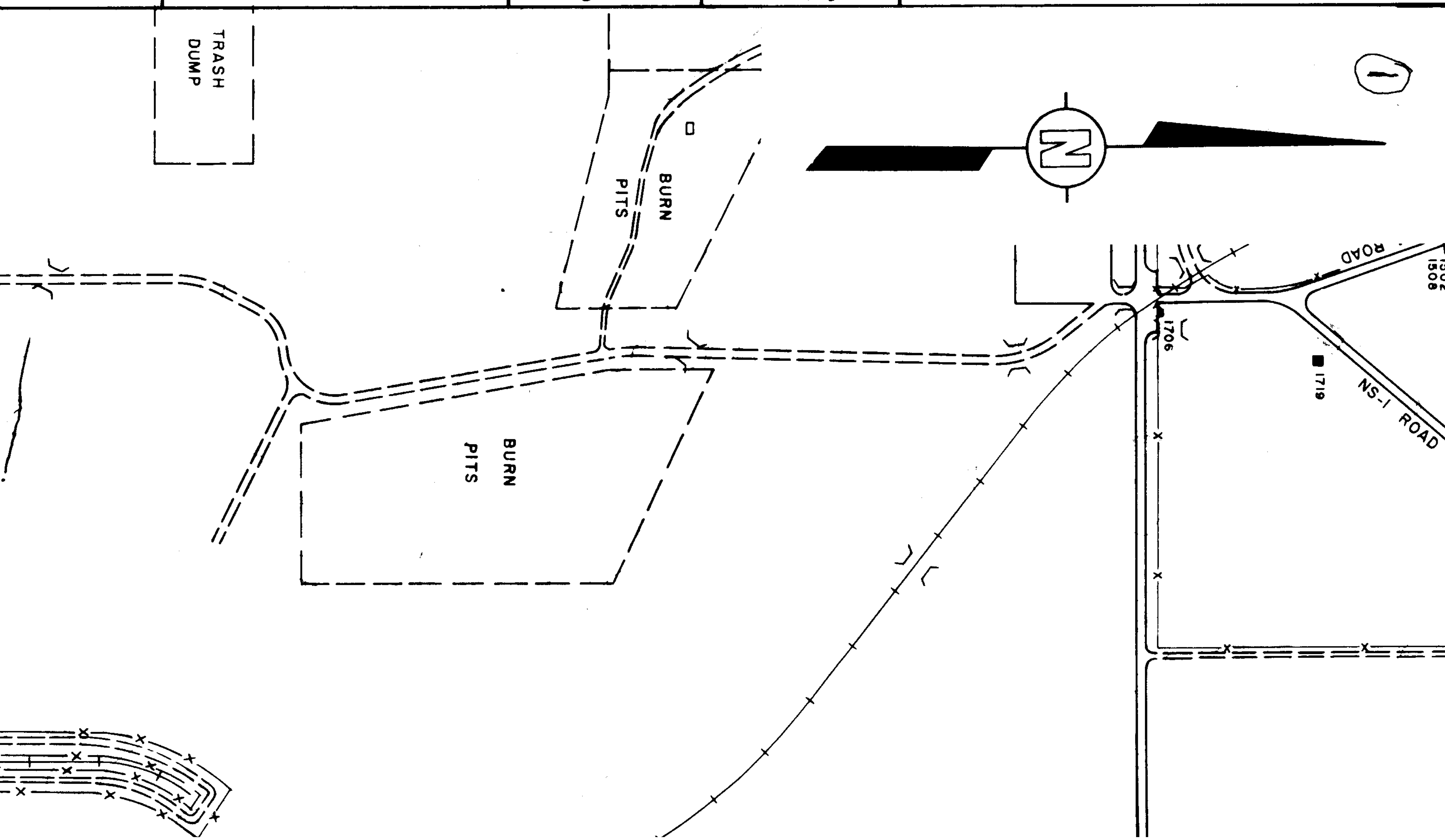
PREPARED FOR

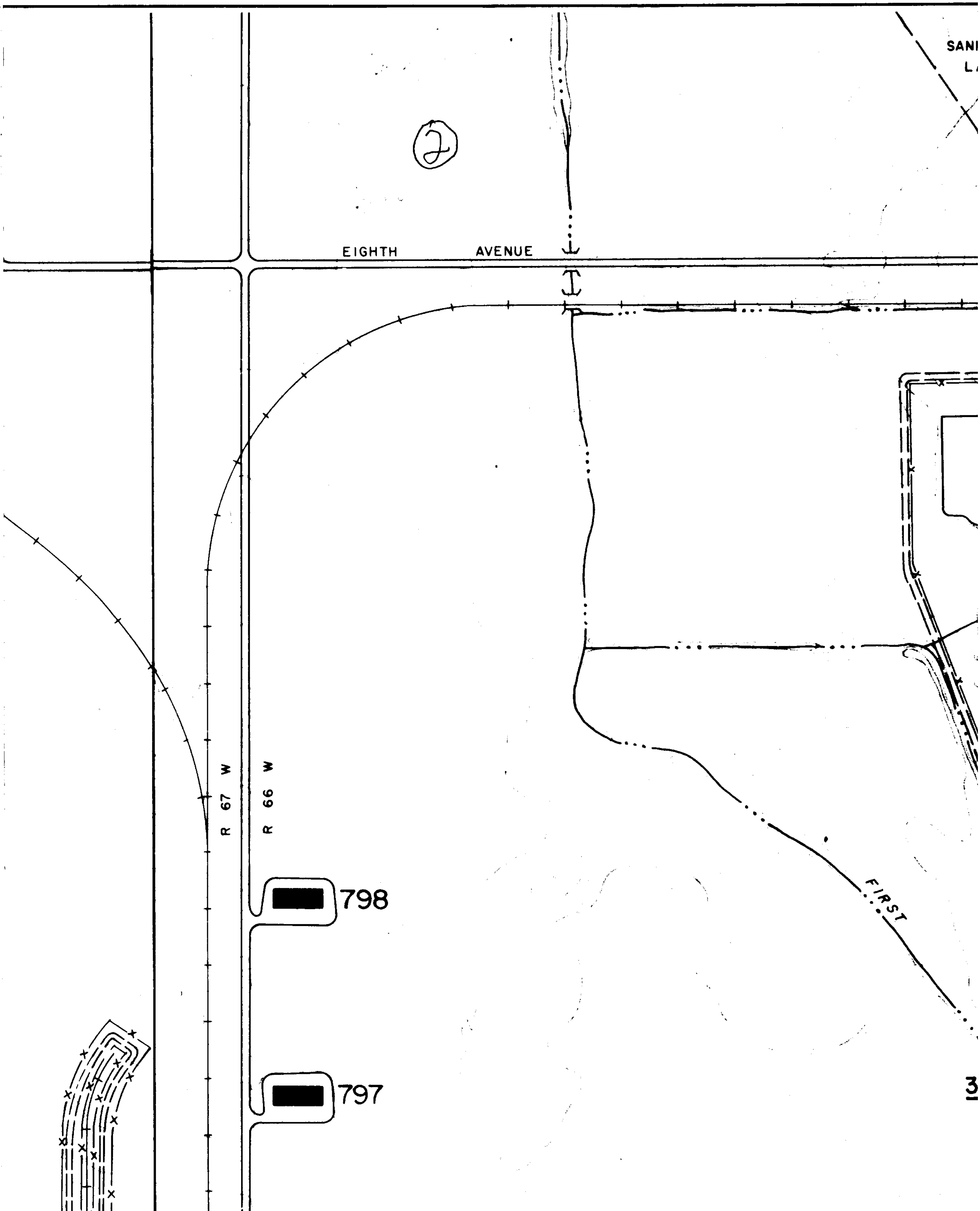
DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

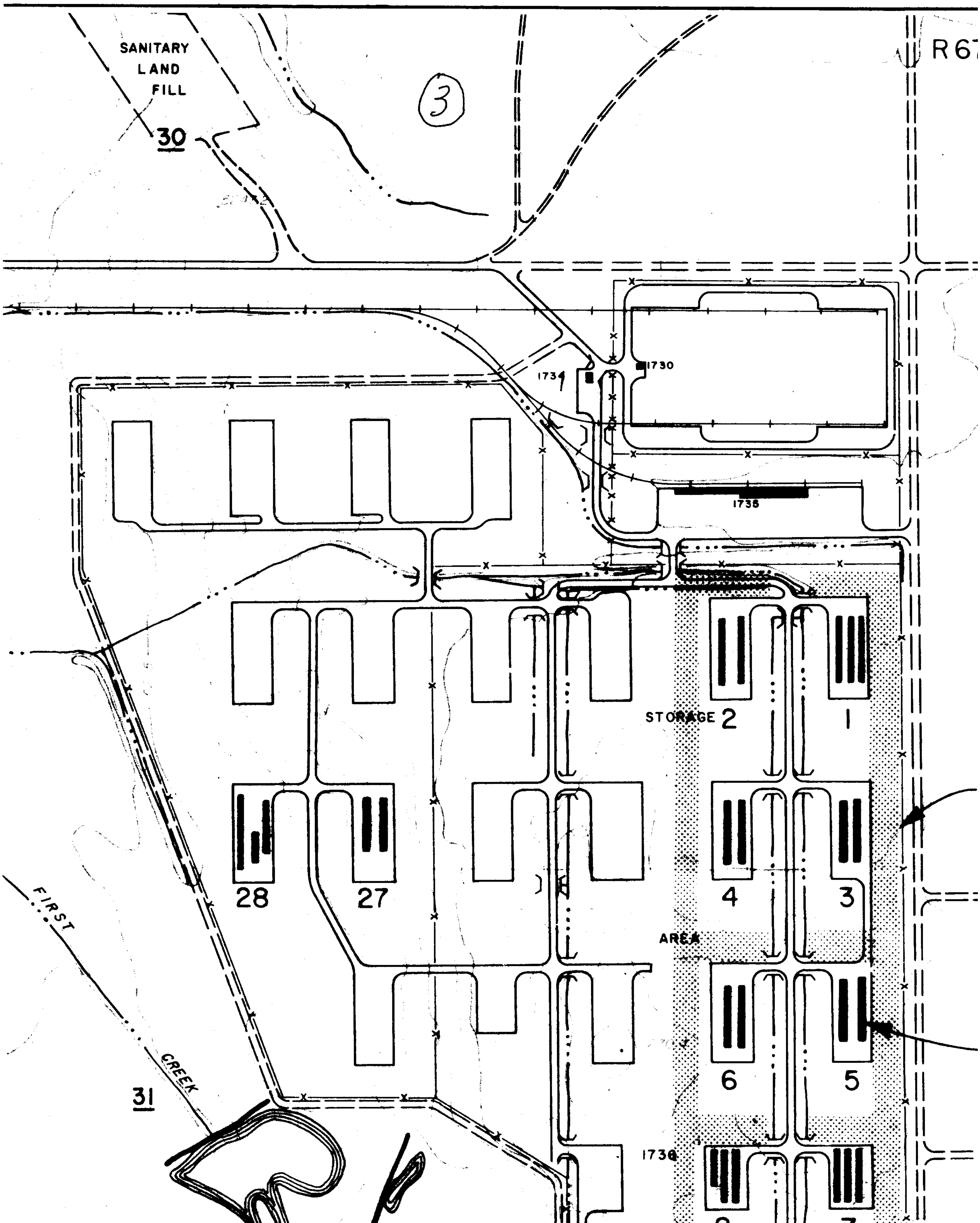
D'APPOLONIA

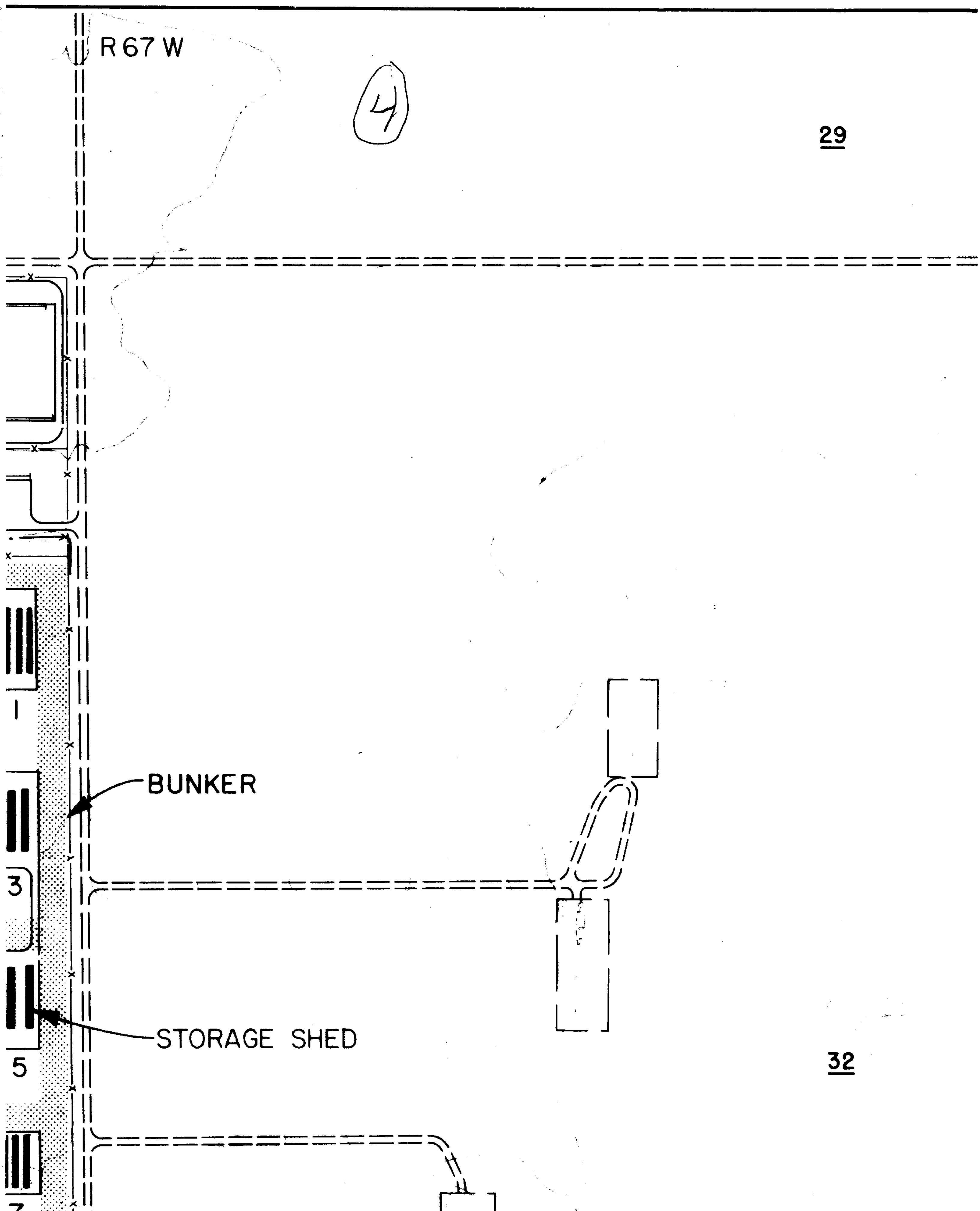
RM82-1981-E8

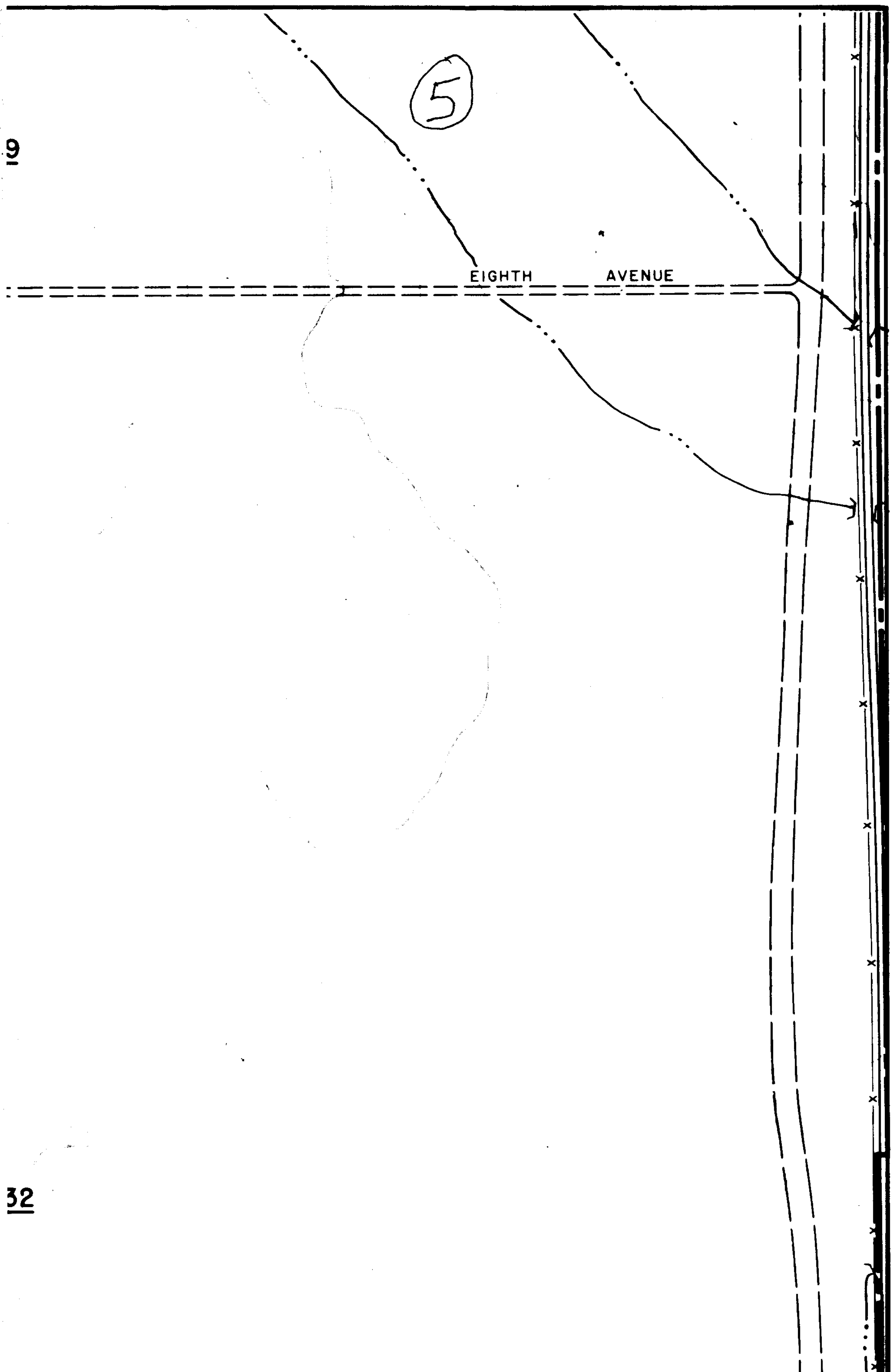
J. Rodriguez	CHECKED BY	PRF	2/27/83	DRAWING NUMBER RM82-1981-E8
-24-83	APPROVED BY	JCM	2/21/83	



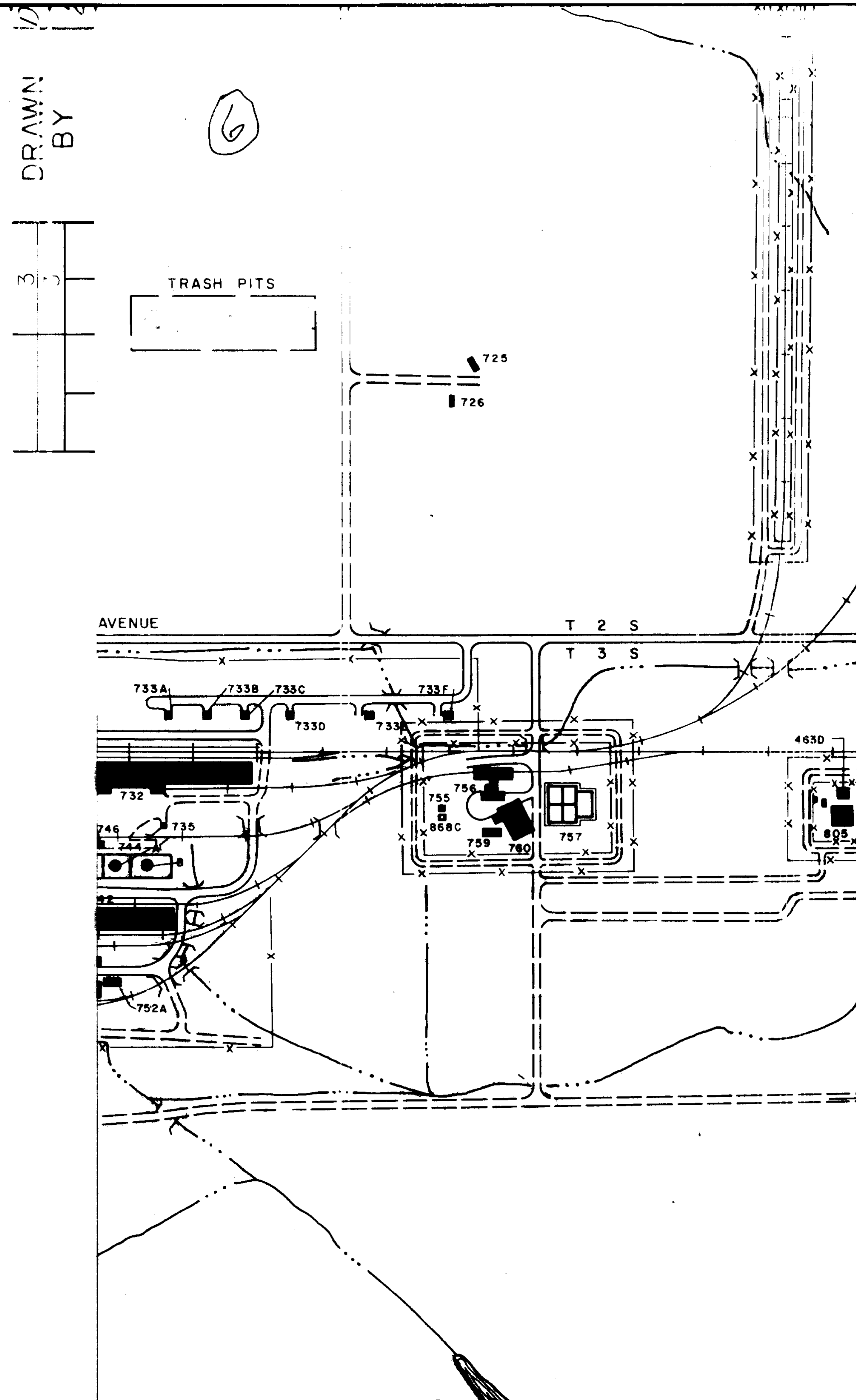

EIGHTH AVENUE
R 67 W
R 66 W
798
797
FIRST

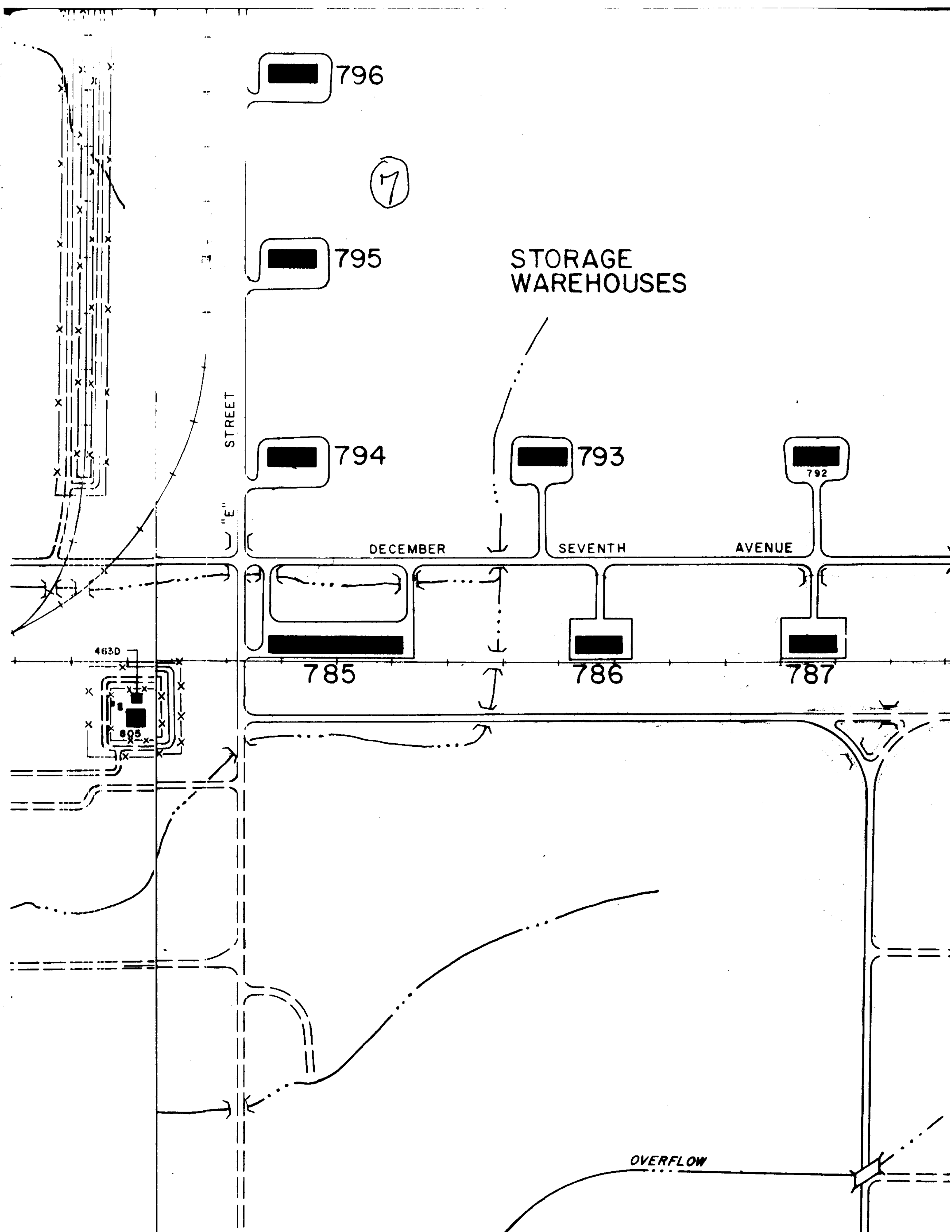

SANITARY
LAND
FILL
30
3
1734
1730
1735
STORAGE
2
1
28
27
4
3
AREA
6
5
FIRST
CREEK
31
1736


R67W
4
29
1
BUNKER
3
STORAGE SHED
5
32

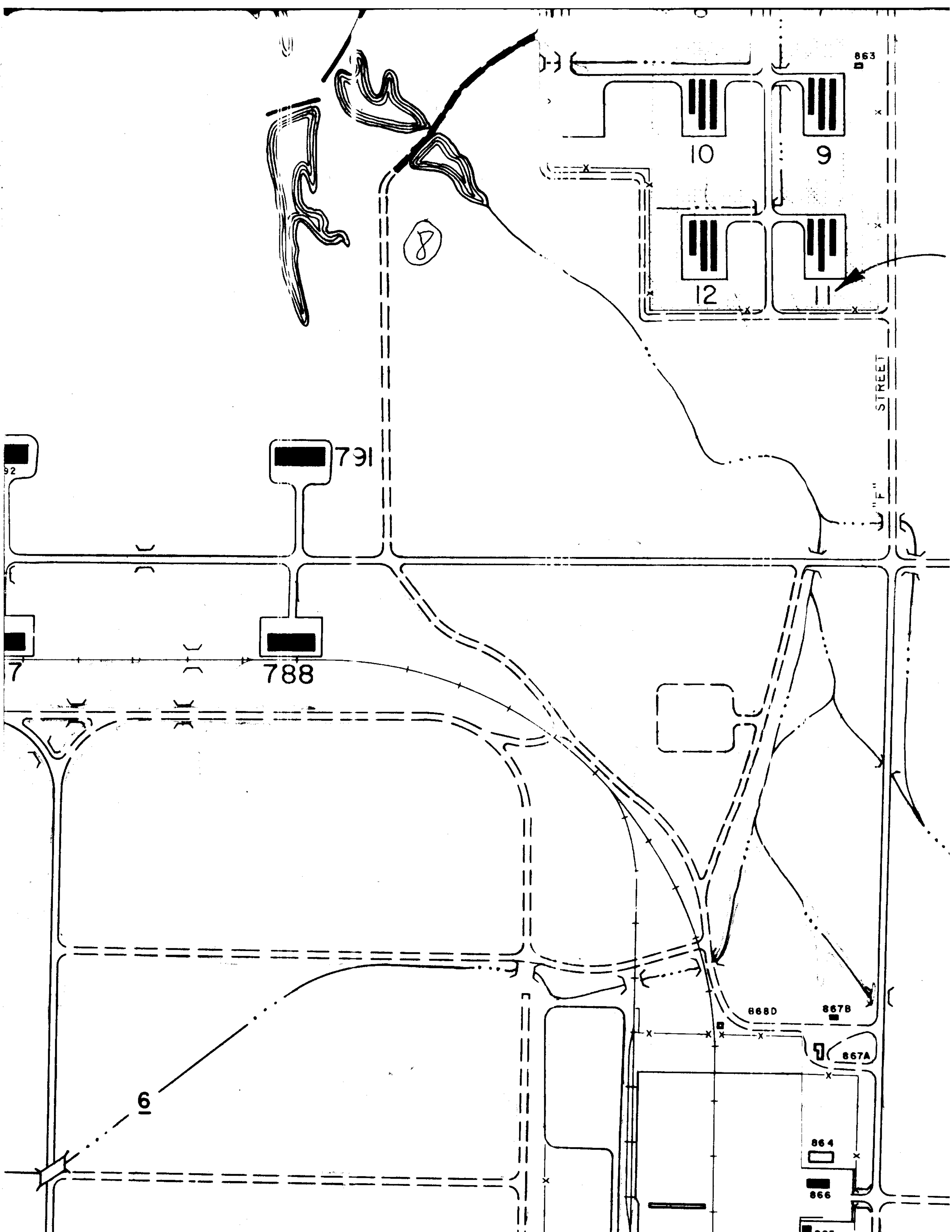


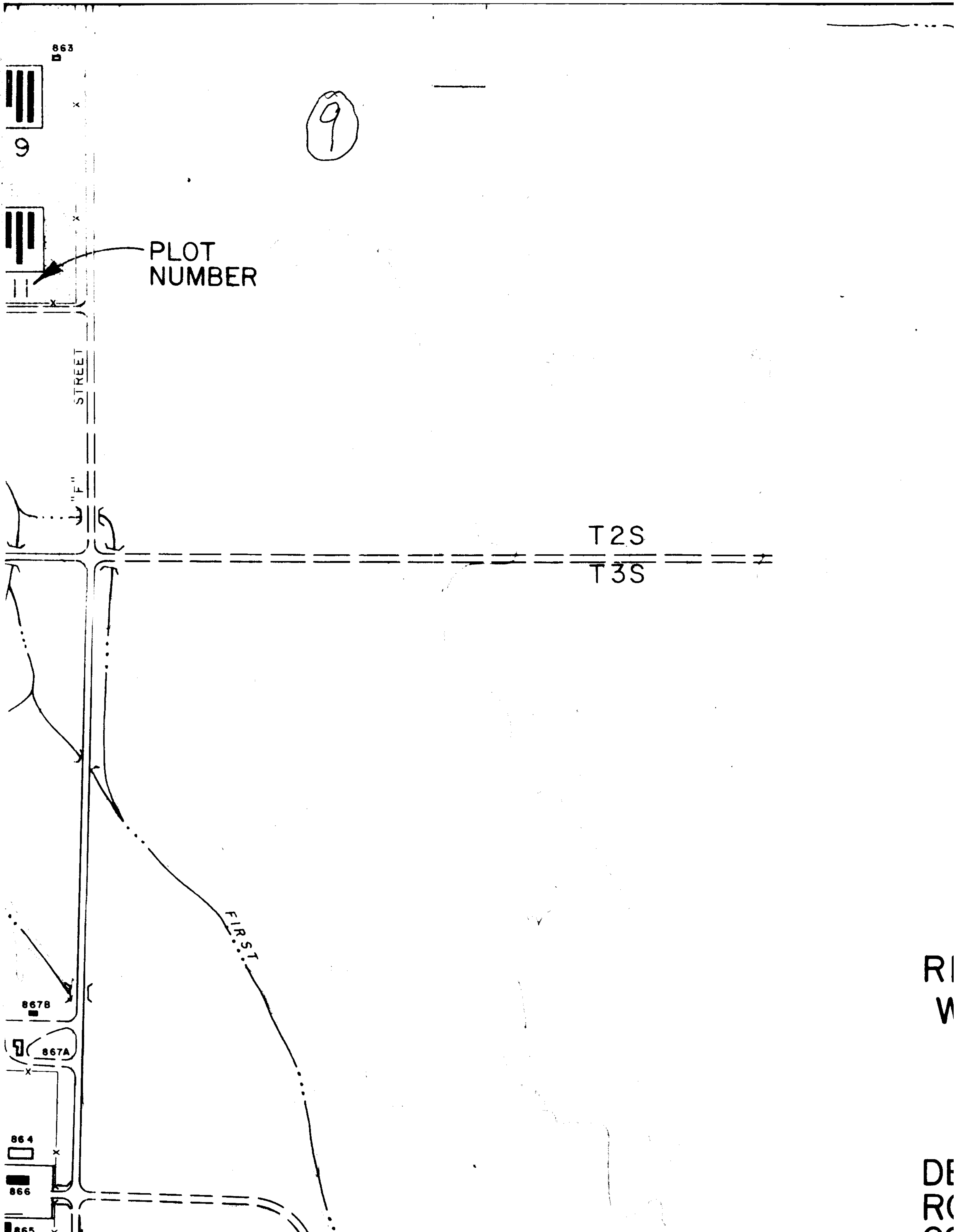
5
9
EIGHTH AVENUE
32

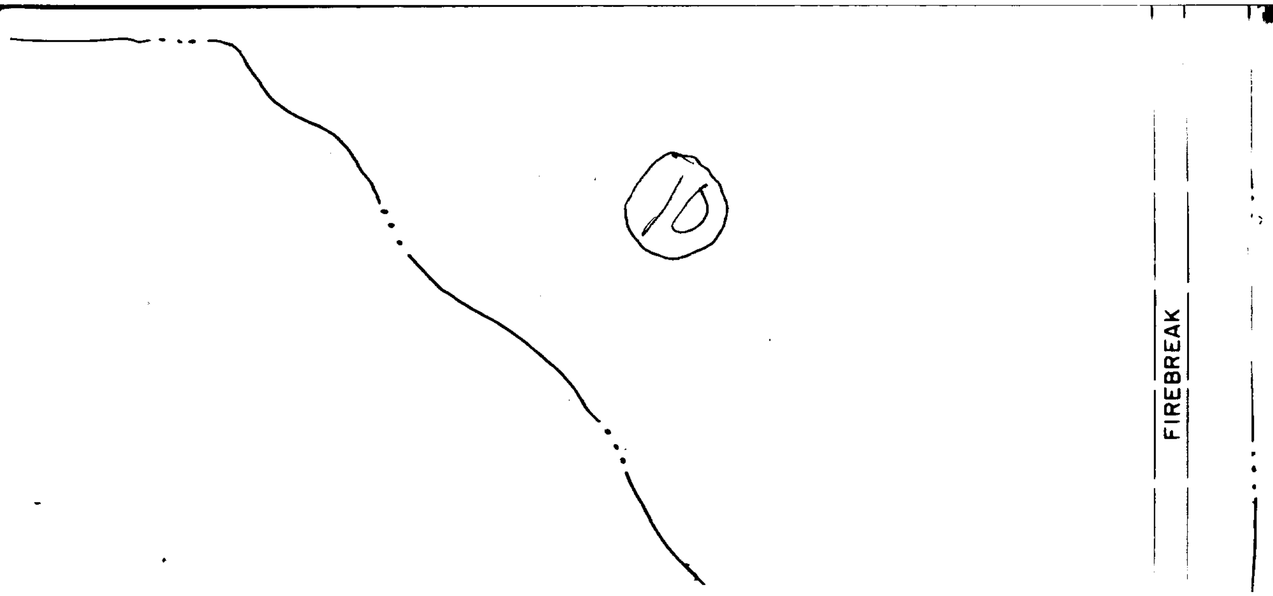

DRAWN BY
3
TRASH PITS
725
726
AVENUE
T 2 S
T 3 S
733A
733B
733C
733D
733F
732
735
746
744
752A
755
756
868C
759
760
757
463D
805



796
(7)
795
STORAGE
WAREHOUSES
794
793
792
"E" STREET
DECEMBER SEVENTH AVENUE
785
786
787
4630
805
OVERFLOW


863
10
9
12
11
8
"F" STREET
791
788
6
868D
867B
867A
864
866


863
9
PLOT
NUMBER
11
"F" STREET
T2S
T3S
FIRST ST
867B
867A
864
866
865



NOTES:

1. SEE FIGURE 2-1 FOR LOCATION.
2. BUILDING 792 IS NOT USED FOR STORAGE OF HAZARDOUS WASTES.
3. SEE FIGURES 2-10 AND 2-11 FOR 100-YEAR FLOODPLAIN.

SCALE

400 0 400 800 FEET

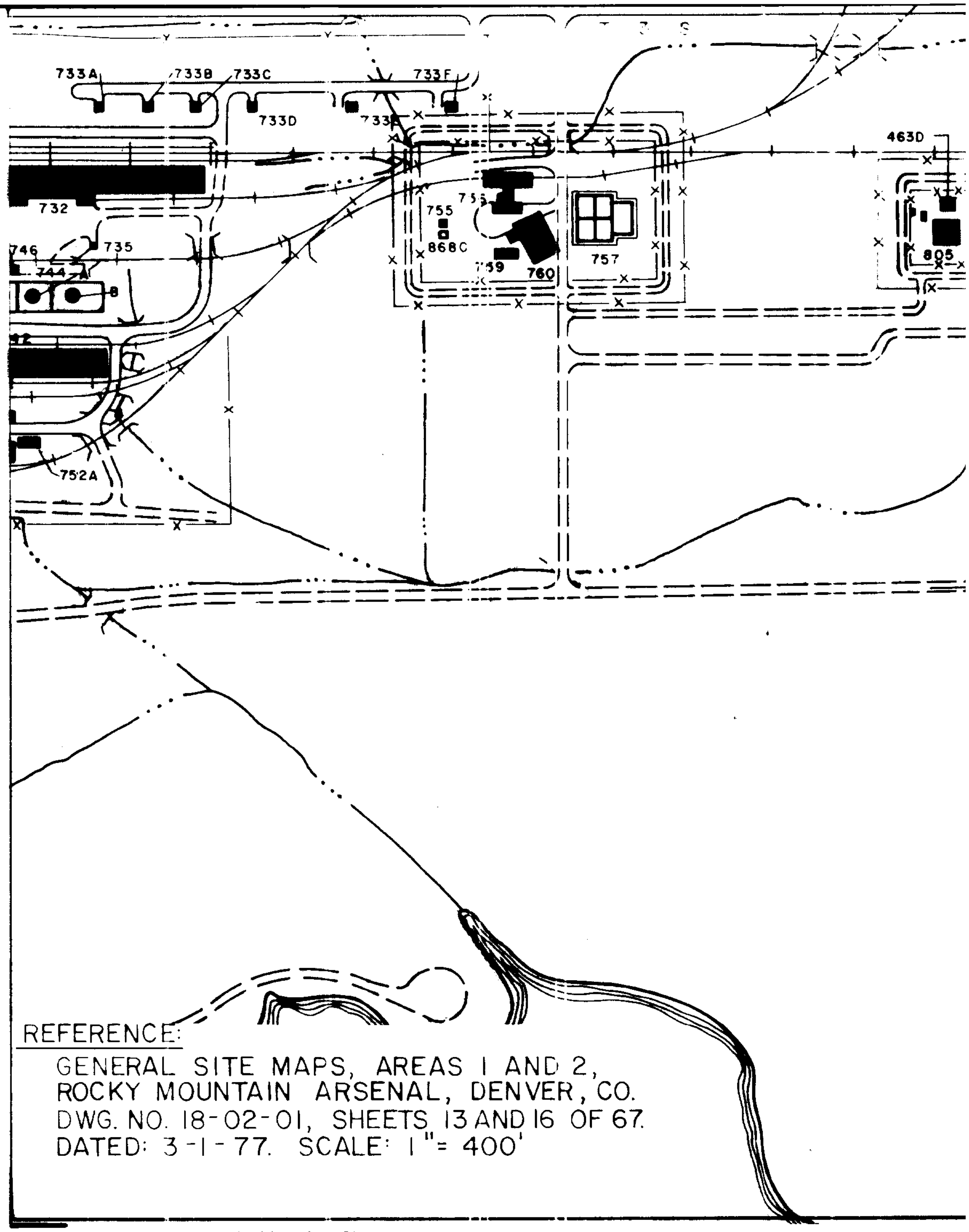
FIGURE 2-3

RMA CONTAINER STORAGE WAREHOUSES AND SHEDS

PREPARED FOR

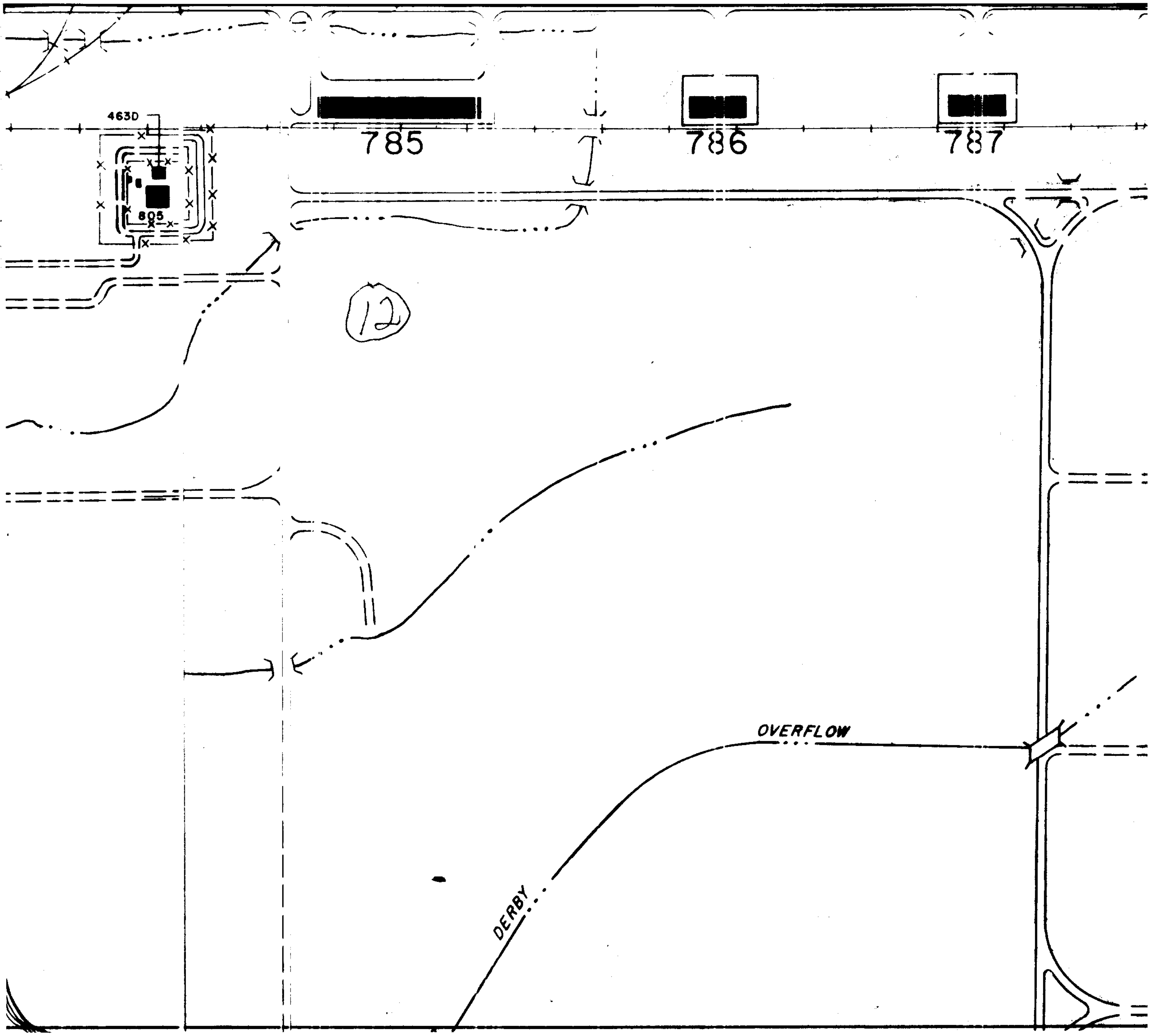
DEPARTMENT OF THE ARMY ROCKY MOUNTAIN ARSENAL COMMERCE CITY, COLORADO

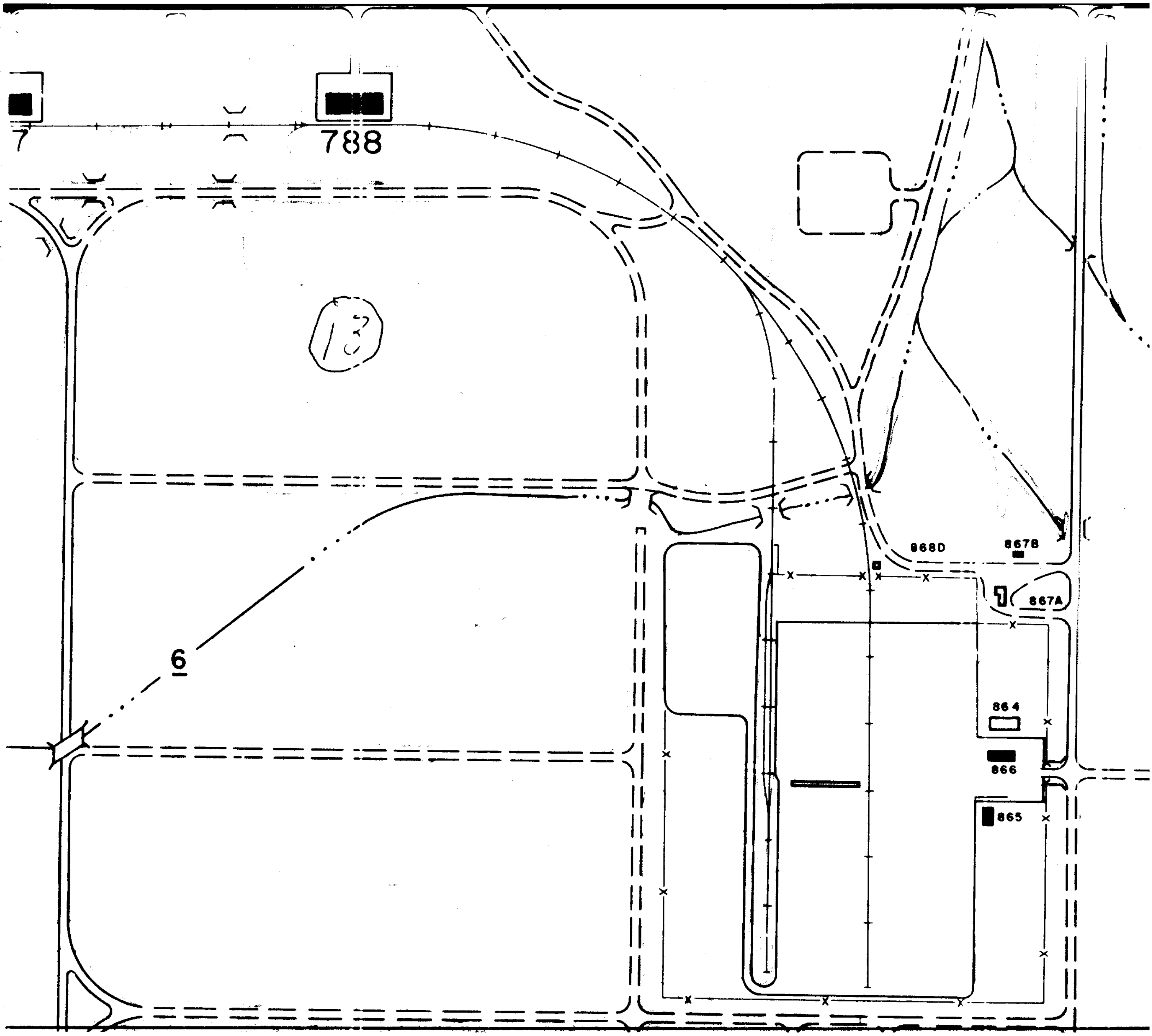
11



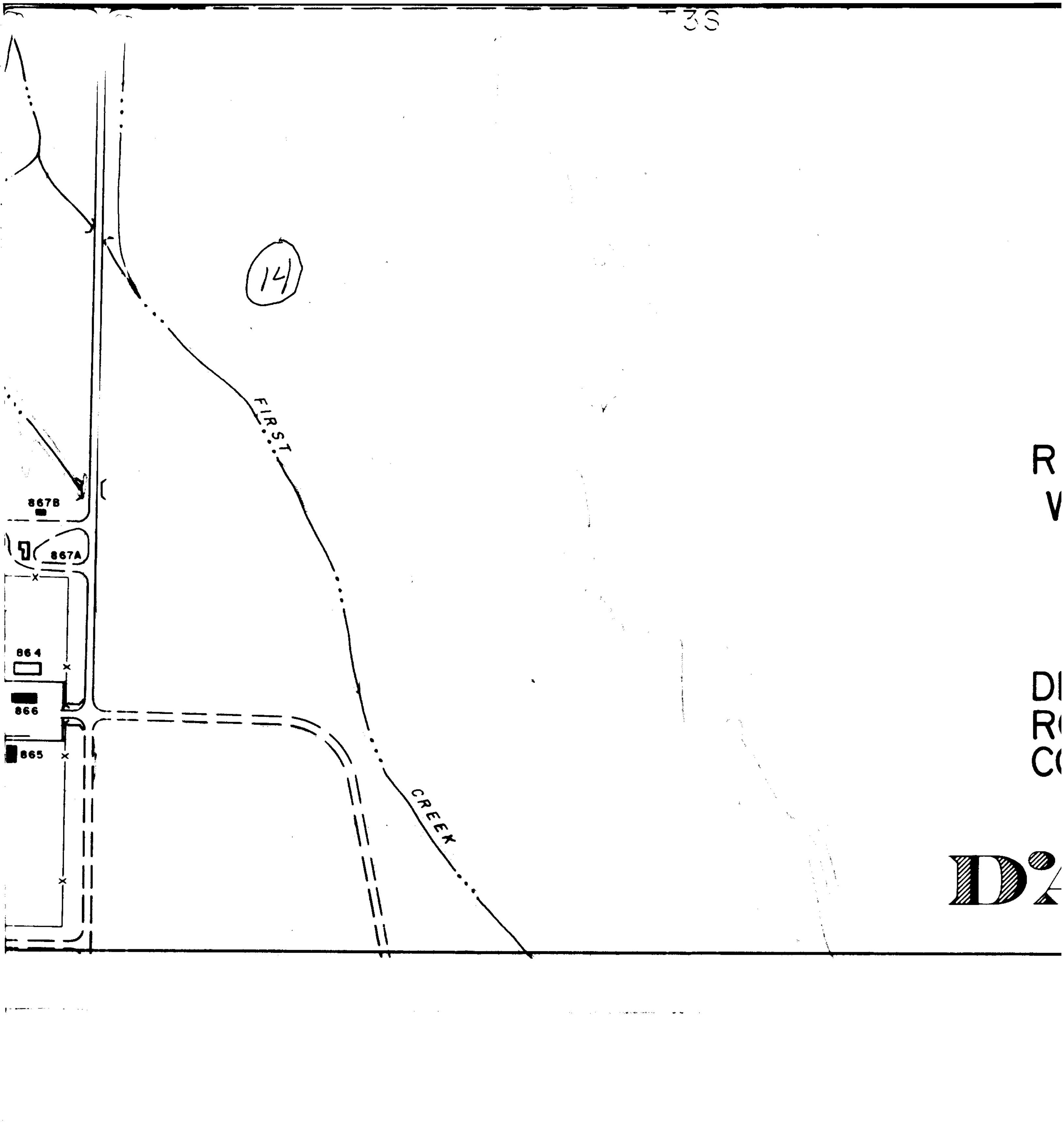
REFERENCE:

GENERAL SITE MAPS, AREAS 1 AND 2,
ROCKY MOUNTAIN ARSENAL, DENVER, CO.
DWG. NO. 18-02-01, SHEETS 13 AND 16 OF 67.
DATED: 3-1-77. SCALE: 1"= 400'


463D
805
785
786
787
12
OVERFLOW
DERBY



7
788
6
868D
867B
867A
864
866
865


3S
14
FIRST
CREEK
867B
867A
864
866
865

SCALE

400 0 400 800 FEET

FIGURE 2-3

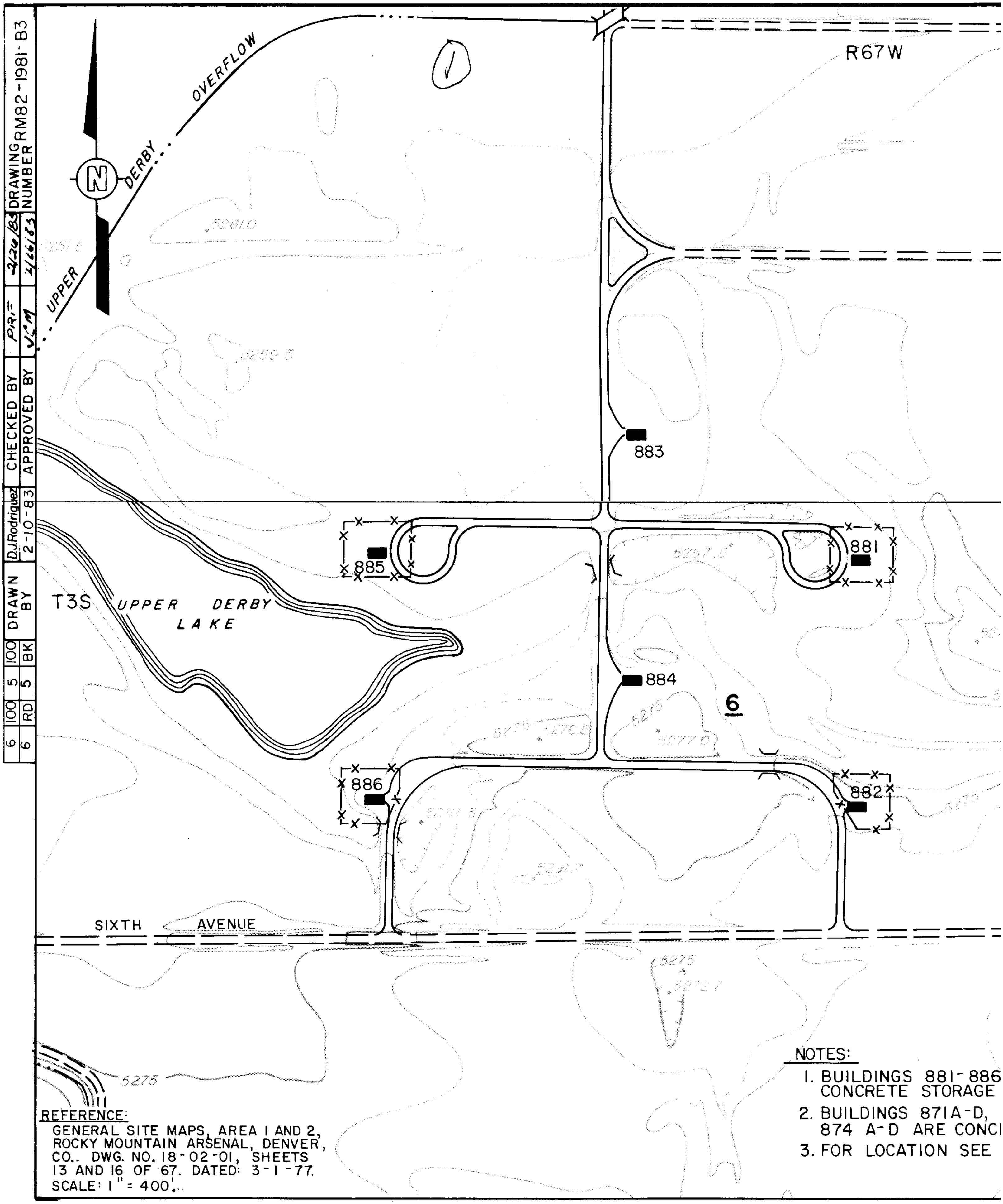
(15)

RMA CONTAINER STORAGE WAREHOUSES AND SHEDS

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA



19 1253 HERCULENE. A&B SMITH CO., PGH., PA

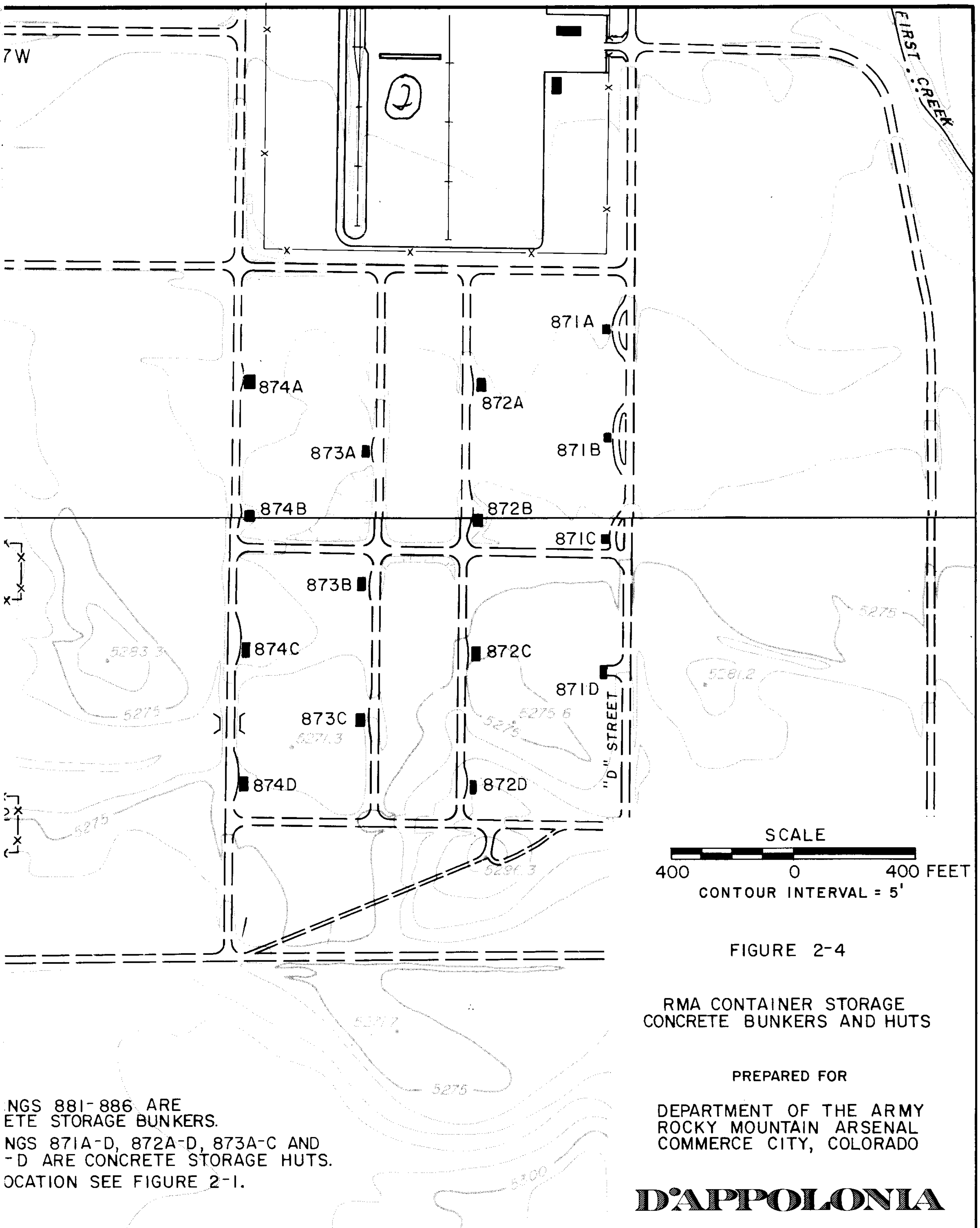


FIGURE 2-4

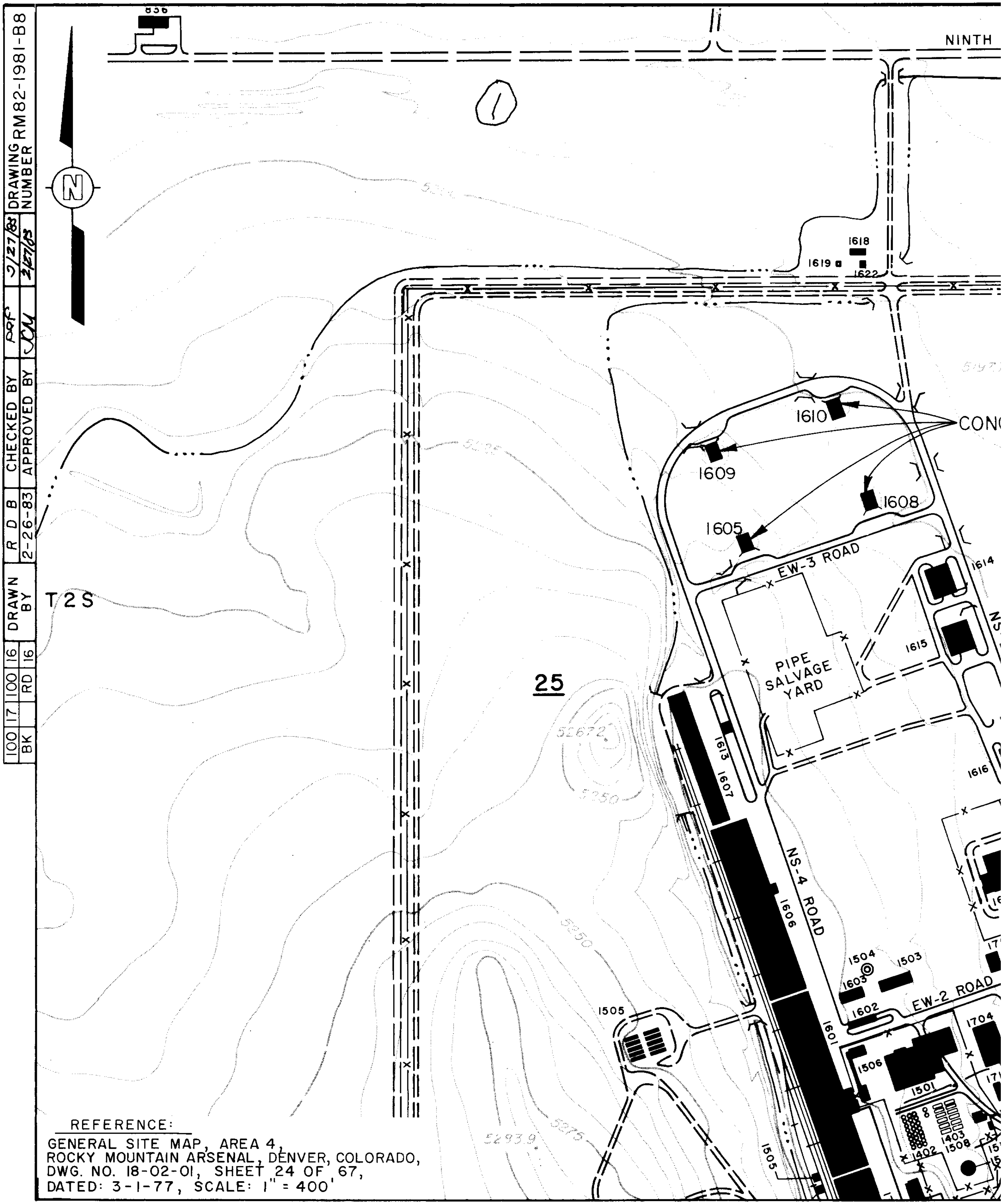
RMA CONTAINER STORAGE
CONCRETE BUNKERS AND HUTS

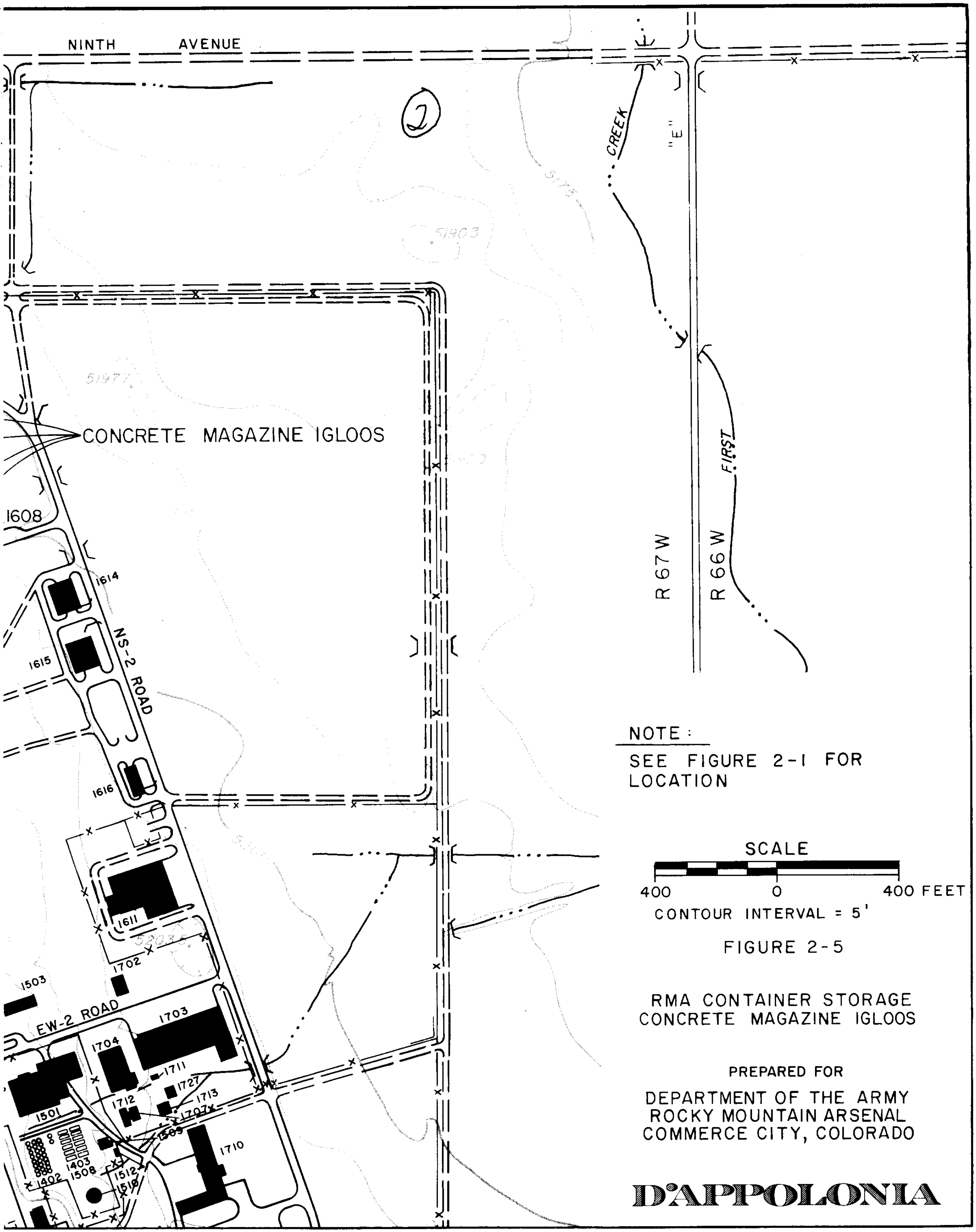
PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

.NGS 881-886 ARE
ETE STORAGE BUNKERS.
NGS 871A-D, 872A-D, 873A-C AND
-D ARE CONCRETE STORAGE HUTS.
OCATION SEE FIGURE 2-1.


DRAWING NUMBER RM82-1981-B8
CHECKED BY
APPROVED BY
DRAWN BY
R D B
2-26-83
100 17 100 16
BK RD 16
N
T2S
NINTH
1618
1619
1622
CONC
1610
1609
1608
1605
EW-3 ROAD
1614
1615
PIPE SALVAGE YARD
25
1613
1607
1616
NS-4 ROAD
1606
1504
1503
1603
1602
EW-2 ROAD
1704
1505
1601
1506
1501
1403
1402
1508
REFERENCE:
GENERAL SITE MAP, AREA 4,
ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO,
DWG. NO. 18-02-01, SHEET 24 OF 67,
DATED: 3-1-77, SCALE: 1" = 400'



NOTE:
SEE FIGURE 2-1 FOR LOCATION

SCALE
400 0 400 FEET
CONTOUR INTERVAL = 5'

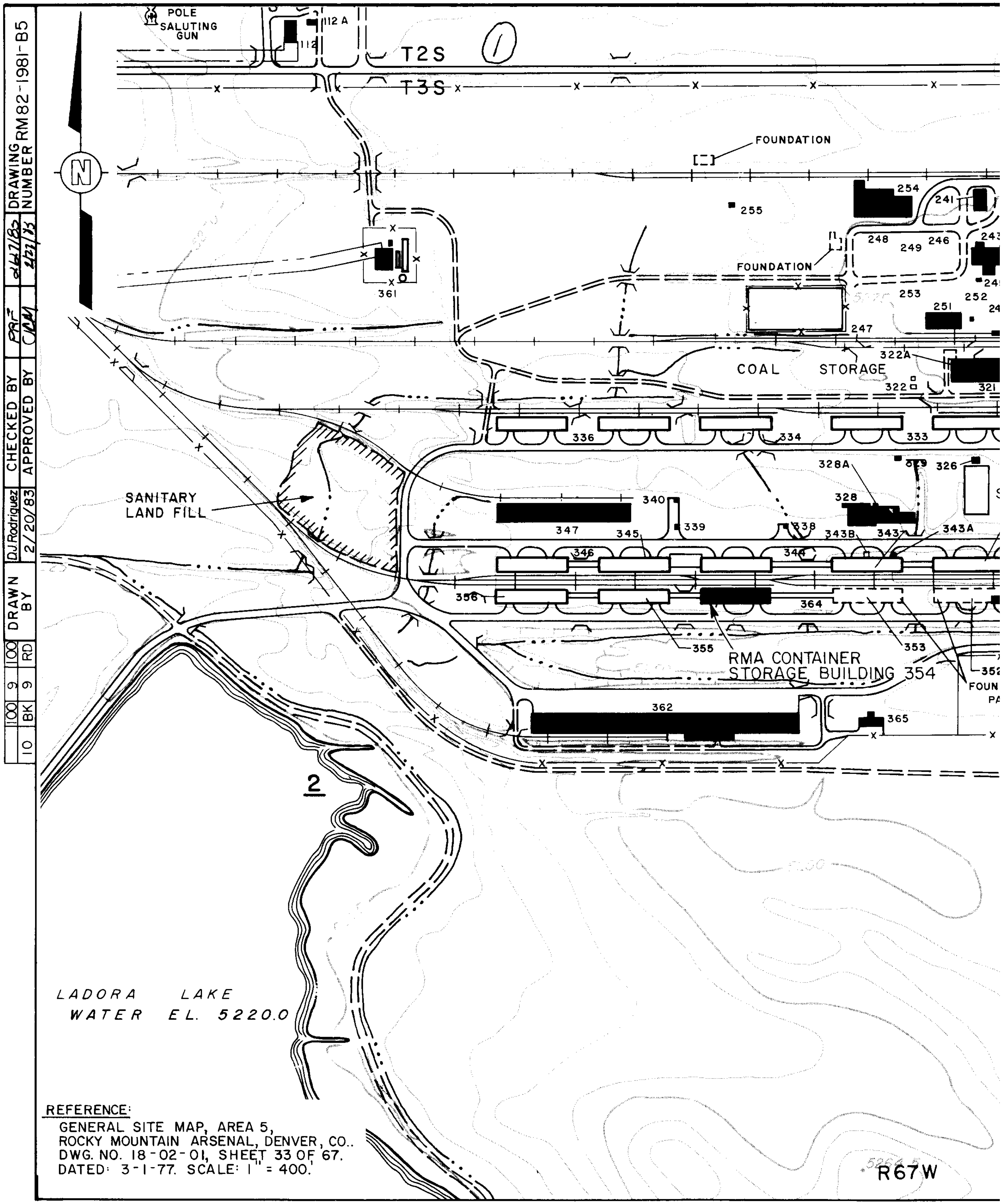
FIGURE 2-5

RMA CONTAINER STORAGE
CONCRETE MAGAZINE IGLOOS

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA


DRAWING NUMBER RM82-1981-B5
CHECKED BY
APPROVED BY
DRAWN BY D.J. Rodriguez 2/20/83
POLE
SALUTING GUN
112 A
112
T2S
T3S
FOUNDATION
254
241
255
243
248
249
246
FOUNDATION
361
253
252
251
247
COAL STORAGE
322A
322
321
336
334
333
328A
329
326
328
340
339
338
343B
343
343A
347
345
346
344
SANITARY LAND FILL
356
364
355
353
RMA CONTAINER STORAGE BUILDING 354
352
362
365
2
LADORA LAKE
WATER EL. 5220.0
REFERENCE:
GENERAL SITE MAP, AREA 5,
ROCKY MOUNTAIN ARSENAL, DENVER, CO..
DWG. NO. 18-02-01, SHEET 33 OF 67.
DATED: 3-1-77. SCALE: 1" = 400.'
R67W

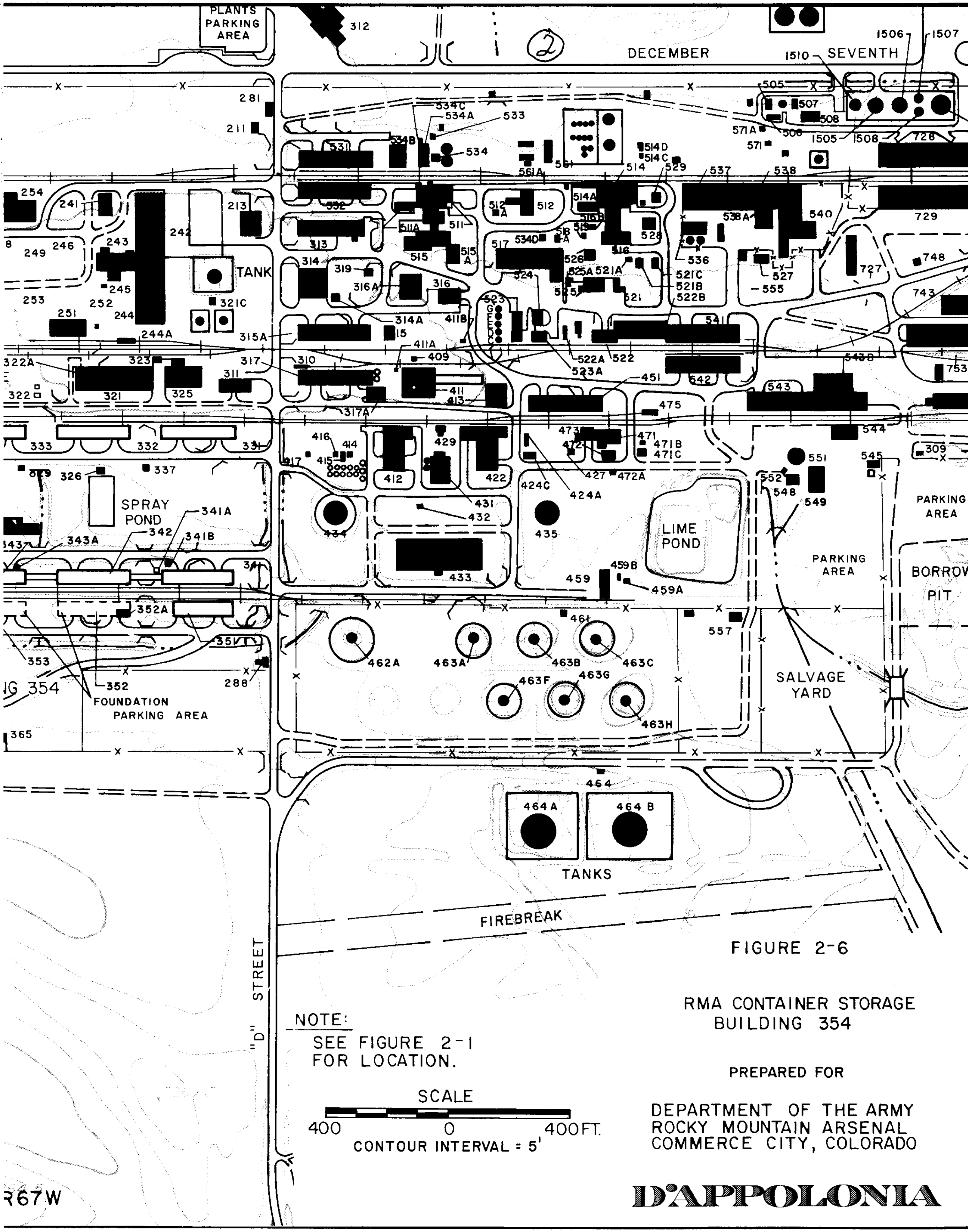


FIGURE 2-6

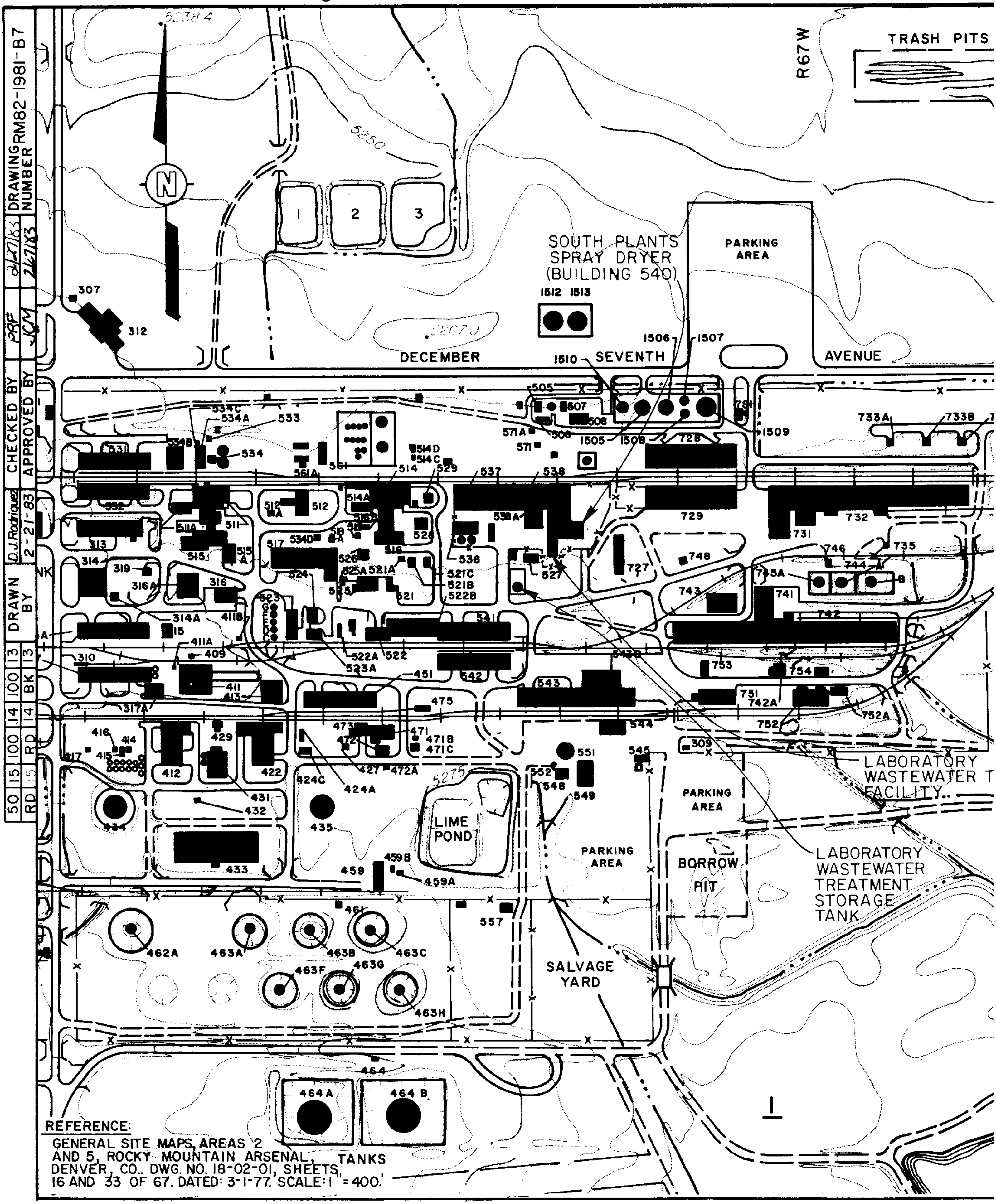
RMA CONTAINER STORAGE
BUILDING 354

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

(1)



DRAWING NUMBER RM82-1981-B7
CHECKED BY PRF 2/27/83
APPROVED BY JCM 2/27/83
DRAWN BY D.J. Rodriguez 2-21-83
50 15 100 14 100 13
RD 15 RD 14 BK 13
N
R67W
TRASH PITS
5250
5275
1
2
3
SOUTH PLANTS SPRAY DRYER (BUILDING 540)
PARKING AREA
1512 1513
DECEMBER SEVENTH AVENUE
LABORATORY WASTEWATER TREATMENT FACILITY
LABORATORY WASTEWATER TREATMENT STORAGE TANK
LIME POND
PARKING AREA
BORROW PIT
SALVAGE YARD
TANKS
464A
464 B
REFERENCE:
GENERAL SITE MAPS, AREAS 2 AND 5, ROCKY MOUNTAIN ARSENAL, DENVER, CO.. DWG. NO. 18-02-01, SHEETS 16 AND 33 OF 67. DATED: 3-1-77. SCALE: 1" = 400.'

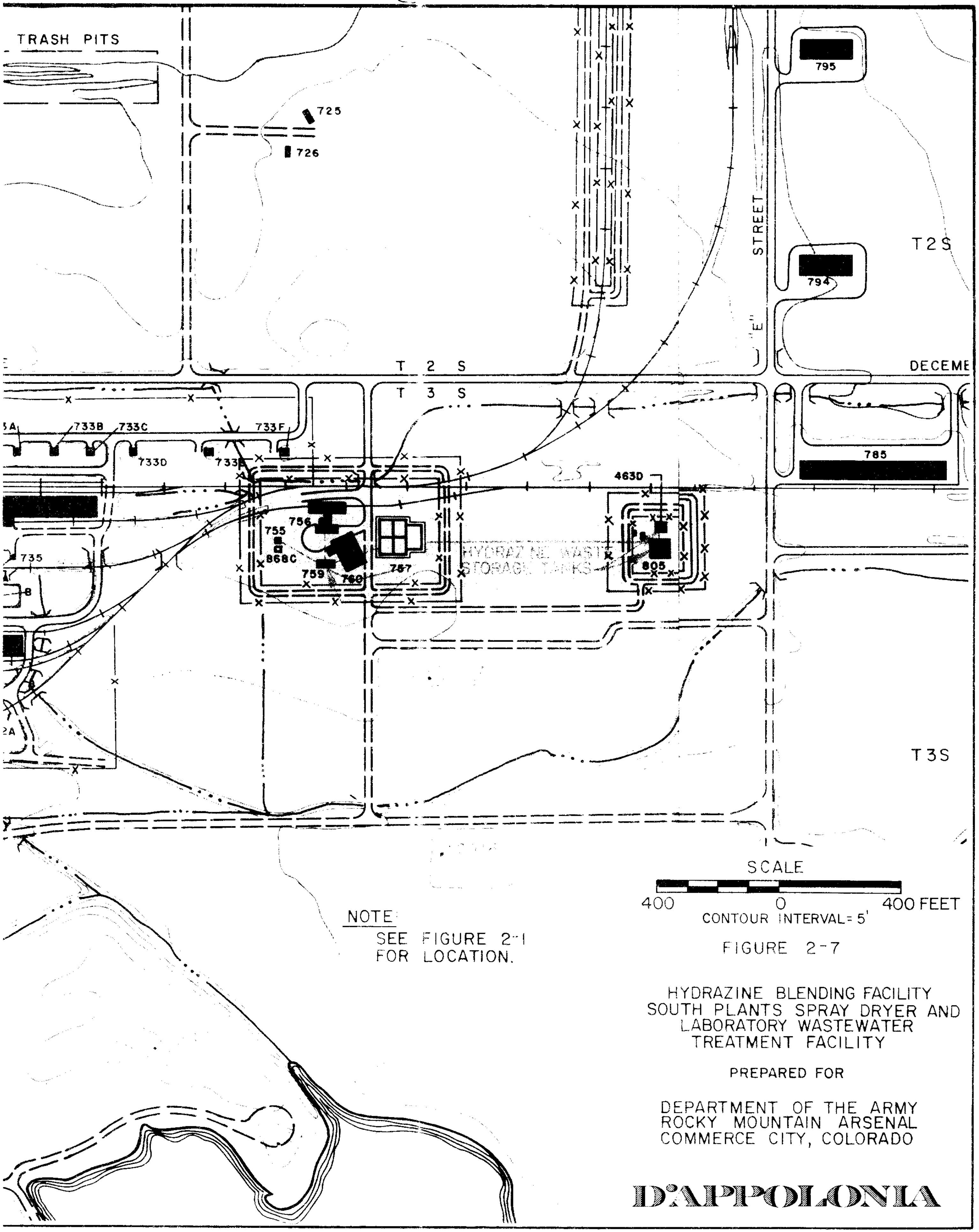


FIGURE 2-7

HYDRAZINE BLENDING FACILITY
SOUTH PLANTS SPRAY DRYER AND
LABORATORY WASTEWATER
TREATMENT FACILITY

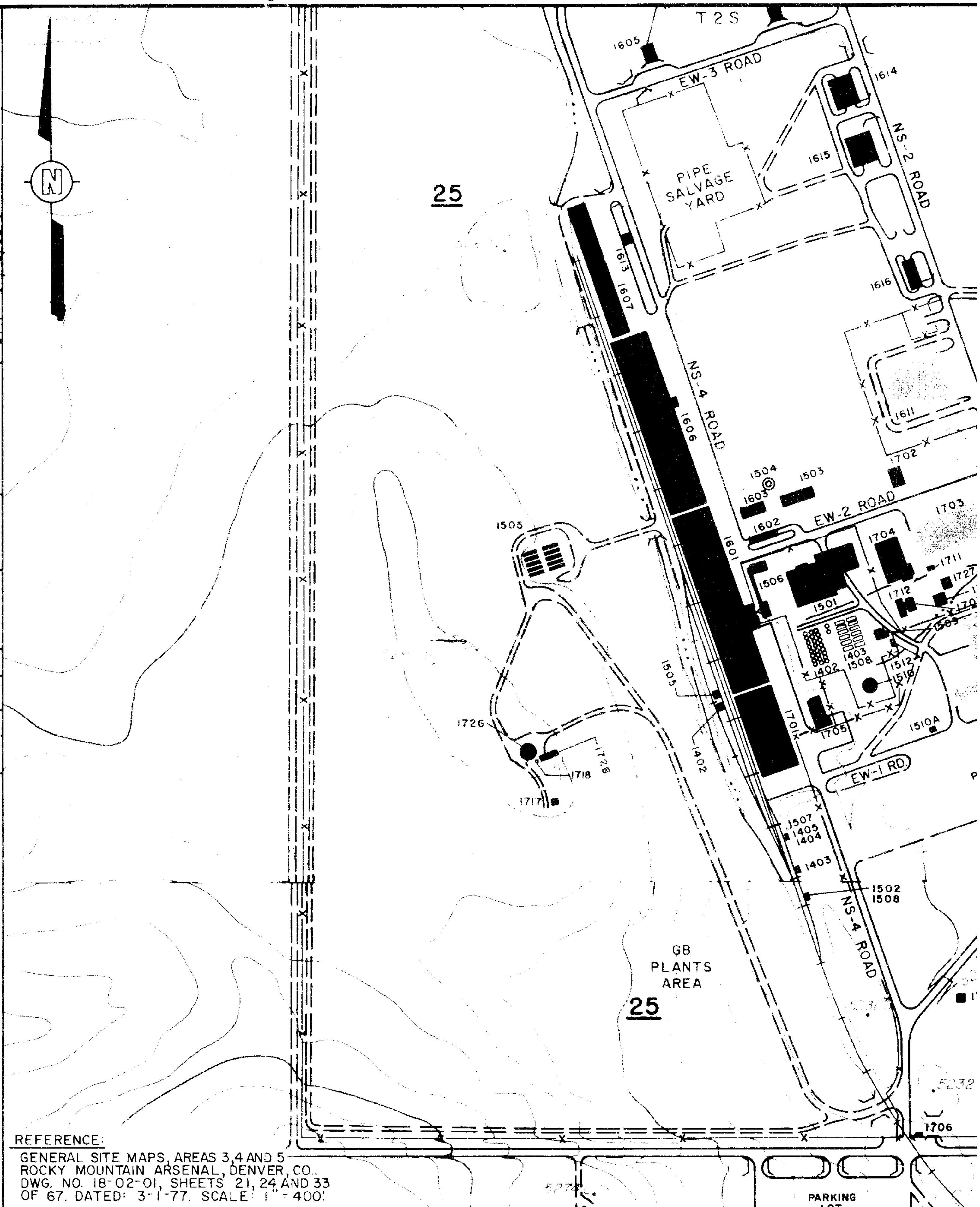
PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

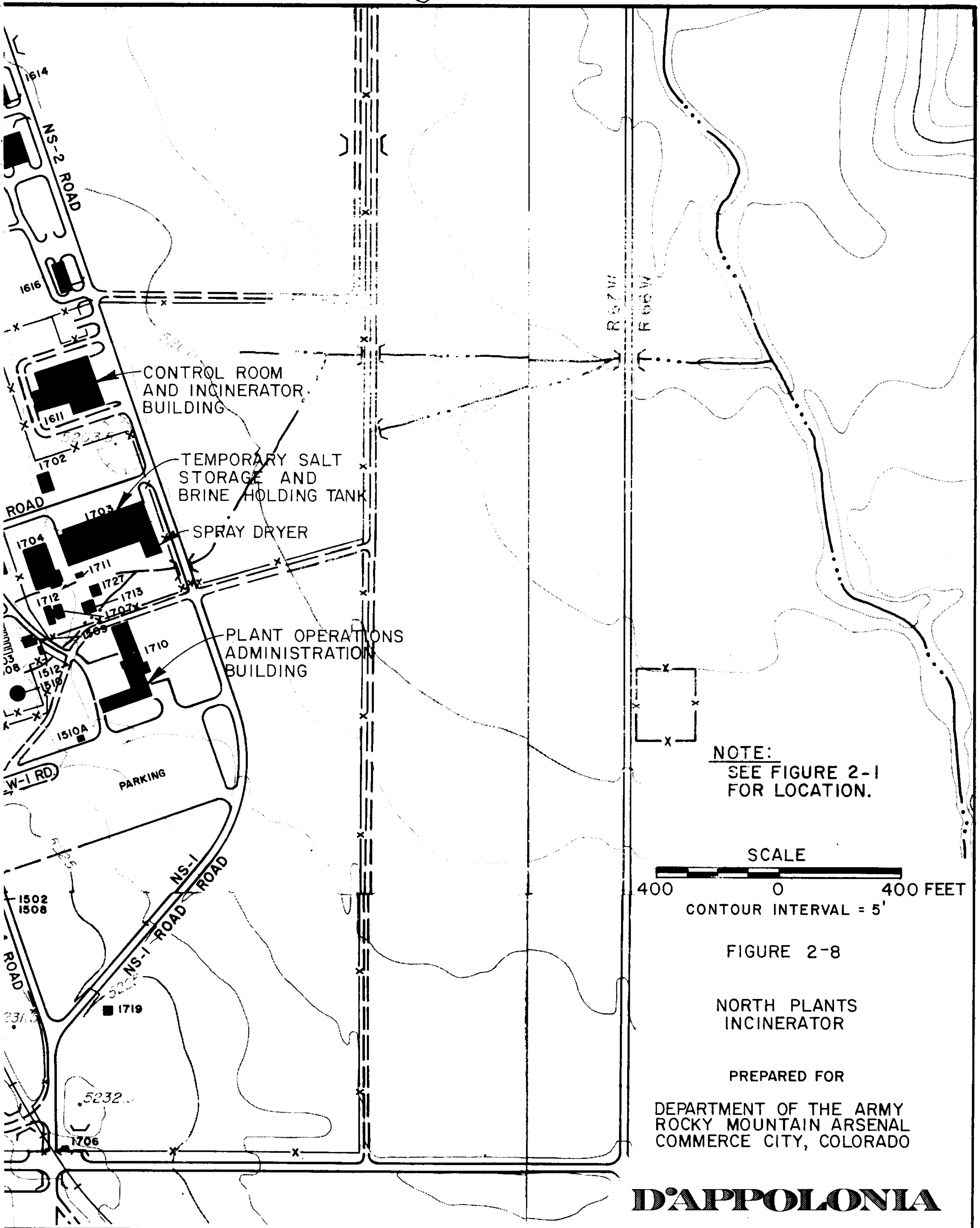
DRAWING NUMBER RM82-1981-B6

CHECKED BY	PRF	2/26/83	
APPROVED BY	JCM	2/26/83	
DRAWN BY	DJ Rodriguez	2-21-83	
100	11	100	12
BK	11	RD	



REFERENCE:
GENERAL SITE MAPS, AREAS 3,4 AND 5
ROCKY MOUNTAIN ARSENAL, DENVER, CO.
DWG. NO. 18-02-01, SHEETS 21, 24 AND 33
OF 67. DATED: 3-1-77. SCALE: 1" = 400'

(2)



NOTE:
SEE FIGURE 2-1 FOR LOCATION.

CONTOUR INTERVAL = 5'

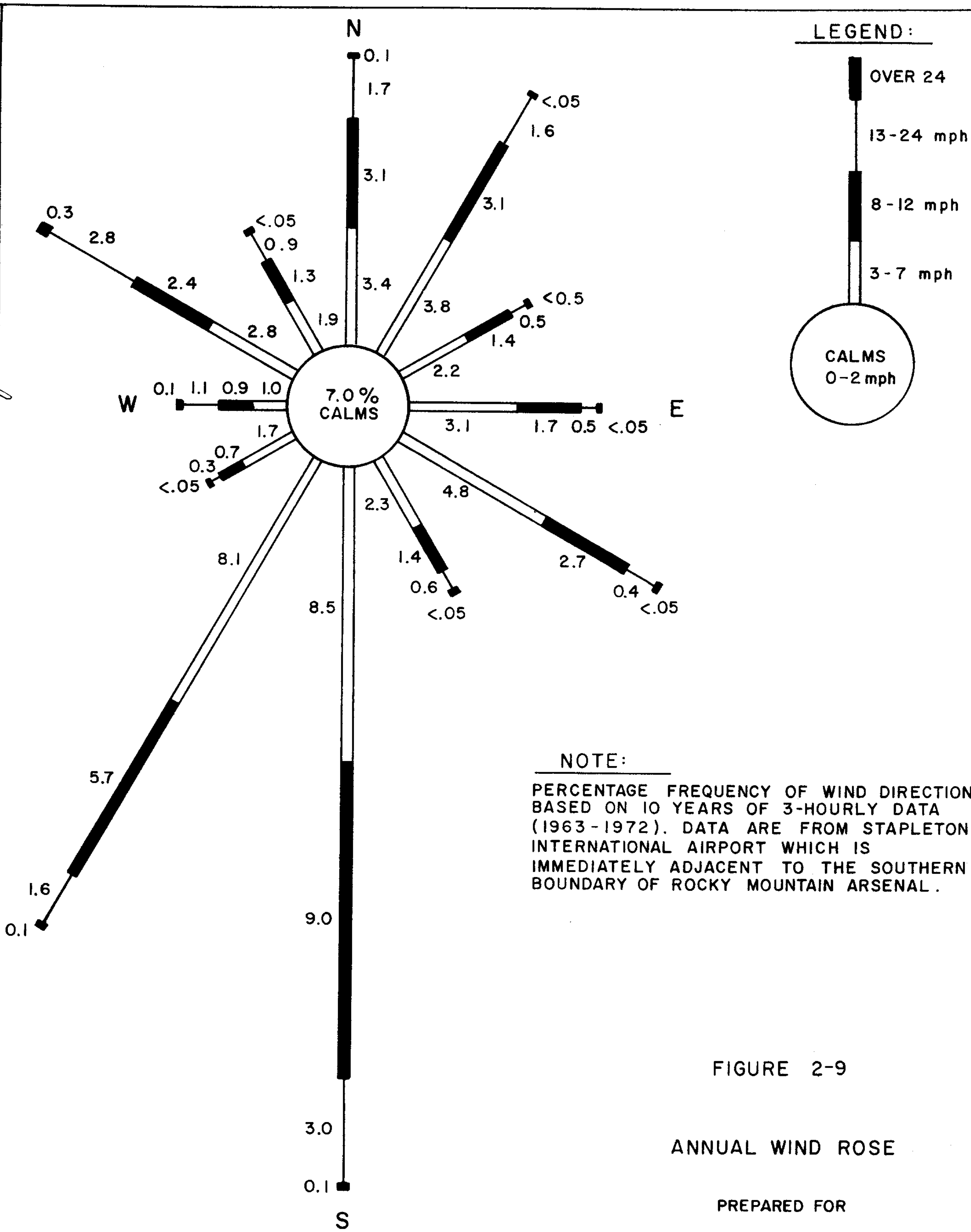
FIGURE 2-8

NORTH PLANTS INCINERATOR

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA



NOTE:

PERCENTAGE FREQUENCY OF WIND DIRECTION BASED ON 10 YEARS OF 3-HOURLY DATA (1963-1972). DATA ARE FROM STAPLETON INTERNATIONAL AIRPORT WHICH IS IMMEDIATELY ADJACENT TO THE SOUTHERN BOUNDARY OF ROCKY MOUNTAIN ARSENAL.

FIGURE 2-9

ANNUAL WIND ROSE

PREPARED FOR

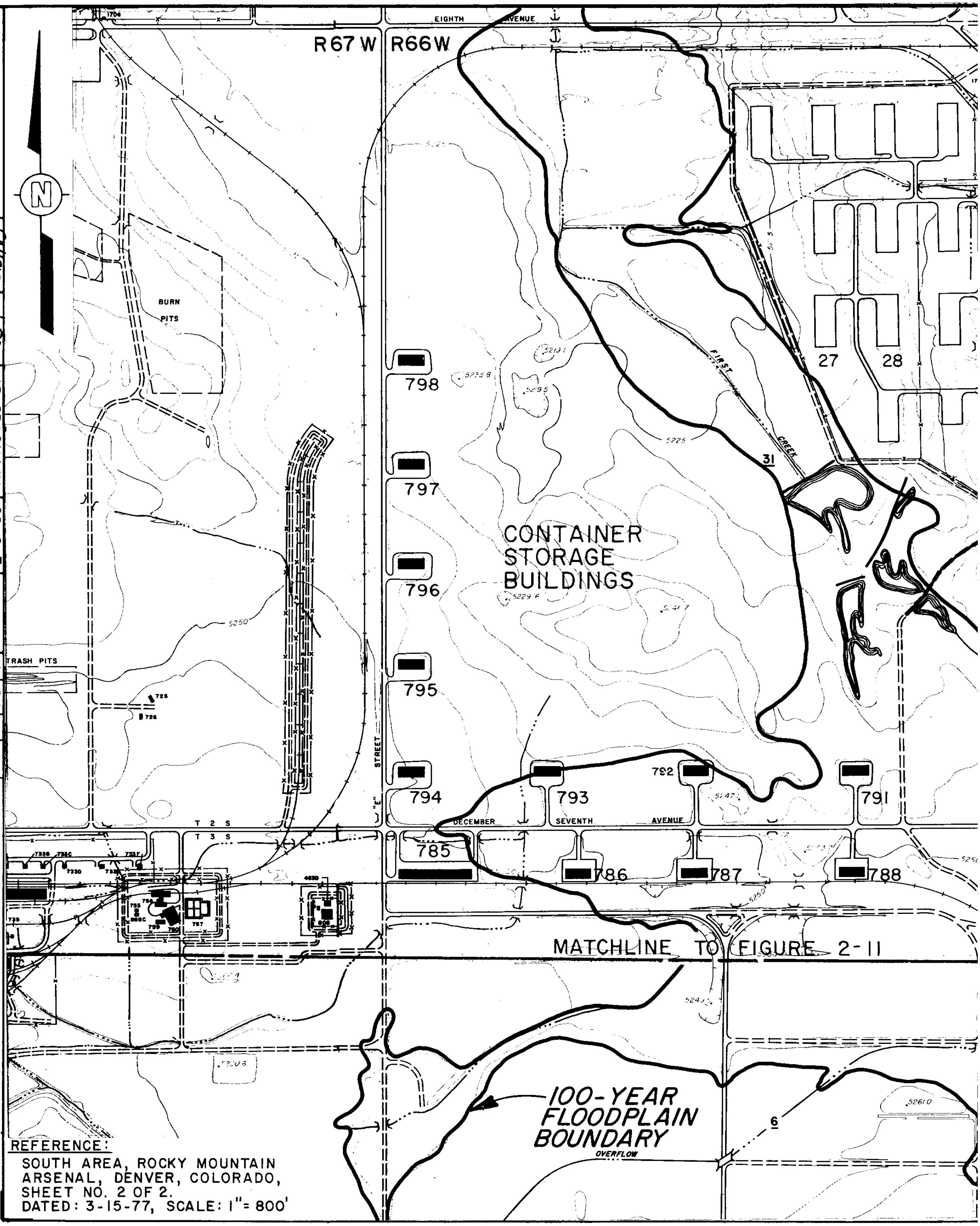
DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	CHECKED BY		DRAWING NUMBER
R. Bricker	PRF	4/26/83	RM82-1981-A1
28 Oct. 82	APPROVED BY JCM	4/26/83	

(1)

DRAWING NUMBER	RM82-1981-B1
CHECKED BY / APPROVED BY	PRP 2/21/83 / JCM 2/27/83
DRAWN BY	BKH 2-3-83
	1 / I
	100 / RD
	2 / 2
	100 / BK



REFERENCE:
SOUTH AREA, ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO, SHEET NO. 2 OF 2.
DATED: 3-15-77, SCALE: 1"= 800'

(2)

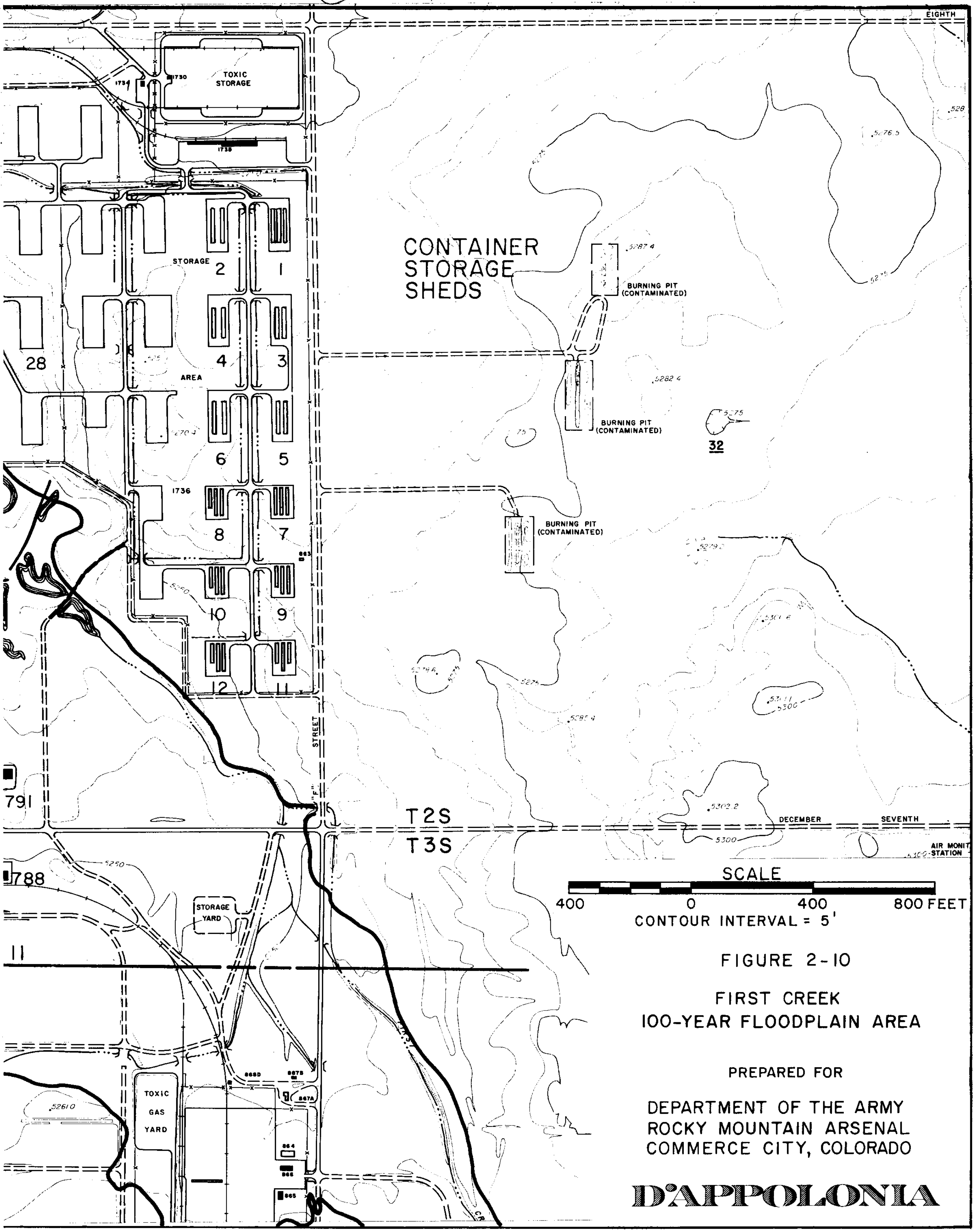


FIGURE 2-10

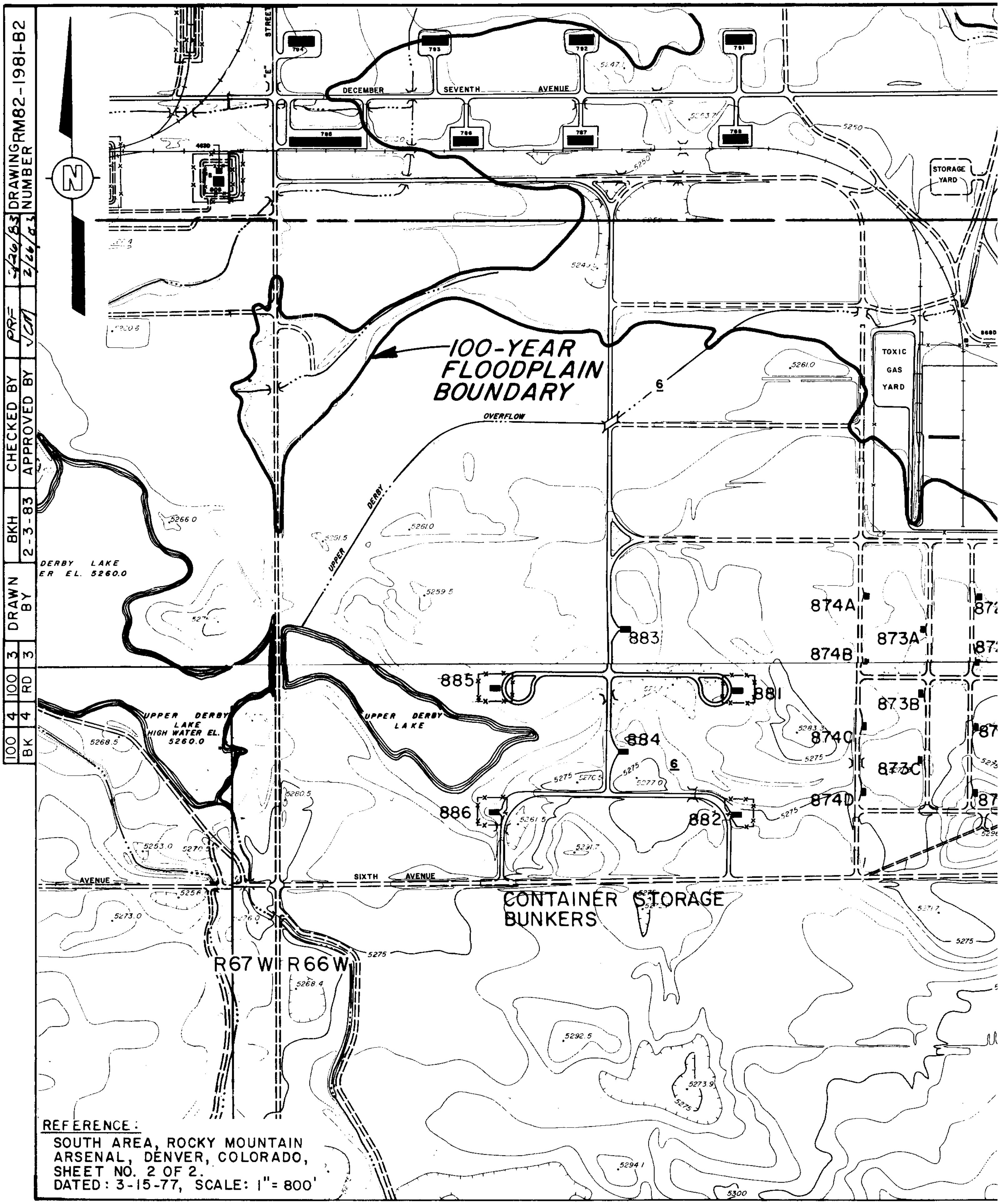
FIRST CREEK
100-YEAR FLOODPLAIN AREA

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

(1)



REFERENCE:
SOUTH AREA, ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO, SHEET NO. 2 OF 2.
DATED: 3-15-77, SCALE: 1" = 800'

(2)

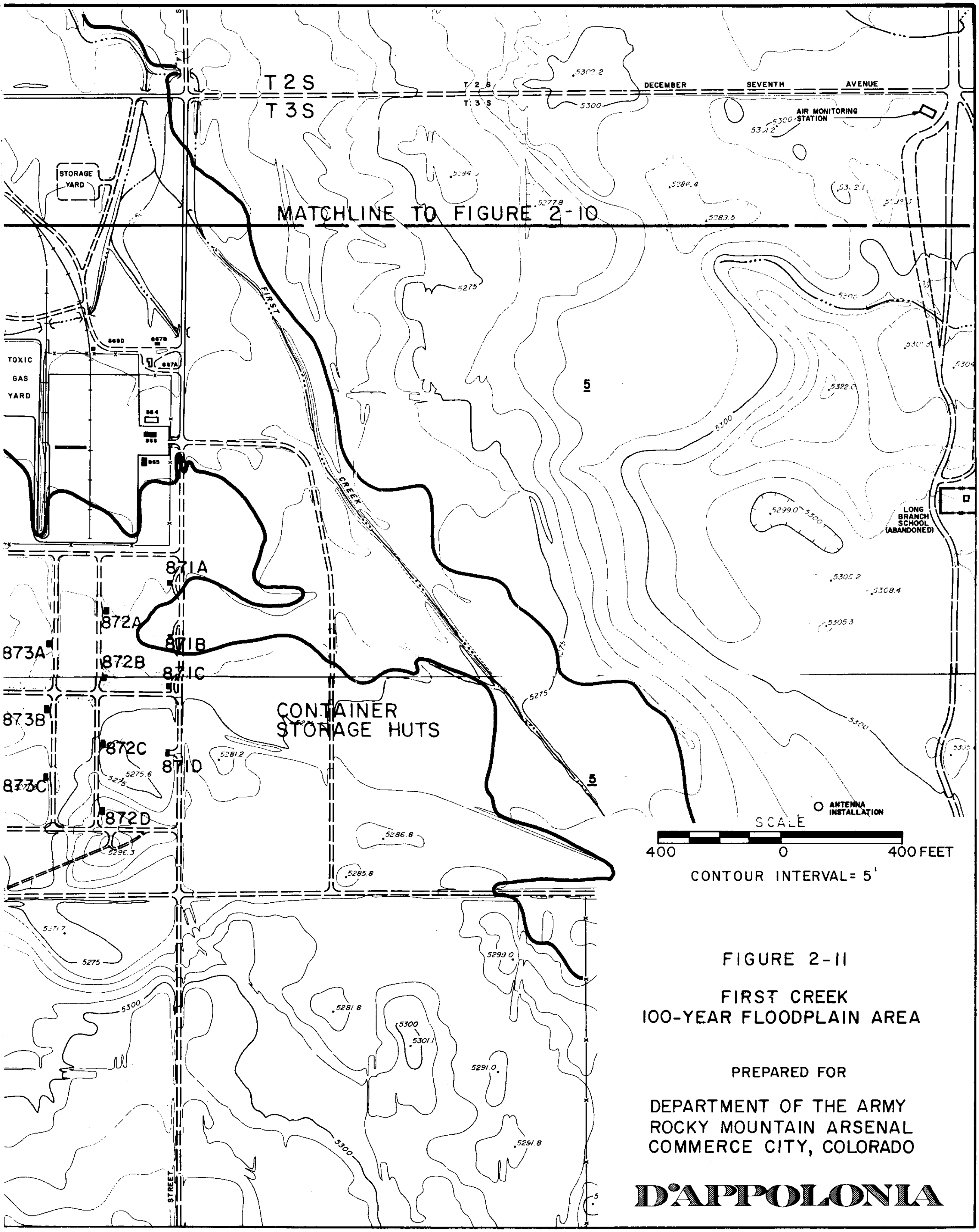


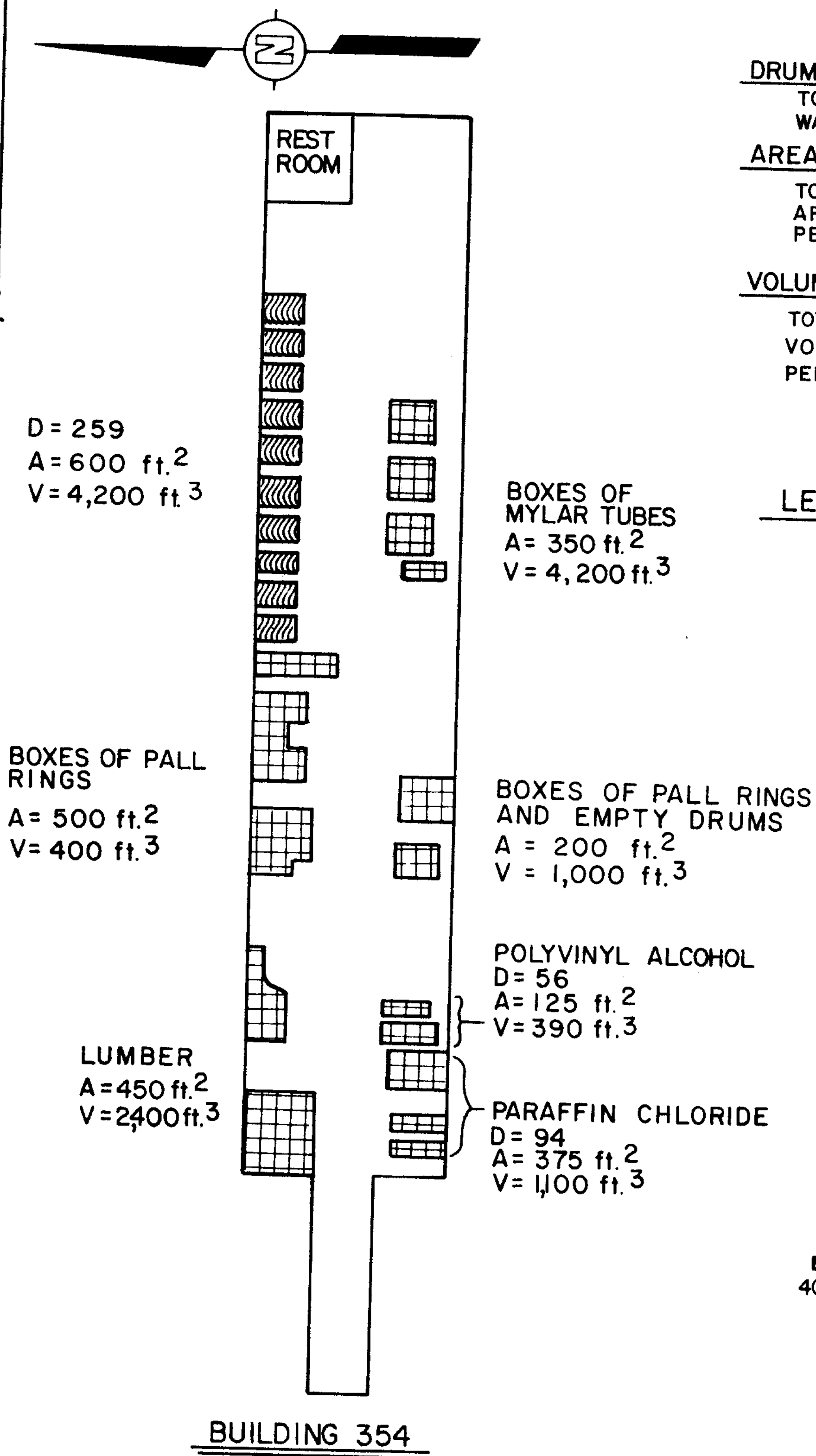
FIGURE 2-11

FIRST CREEK
100-YEAR FLOODPLAIN AREA

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA



DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 257

AREA:

TOTAL AREA OF BUILDING = 11,790 ft.^{2}
AREA USED FOR STORAGE = 2,600 ft.^{2}
PERCENT AREA OCCUPIED = 22%

VOLUME:

TOTAL VOLUME OF BUILDING = 152,740 ft.^{3}
VOLUME USED FOR STORAGE = 17,290 ft.^{3}
PERCENT VOLUME OCCUPIED = 11%

LEGEND:

CERESAN TREATED WHEAT
MISCELLANEOUS EQUIPMENT AND MATERIALS
D = NO. OF DRUMS
A = AREA
V = VOLUME

SCALE
40 0 40 FEET

FIGURE 4-1

CONTENTS OF BUILDING 354
CONTAMINATED WHEAT STORAGE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

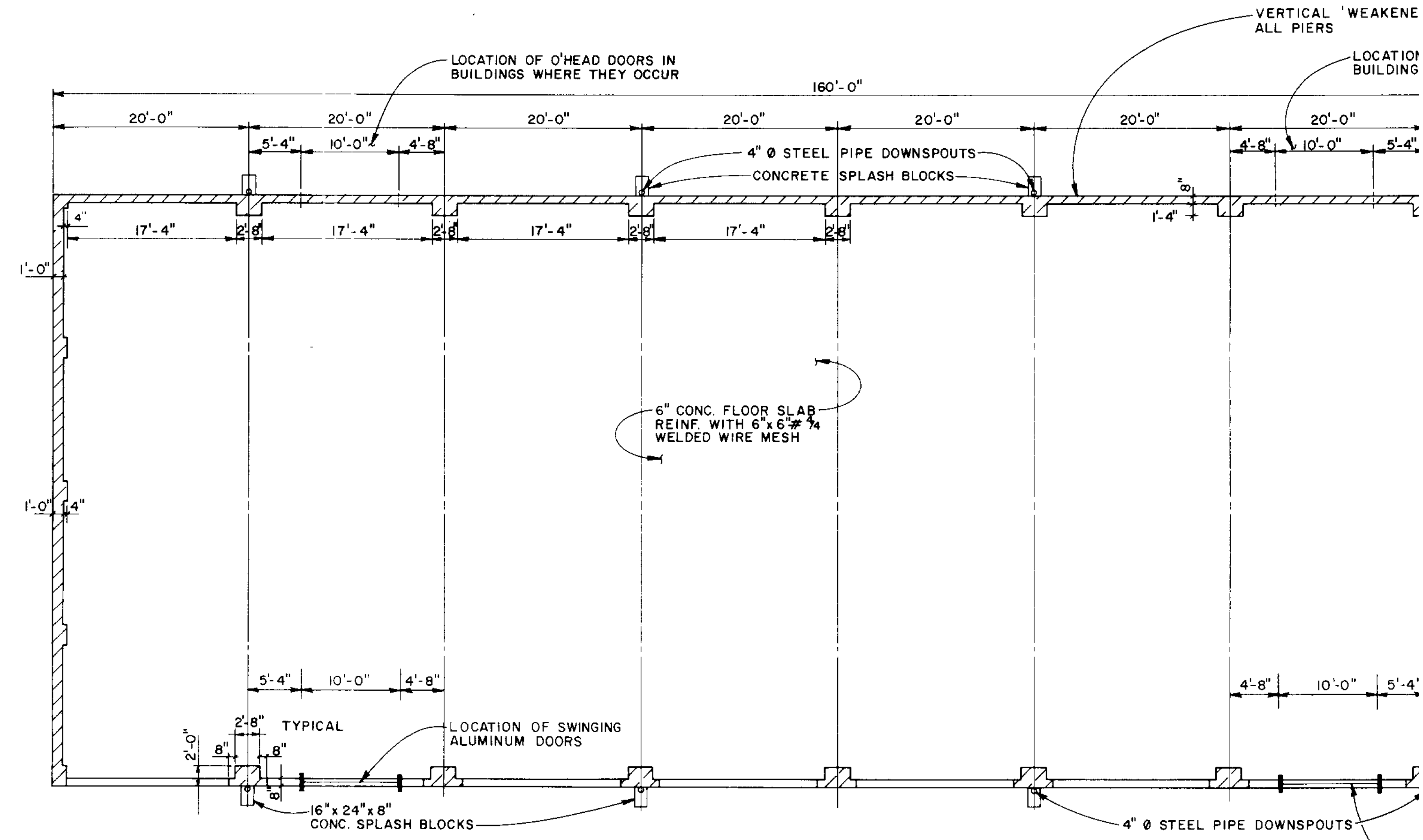
DRAWN BY	D.J. Rodriguez	11-30-82
CHECKED BY	PRF	9/29/83
APPROVED BY	JCM	4/26/83
DRAWING NUMBER	RM82-1981-A12	

DRAWING NUMBER RM82-1981-E5

DRAWN BY

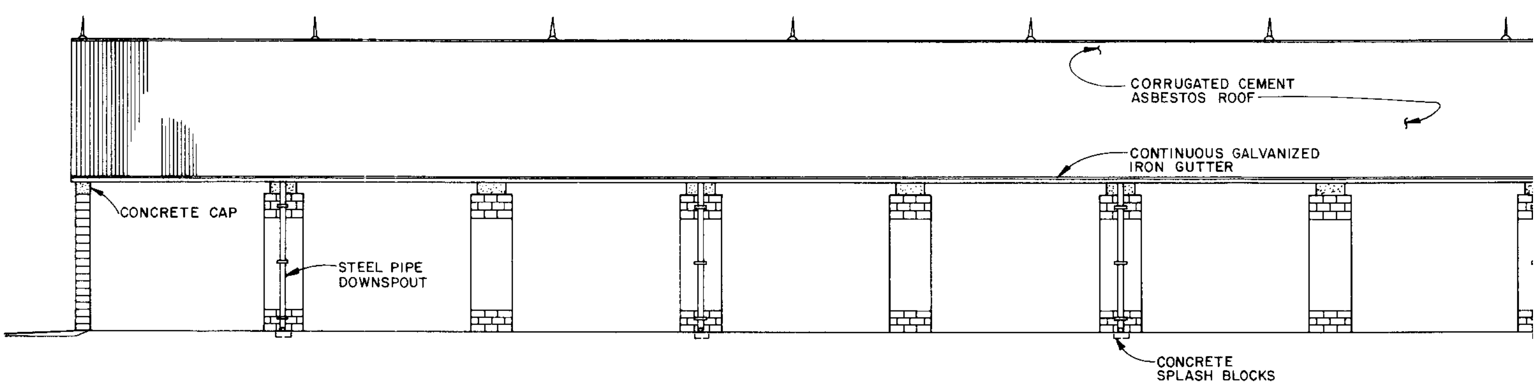
CHECKED BY BKH

APPROVED BY 11-22-82



FLOOR PLAN

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

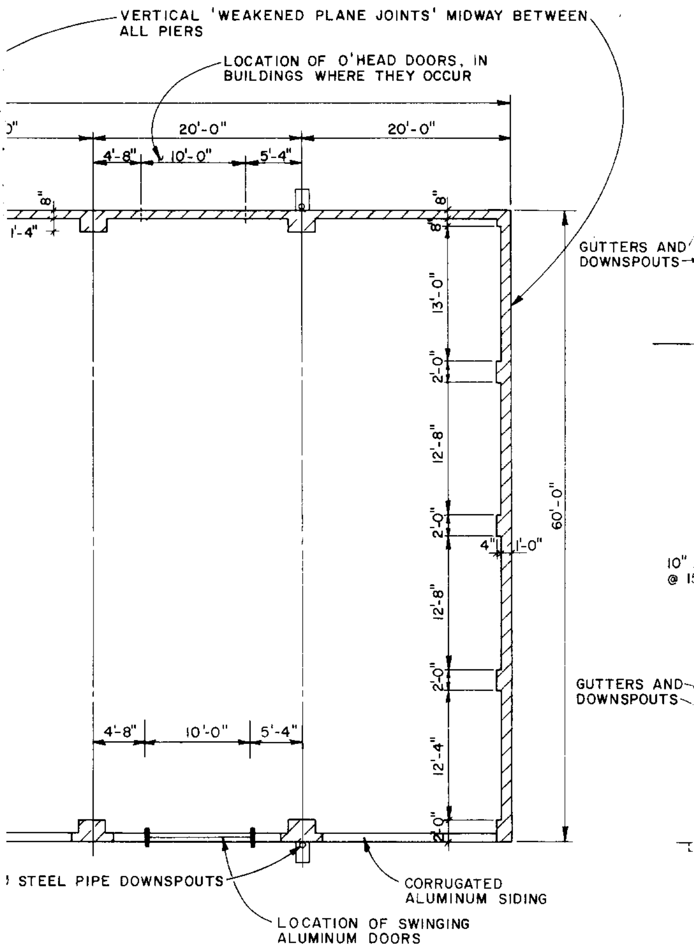


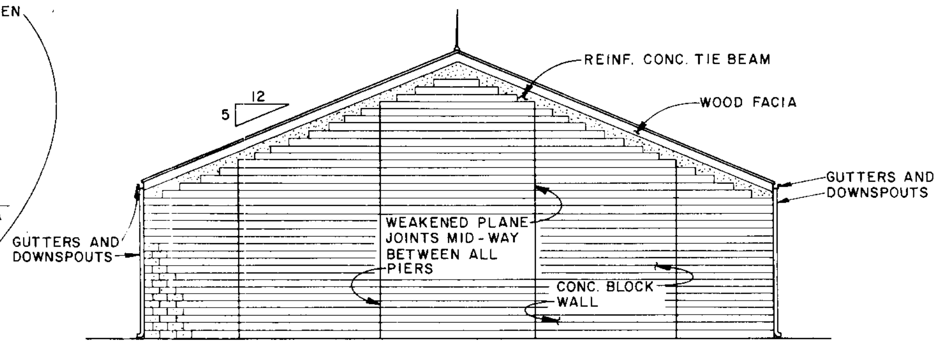
ELEVATION - OPEN SIDE

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

REFERENCE:
TWELVE PERMANENT TYPE WAREHOUSES,
ROCKY MOUNTAIN ARSENAL, DENVER,
COLORADO. DWG. NO. 33-02-02, SHEET NO. 11 OF 20
DATED: 2-25-52, SCALE: 1/8" = 1'-0".

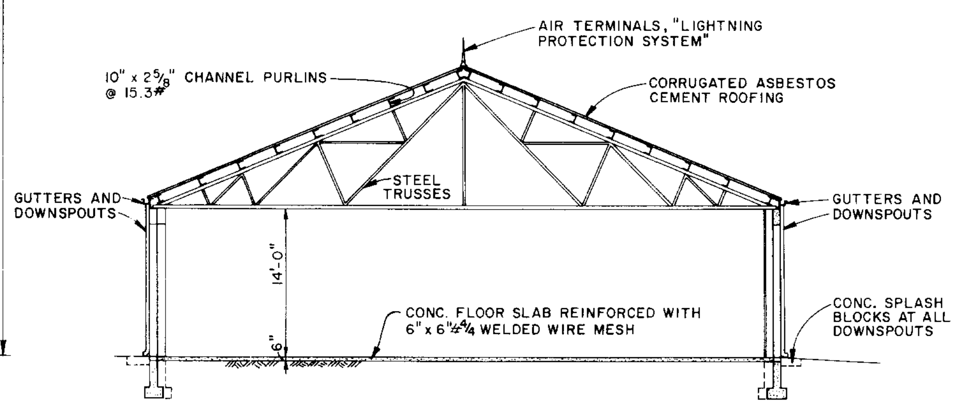
2





TYPICAL END ELEVATION

OPPO. END REVERSED
SCALE: 1/8" = 1'-0"



TYPICAL SECTION

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

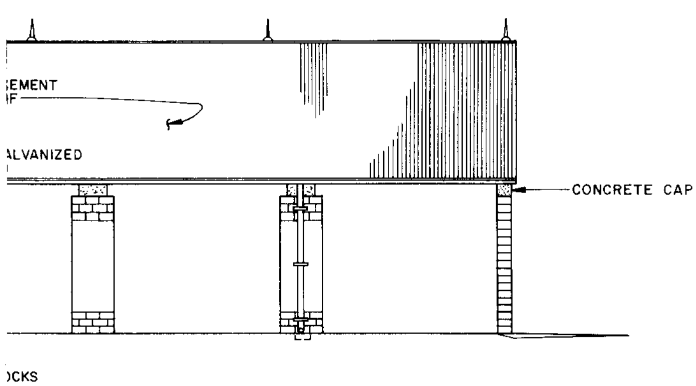
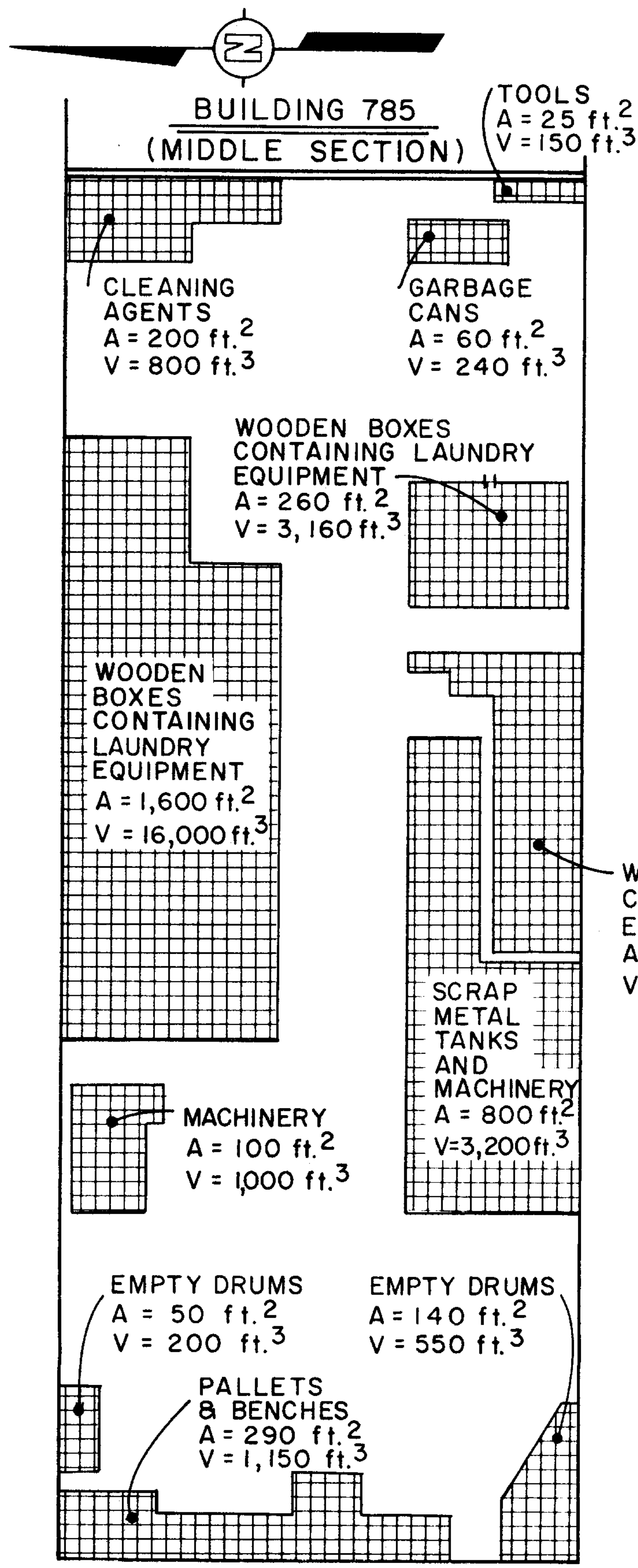


FIGURE 4-2

TYPICAL FLOOR PLAN, ELEVATION AND SECTION

DRAWN BY D.J.Rodriguez 11-30-82 | CHECKED BY PRF 4/26/83 | APPROVED BY JCM 4/26/83 | DRAWING NUMBER RM82-1981-A16



BUILDING 785

(WEST SECTION)

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 0

AREA:

TOTAL AREA OF BUILDING = 9,600 ft.^{2}

AREA USED FOR STORAGE = 3,775 ft.^{2}

PERCENT AREA OCCUPIED = 39 %

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 ft.^{3}

VOLUME USED FOR STORAGE = 29,770 ft.^{3}

PERCENT VOLUME OCCUPIED = 22 %

LEGEND:

MISCELLANEOUS EQUIPMENT AND MATERIALS

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

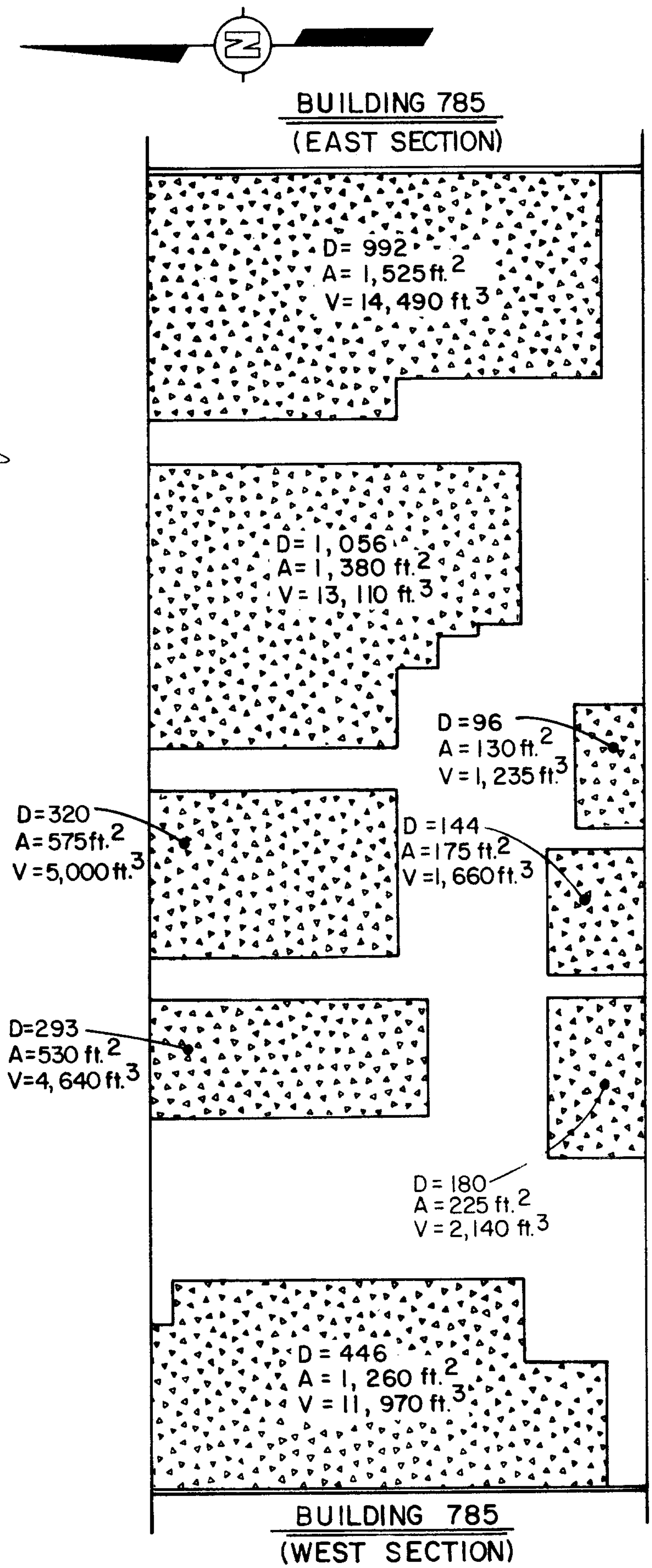
FIGURE 4-3

CONTENTS OF BUILDING 785
(WEST SECTION)
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA



DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 3,577

AREA:

TOTAL AREA OF BUILDING = 9,600 $ft.^2$

AREA USED FOR STORAGE = 5,800 $ft.^2$

PERCENT AREA OCCUPIED = 60%

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 $ft.^3$

VOLUME USED FOR STORAGE = 54,245 $ft.^3$

PERCENT VOLUME OCCUPIED = 40%

LEGEND:

CAIS RESIDUE

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

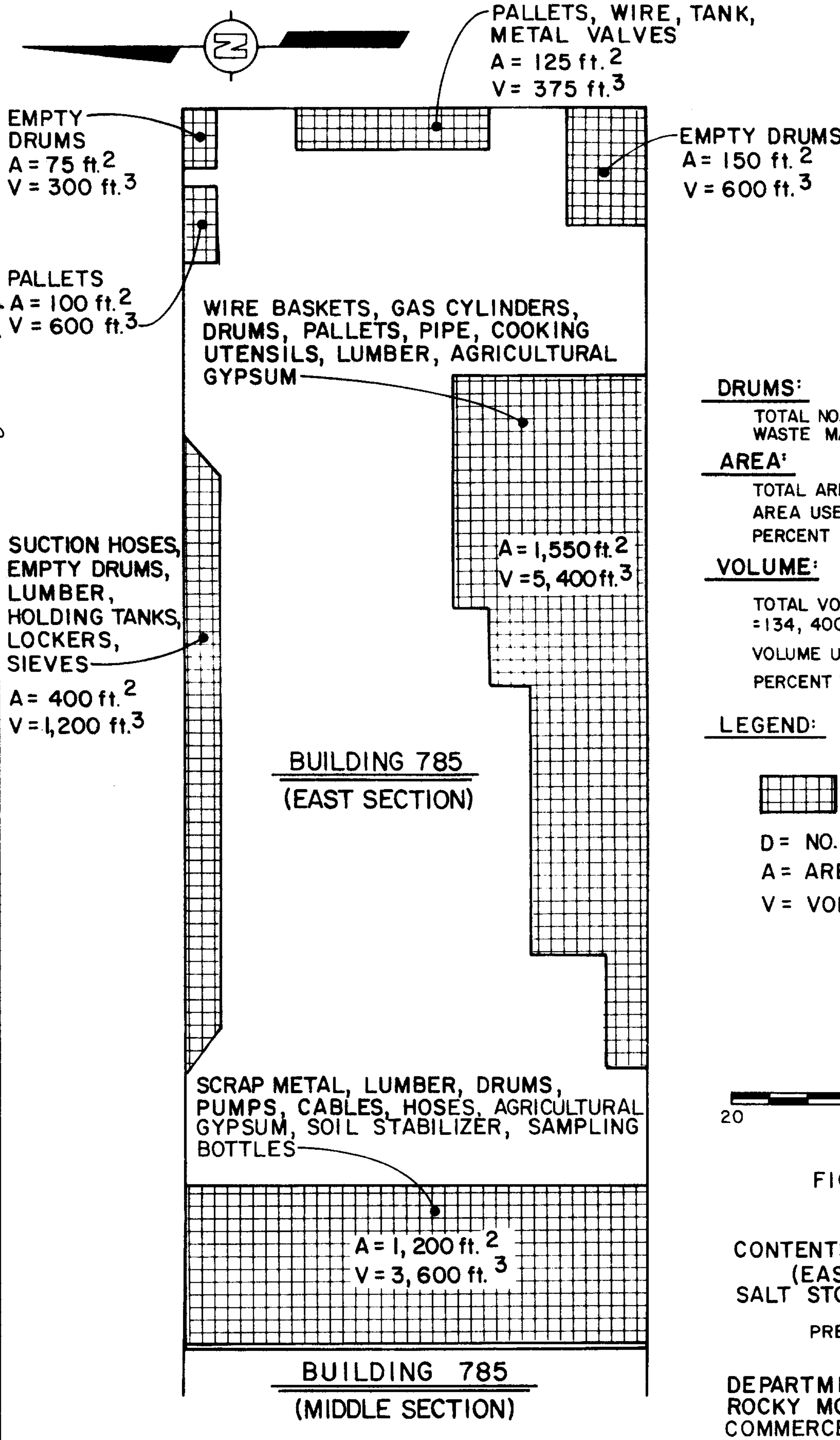
FIGURE 4-4

CONTENTS OF BUILDING 785
(MIDDLE SECTION)
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA



DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 0

AREA:

TOTAL AREA OF BUILDING = 9,600 ft.^{2}
AREA USED FOR STORAGE = 3,500 ft.^{2}
PERCENT AREA OCCUPIED = 36%

VOLUME:

TOTAL VOLUME OF BUILDING = 134, 400 ft.^{3}
VOLUME USED FOR STORAGE = 12, 075 ft.^{3}
PERCENT VOLUME OCCUPIED = 9%

LEGEND:

MISCELLANEOUS EQUIPMENT AND MATERIALS

D = NO. OF DRUMS
A = AREA
V = VOLUME

SCALE
20 0 20 FEET

FIGURE 4-5

CONTENTS OF BUILDING 785
(EAST SECTION)
SALT STORAGE WAREHOUSE

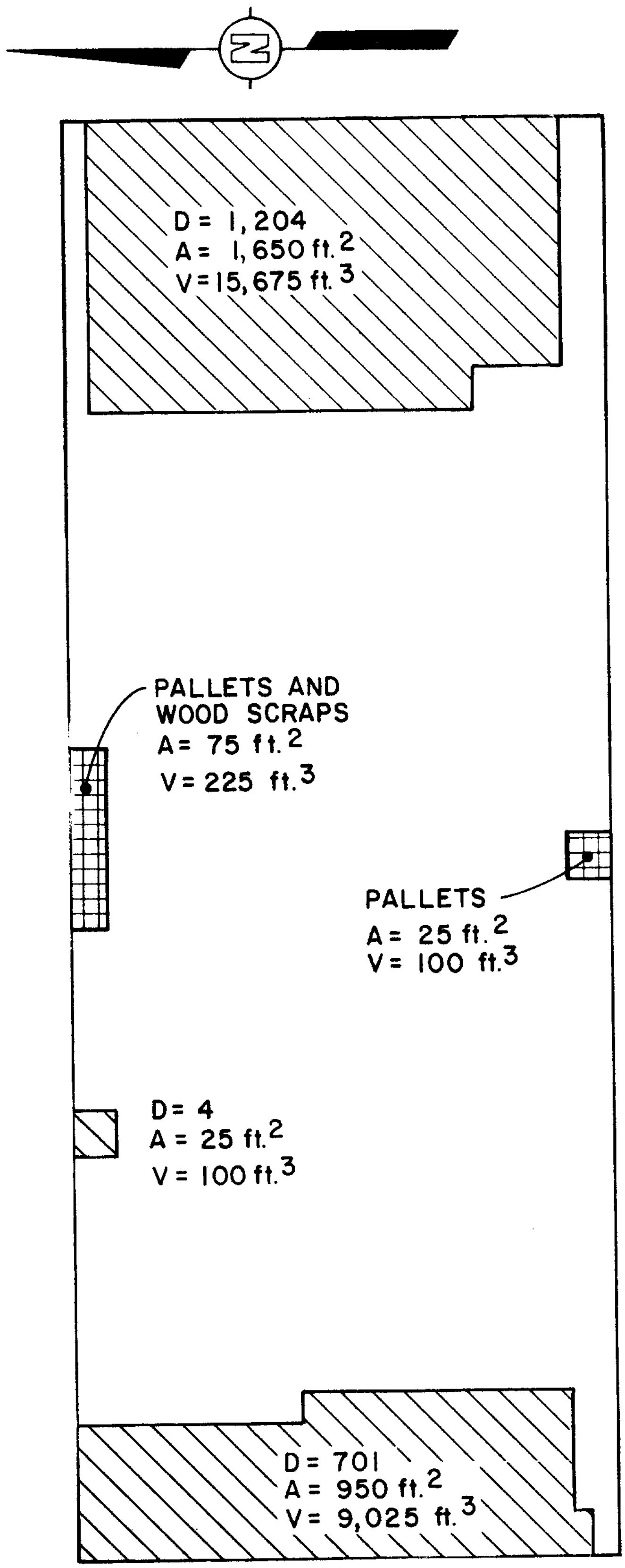
PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWING NUMBER RM82-1981-A17
CHECKED BY PRF 4/26/83
APPROVED BY JCM 4/26/83
DRAWN BY D.J.Rodriguez 11-30-82

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D.J.Rodriguez 11-30-82	PRF 4/26/83	JCM 4/26/83	RM82-1981-A10



BUILDING 786

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 1909

AREA:

TOTAL AREA OF BUILDING = 9,600 ft.^{2}

AREA USED FOR STORAGE = 2,725 ft.^{2}

PERCENT AREA OCCUPIED = 28%

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 ft.^{3}

VOLUME USED FOR STORAGE = 25,125 ft.^{3}

PERCENT VOLUME OCCUPIED = 19%

LEGEND:

GB SALTS

MISCELLANEOUS EQUIPMENT AND MATERIALS

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

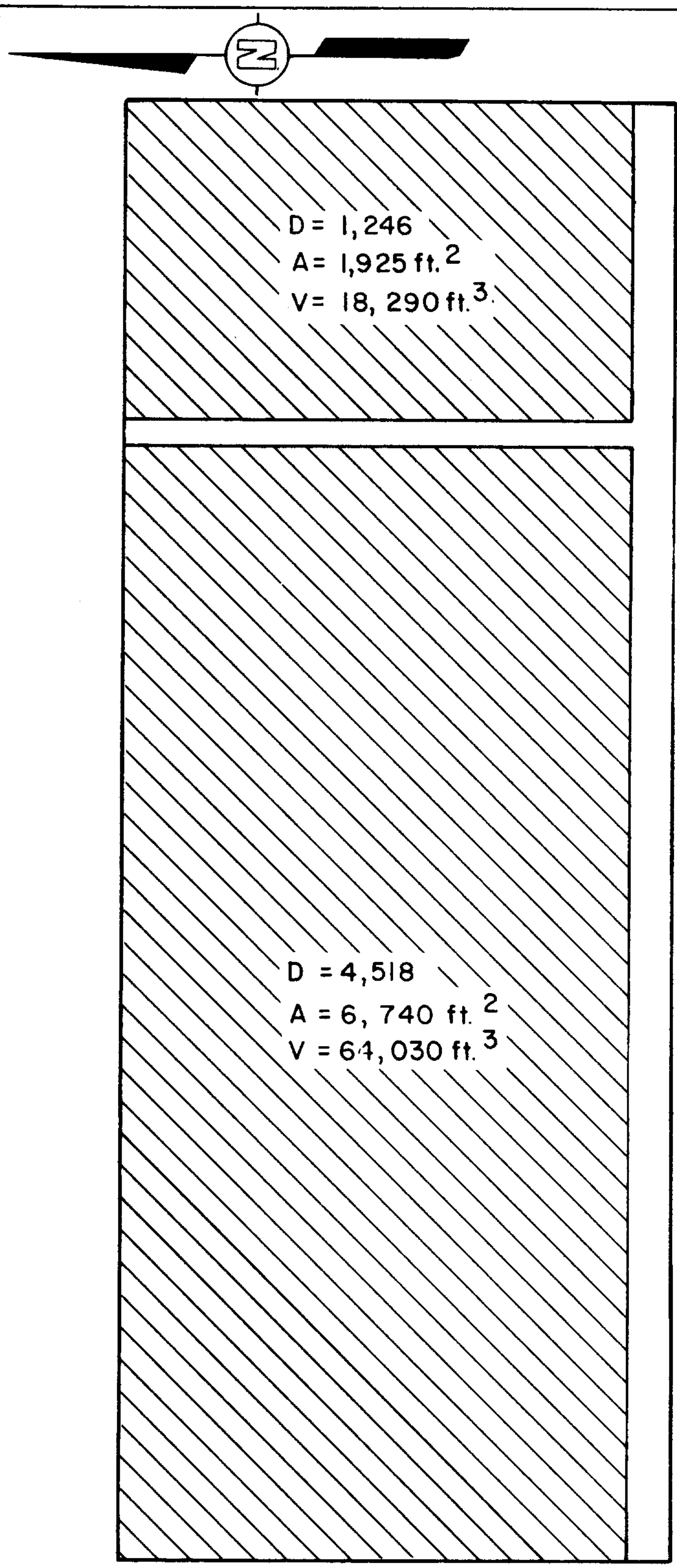
FIGURE 4-6

CONTENTS OF BUILDING 786
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA



BUILDING 787

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 5,764

AREA:

TOTAL AREA OF BUILDING = 9,600 FT.^{2}
AREA USED FOR STORAGE = 8,665 FT.^{2}
PERCENT AREA OCCUPIED = 90%

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 FT.^{3}
VOLUME USED FOR STORAGE = 82, 320 FT.^{3}
PERCENT OF VOLUME OCCUPIED = 61%

LEGEND:

GB SALTS

D = NO. OF DRUMS
A = AREA
V = VOLUME

SCALE
20 0 20 FEET

FIGURE 4-7

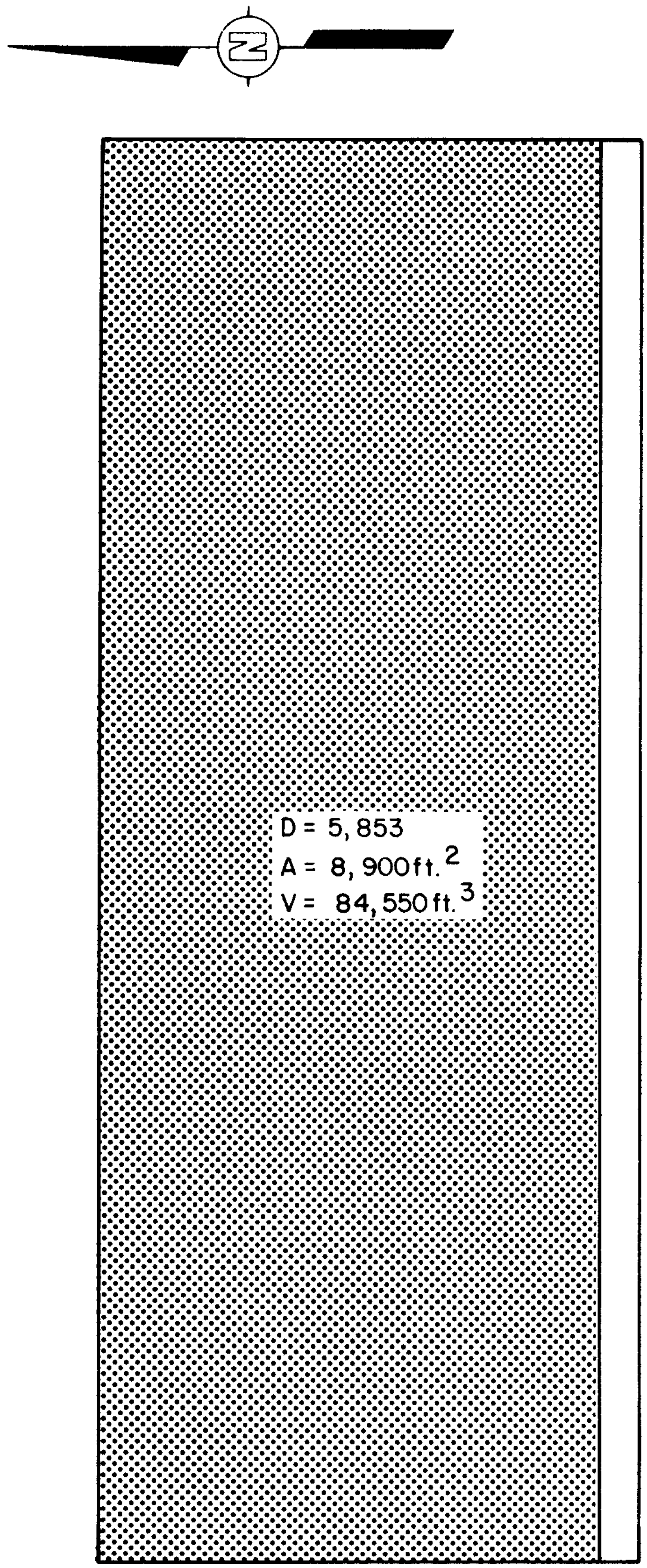
CONTENTS OF BUILDING 787
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	D.J.Rodriguez 11-22-82	CHECKED BY	PRF 4/26/83	DRAWING NUMBER RM82-1981-A19
		APPROVED BY	CM 4/26/83	



BUILDING 788

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 5,853

AREA:

TOTAL AREA OF BUILDING = 9,600 ft.^{2}

AREA USED FOR STORAGE = 8,900 ft.^{2}

PERCENT AREA OCCUPIED = 93%

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 ft.^{3}

VOLUME USED FOR STORAGE = 84,550 ft.^{3}

PERCENT VOLUME OCCUPIED = 63%

LEGEND:

H SALTS

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

FIGURE 4-8

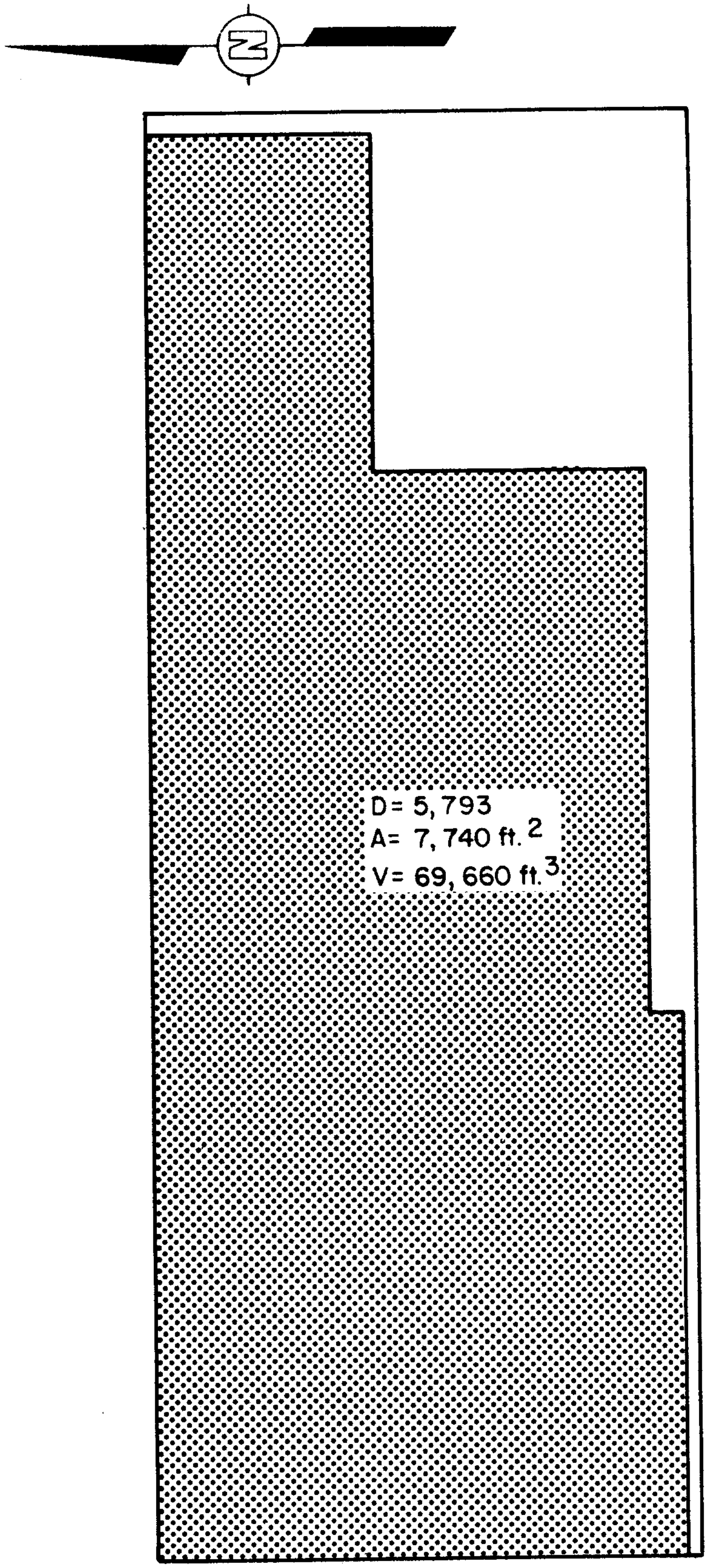
CONTENTS OF BUILDING 788
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	CHECKED BY		DRAWING NUMBER
D.J.Rodriguez	PRF	4/26/83	RM82-1981-A18
11-22-82	APPROVED BY JCM	4/26/83	



BUILDING 791

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 5,793

AREA:

TOTAL AREA OF BUILDING = 9,600 $ft.^2$

AREA USED FOR STORAGE = 7,740 $ft.^2$

PERCENT AREA OCCUPIED = 81 %

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 $ft.^3$

VOLUME USED FOR STORAGE = 69,660 $ft.^3$

PERCENT VOLUME OCCUPIED = 52 %

LEGEND:

H SALTS

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

FIGURE 4-9

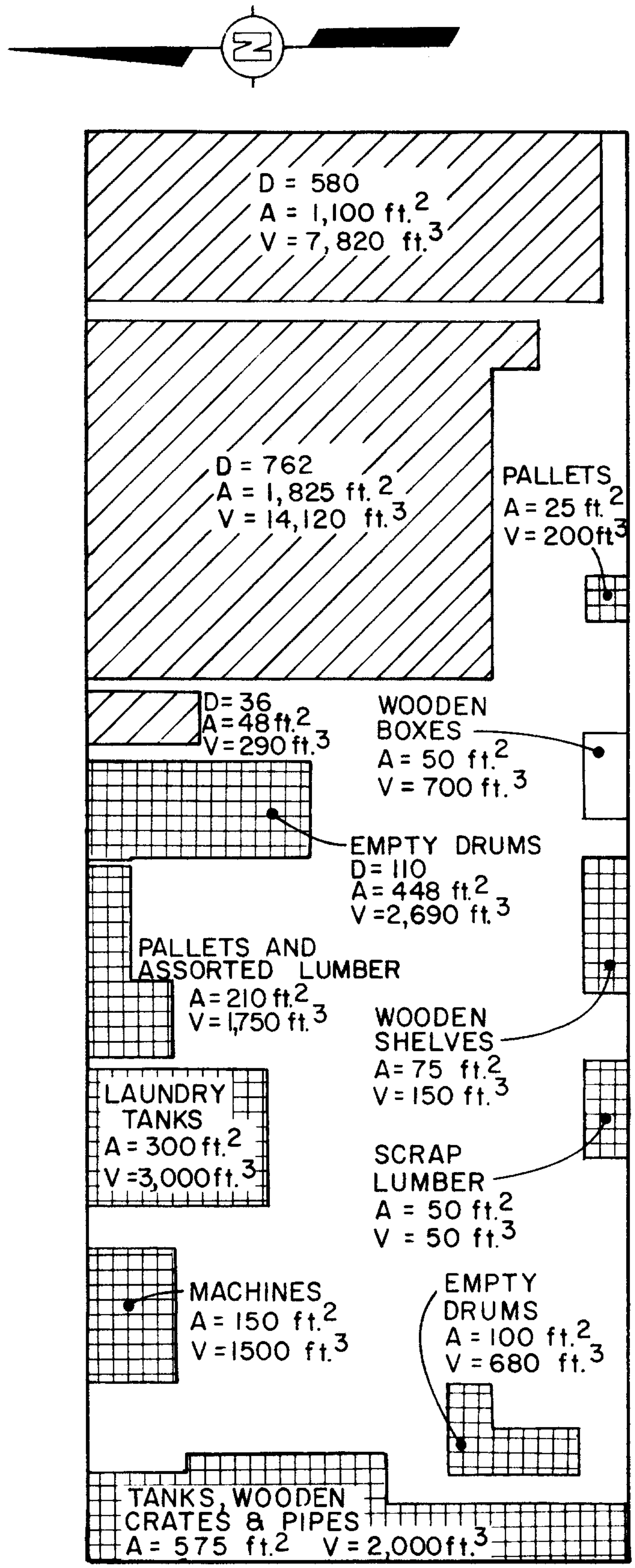
CONTENTS OF BUILDING 791
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	D.J.Rodriguez 11-29-82	CHECKED BY	RRF 4/26/83	DRAWING NUMBER	RM82-1981-A5
		APPROVED BY	JCM 4/26/83		



BUILDING 793

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 1,378

AREA:

TOTAL AREA OF BUILDING = 9,600 ft.²
AREA USED FOR STORAGE = 4,956 ft.²
PERCENT AREA OCCUPIED = 52 %

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 ft.³
VOLUME USED FOR STORAGE = 34,350 ft.³
PERCENT VOLUME OCCUPIED = 26 %

LEGEND:

CG SALTS
MISCELLANEOUS EQUIPMENT AND MATERIALS
D = NO. OF DRUMS
A = AREA
V = VOLUME

SCALE
20 0 20 FEET

FIGURE 4-10

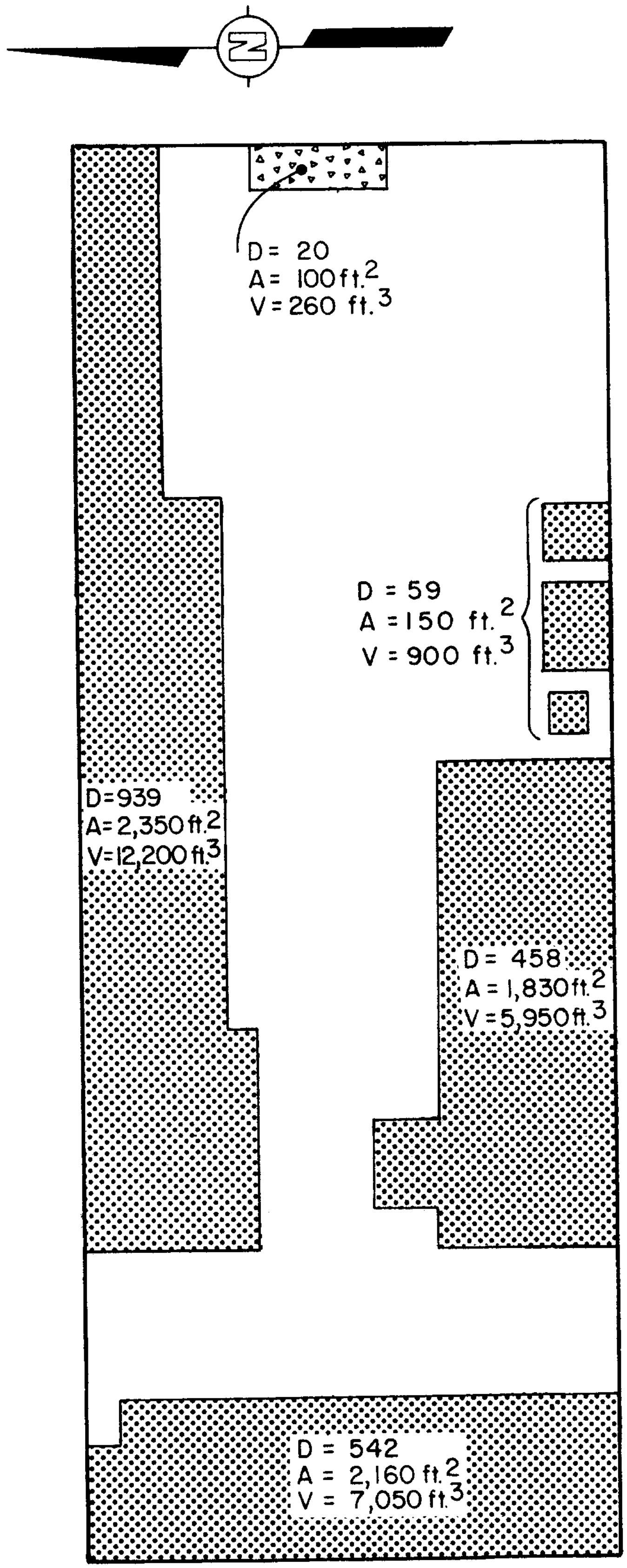
CONTENTS OF BUILDING 793
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY: D.J.Rodriguez 11-30-82
CHECKED BY: 2/21/83
APPROVED BY: JCM 2/27/83
DRAWING NUMBER: RM82-1981-A13



BUILDING 794

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 2,018

AREA:

TOTAL AREA OF BUILDING = 9,600 $ft.^2$
AREA USEA FOR STORAGE = 6,570 $ft.^2$
PERCENT AREA OCCUPIED = 68 %

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 $ft.^3$
VOLUME USED FOR STORAGE = 26,360 $ft.^3$
PERCENT VOLUME OCCUPIED = 20 %

LEGEND:

H ASH RESIDUE

CAIS RESIDUE

D = NO. OF DRUMS
A = AREA
V = VOLUME

NOTE:

THERE ARE TWO-FOOT AISLES BETWEEN DRUMS SO THAT ALL DRUMS CAN BE INSPECTED.

SCALE

20 0 20 FEET

FIGURE 4-11

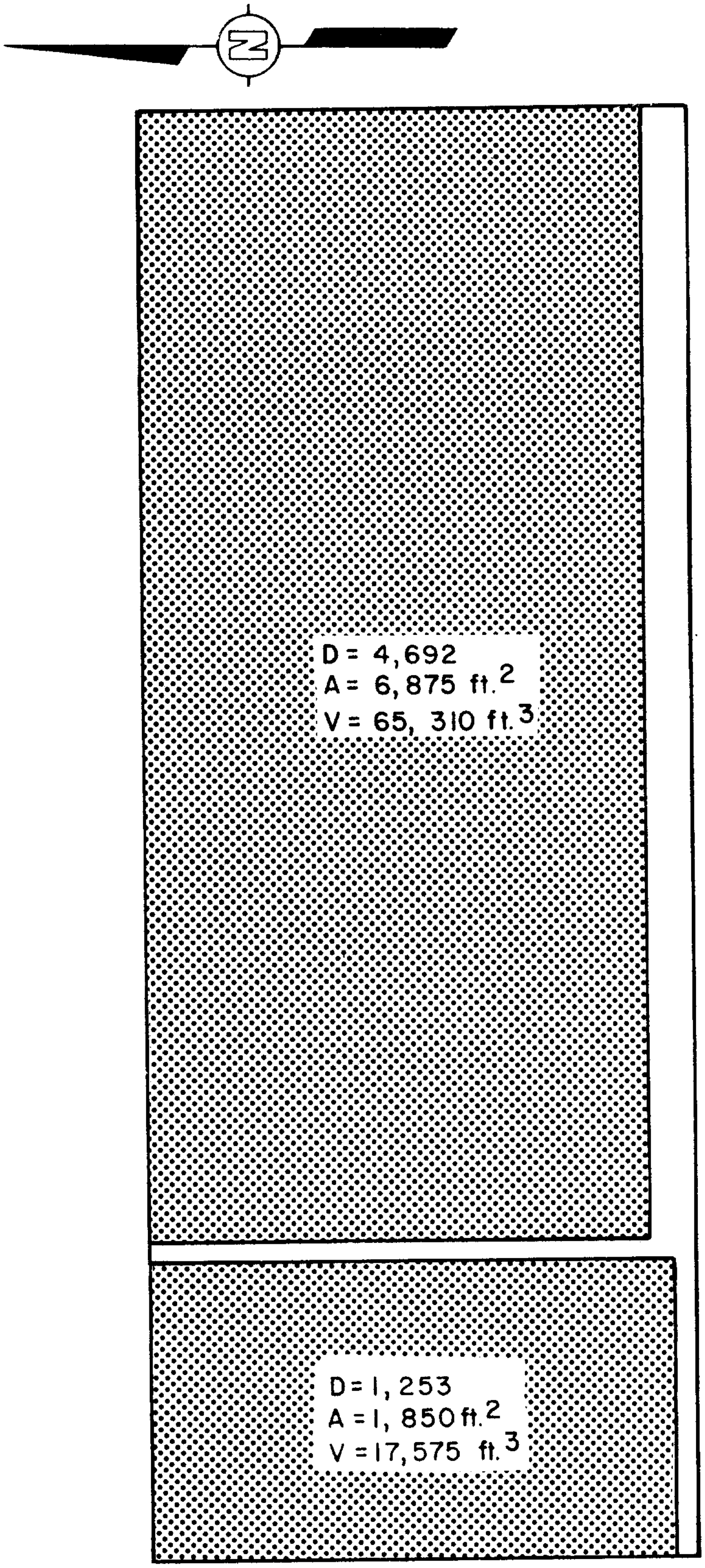
CONTENTS OF BUILDING 794
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D.J.Rodriguez 11-30-82	DRF 4/26/83	JCM 4/26/83	RM82-1981-A14



BUILDING 795

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 5,945

AREA:

TOTAL AREA OF BUILDING = 9,600 $ft.^2$
AREA USED FOR STORAGE = 8,725 $ft.^2$
PERCENT AREA OCCUPIED = 91%

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 $ft.^3$
VOLUME USED FOR STORAGE = 82,885 $ft.^3$
PERCENT VOLUME OCCUPIED = 62%

LEGEND:

H SALTS

D = NO. OF DRUMS
A = AREA
V = VOLUME

SCALE
20 0 20 FEET

FIGURE 4-12

CONTENTS OF BUILDING 795
SALT STORAGE WAREHOUSE

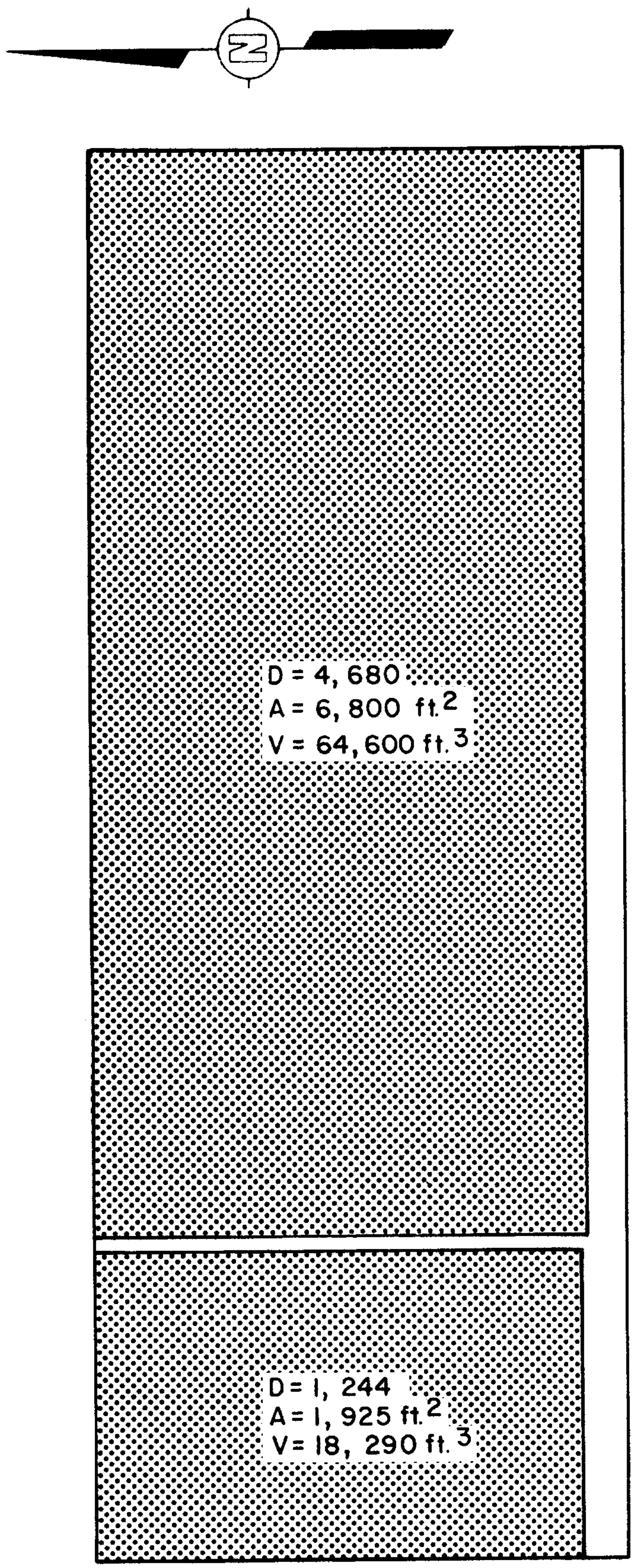
PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	D.J. Rodriguez	11-29-82
CHECKED BY	PKF	1/24/83
APPROVED BY	JCM	4/26/83
DRAWING NUMBER	RM82-1981-A7	

DRAWN BY D.J. Rodriguez 11-29-82 | CHECKED BY [illegible] 4/26/83 | APPROVED BY [illegible] 4/26/83 | DRAWING NUMBER RM82-1981-A6



BUILDING 796

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 5,924

AREA:

TOTAL AREA OF BUILDING = 9,600 $ft.^2$

AREA USED FOR STORAGE = 8,725 $ft.^2$

PERCENT AREA OCCUPIED = 91 %

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 $ft.^3$

VOLUME USED FOR STORAGE = 82,890 $ft.^3$

PERCENT VOLUME OCCUPIED = 62 %

LEGEND:

(shaded) H SALTS

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

FIGURE 4-13

CONTENTS OF BUILDING 796
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

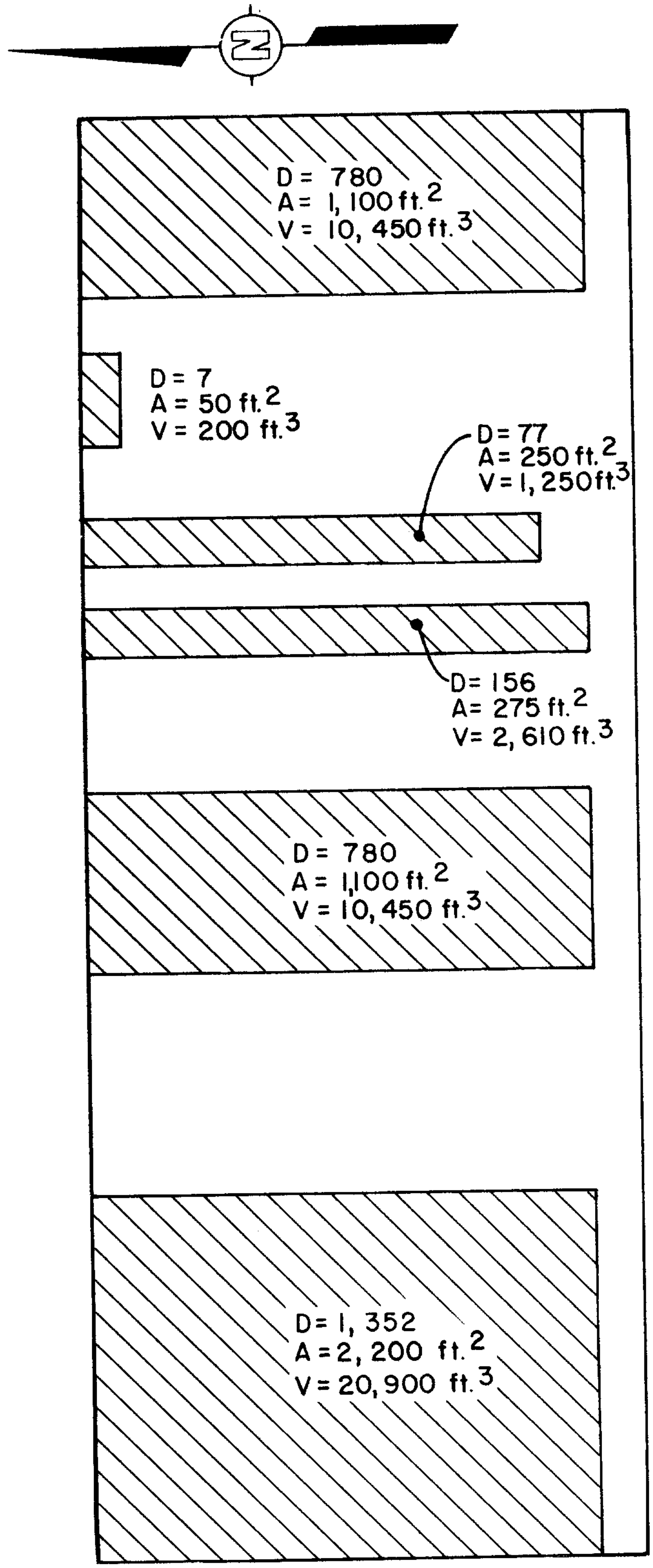
D'APPOLONIA

DRAWING NUMBER RM82-1981-A11

DRAWN BY D.J. Rodriguez 11-30-82

CHECKED BY PRF 4/26/83

APPROVED BY JCM 4/26/83



BUILDING 797

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL= 3,152

AREA:

TOTAL AREA OF BUILDING= 9,600 ft.^{2}

AREA USED FOR STORAGE= 4,975 ft.^{2}

PERCENT AREA OCCUPIED= 52%

VOLUME:

TOTAL VOLUME OF BUILDING= 134,400 ft.^{3}

VOLUME USED FOR STORAGE= 45,860 ft.^{3}

PERCENT VOLUME OCCUPIED= 34%

LEGEND:

GB SALTS

D= NO. OF DRUMS

A= AREA

V= VOLUME

SCALE

20 0 20 FEET

FIGURE 4-14

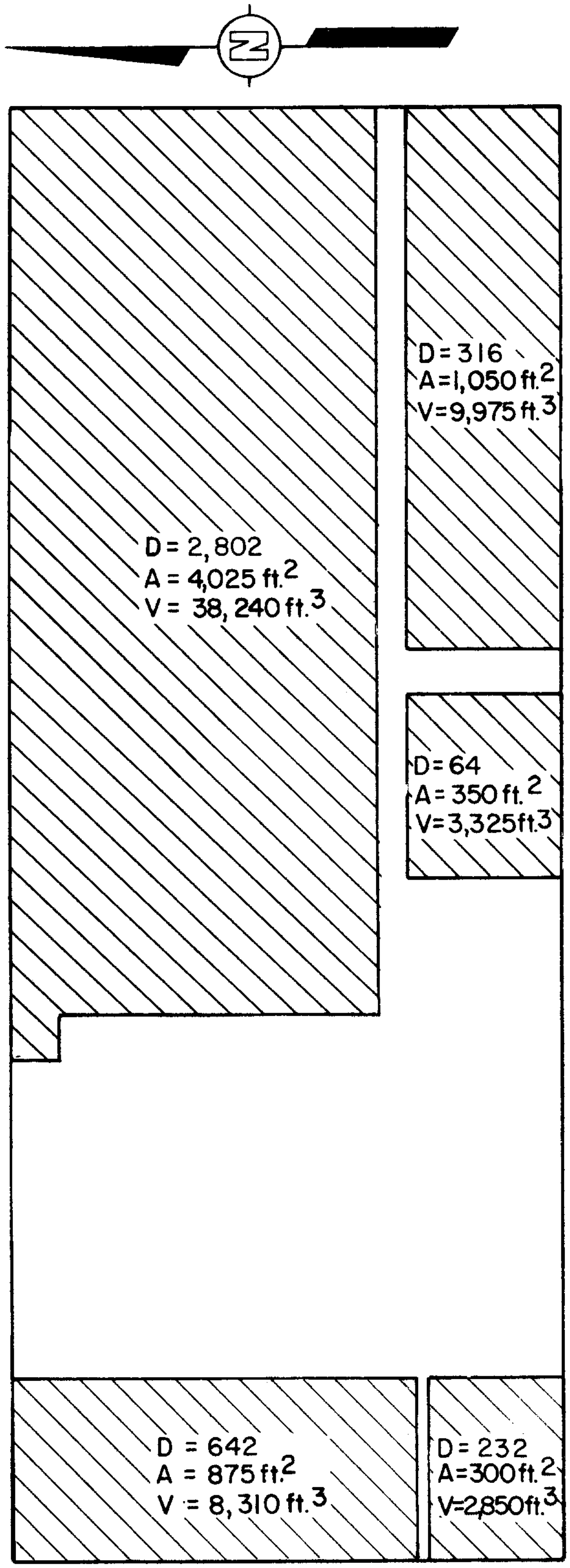
CONTENTS OF BUILDING 797
SALT STORAGE WAREHOUSE

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D.J.Rodriguez 11-29-82	PRF 4/24/83	KM 4/24/83	RM82-1981-A8



BUILDING 798

DRUMS:

TOTAL NO. OF DRUMS CONTAINING WASTE MATERIAL = 4,056

AREA:

TOTAL AREA OF BUILDING = 9,600 $ft.^2$

AREA USED FOR STORAGE = 6,600 $ft.^2$

PERCENT AREA OCCUPIED = 69 %

VOLUME:

TOTAL VOLUME OF BUILDING = 134,400 $ft.^3$

VOLUME USED FOR STORAGE = 62,700 $ft.^3$

PERCENT VOLUME OCCUPIED = 47 %

LEGEND:

GB SALTS

D = NO. OF DRUMS

A = AREA

V = VOLUME

SCALE

20 0 20 FEET

FIGURE 4-15

CONTENTS OF BUILDING 798
SALT STORAGE WAREHOUSE

PREPARED FOR

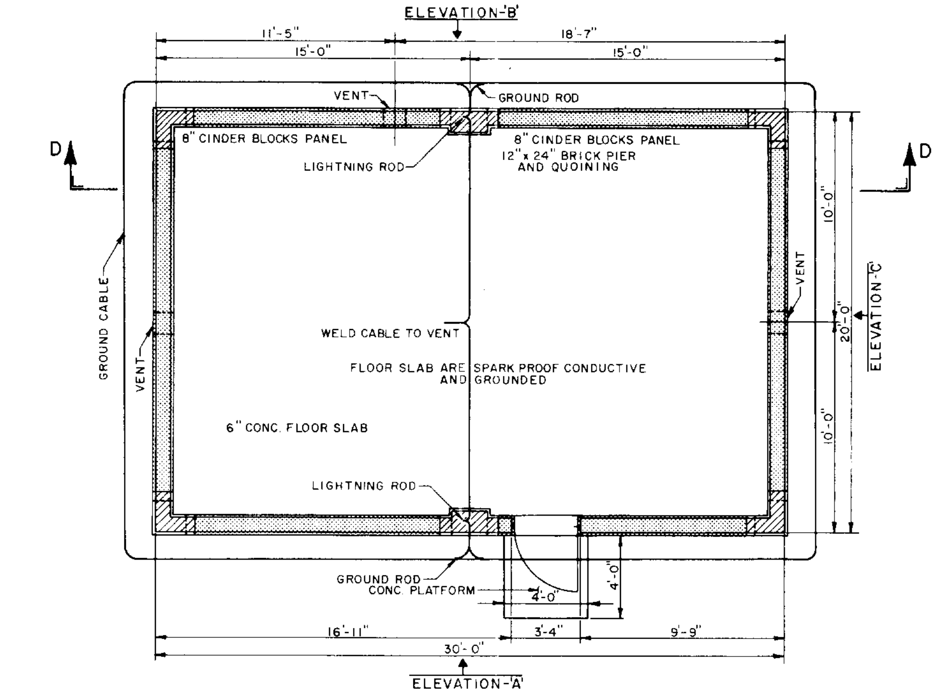
DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

D'APPOLONIA

DRAWING NUMBER RM 82-1981-E9

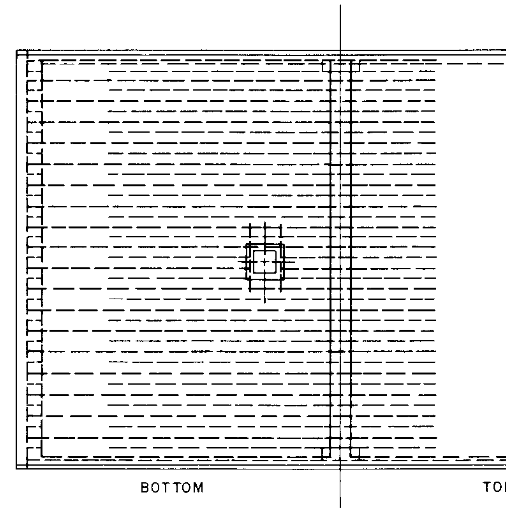
DRAWN BY	cjb/ 02-26-83	
CHECKED BY	PRF	2/27/83
APPROVED BY	JCM	2/22/83

(1)



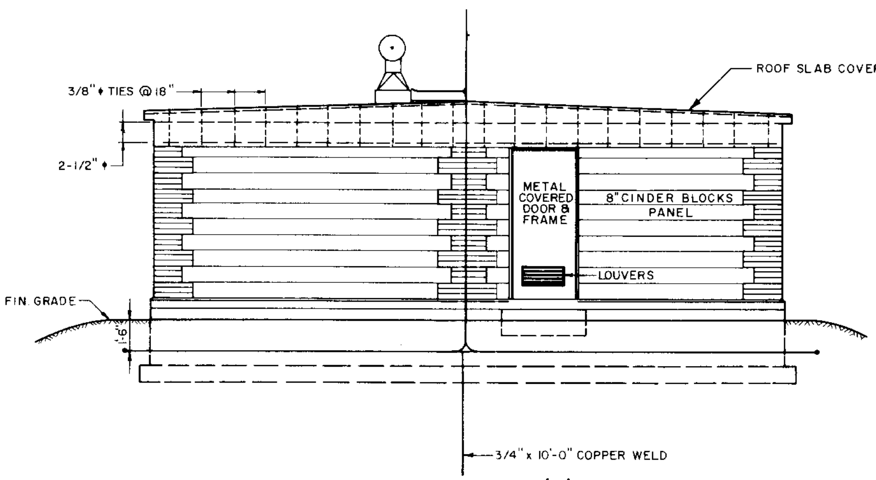
PLAN

SCALE 1/4"=1'-0"



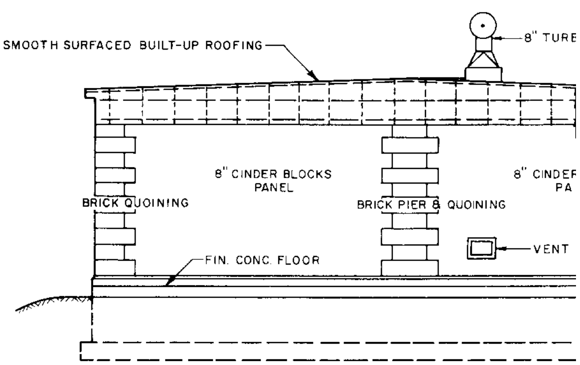
REINFORCING IN ROOF SL

SCALE 1/4"=1'-0"



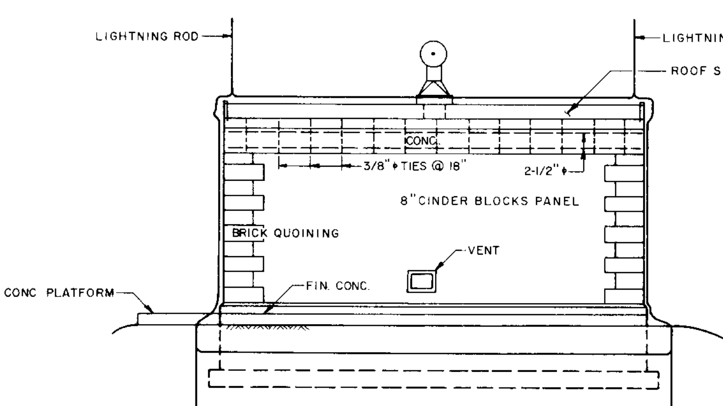
ELEVATION-'A'

SCALE 1/4"=1'-0"



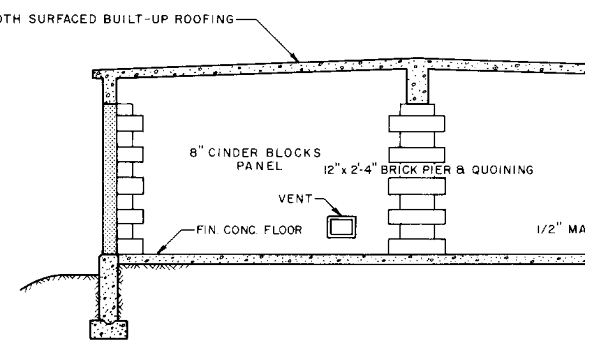
ELEVATION-'B'

SCALE 1/4"=1'-0"



ELEVATION-'C'

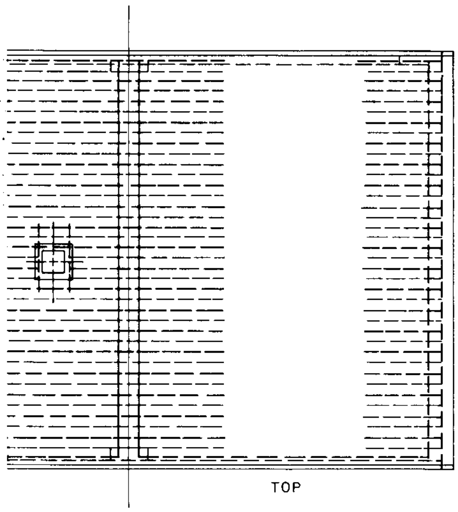
SCALE 1/4"=1'-0"



SECTION-'C'

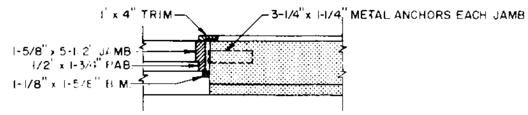
SCALE 1/4"=1'-0"

IB 1253 HERCULENE AAB SMITH CO. PGH. PA.



)RCING IN ROOF SLAB

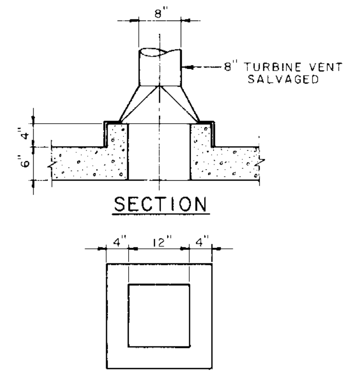
SCALE: 1/4"=1'-0"



PLAN

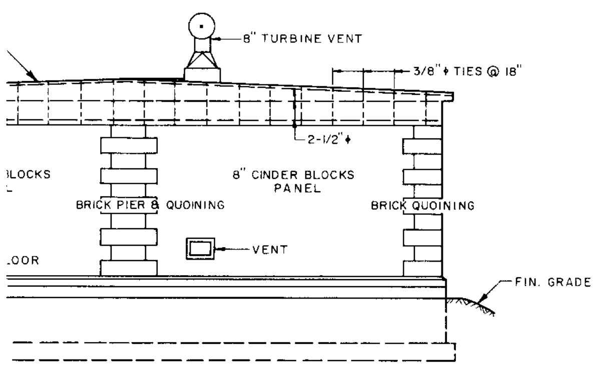
DETAIL OF DOOR JAMB

SCALE: 3/4"=1'-0"



DETAILS OF CURB FOR TURBINE VENT

SCALE: 3/4"=1'-0"

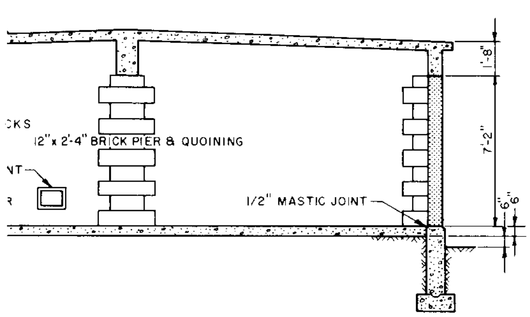


ELEVATION -'B'

SCALE: 1/4"=1'-0"

FIGURE 4-16

TYPICAL PLAN, SECTION, AND ELEVATION DETAILS OF CONCRETE STORAGE HUTS



SECTION-'C'

SCALE: 1/4"=1'-0"

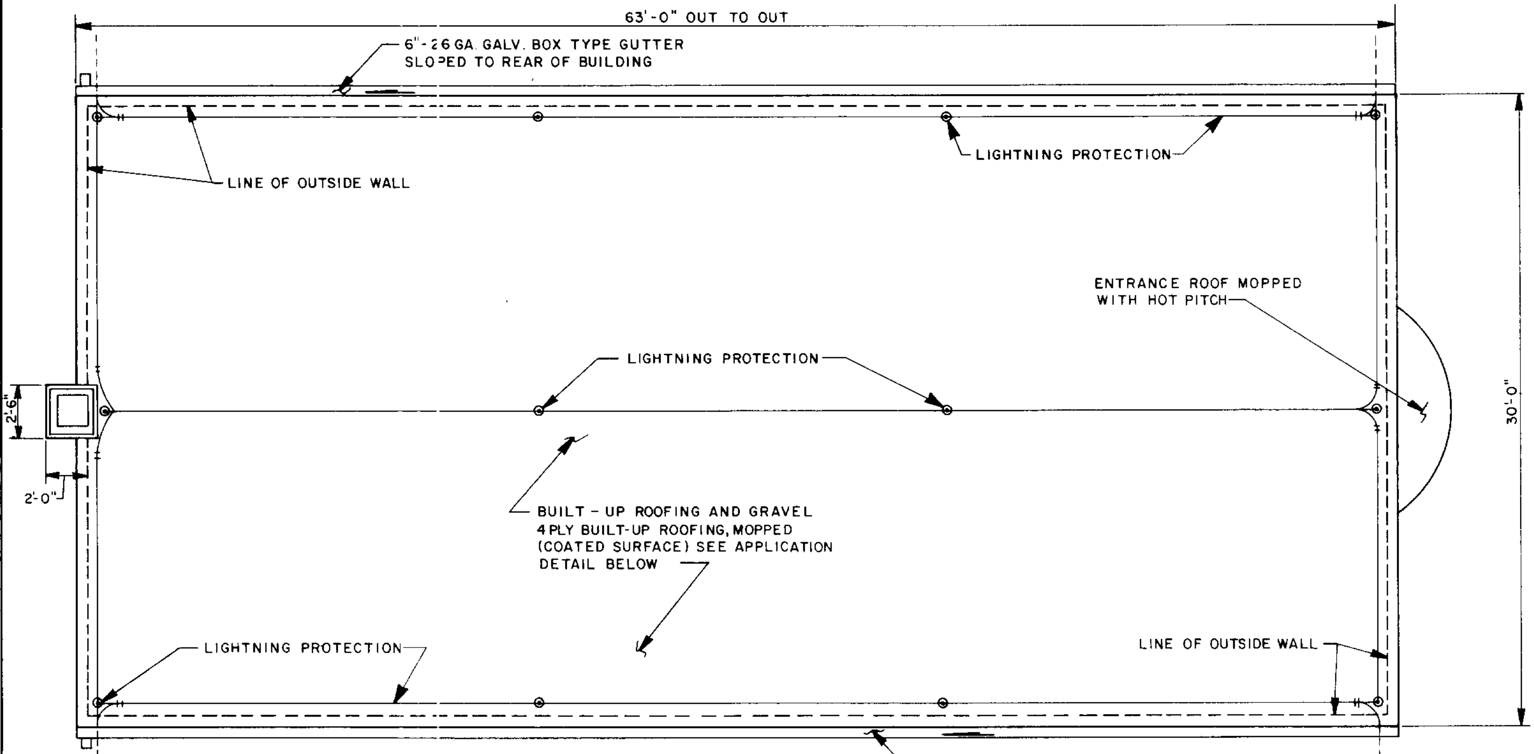
REFERENCE:
WAR DEPARTMENT-OFFICE OF THE DISTRICT ENGINEER-DENVER, COLORADO DWG. No. A-8, TITLED: "MAGAZINE BLDG'S. No. 871 A, B, C.-PLANS, SECTION, ELEV.& DETAILS PLOT PLAN"-DATED: 14-MAR., 1952-REVISION No. 3.

(1)

DRAWING NUMBER RM82-1981-E12

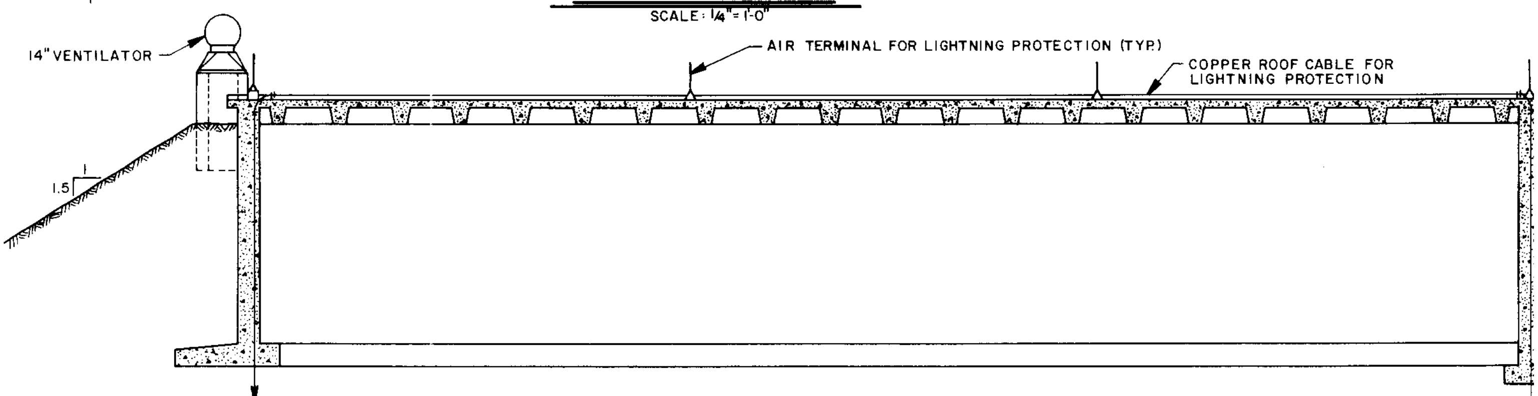
CHECKED BY: 2/27/83 | APPROVED BY: JCM 2/21/83

DRAWN BY: dam 2-26-83



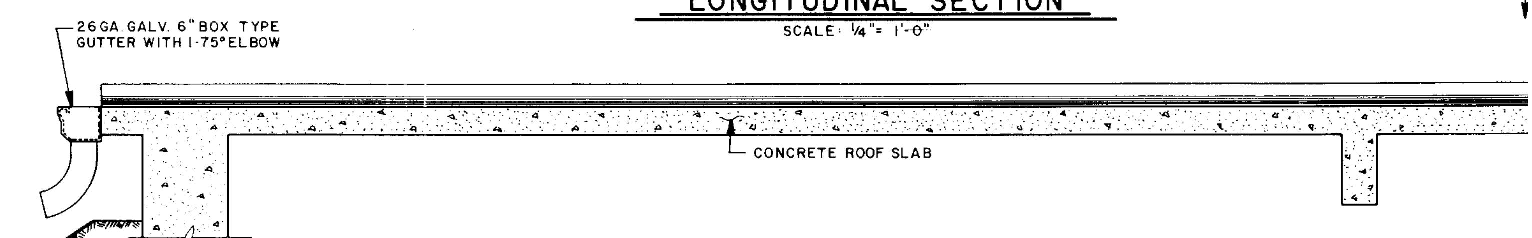
ROOFING PLAN

SCALE: 1/4" = 1'-0"



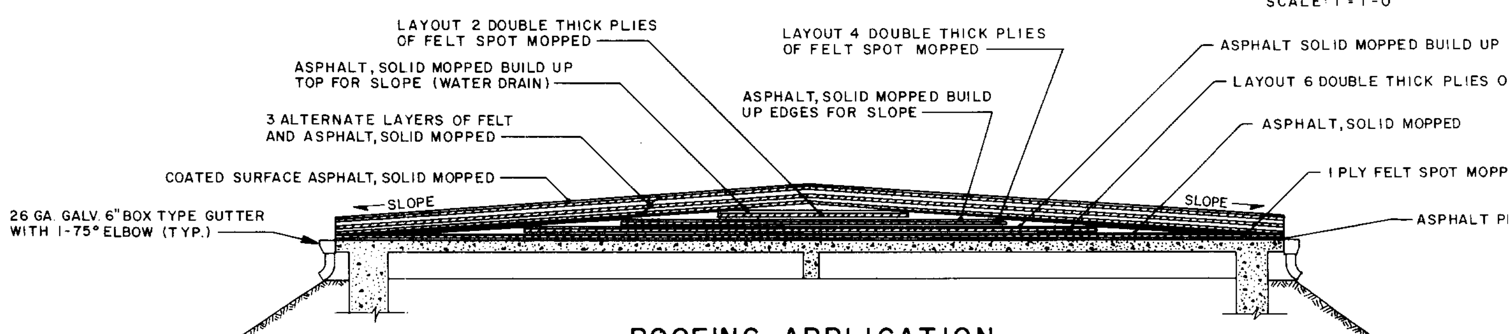
LONGITUDINAL SECTION

SCALE: 1/4" = 1'-0"



TYPICAL SECTION BUILT-UP

SCALE: 1" = 1'-0"



ROOFING APPLICATION (TO SHED WATER)

SCALE: 3/8" = 1'-0"

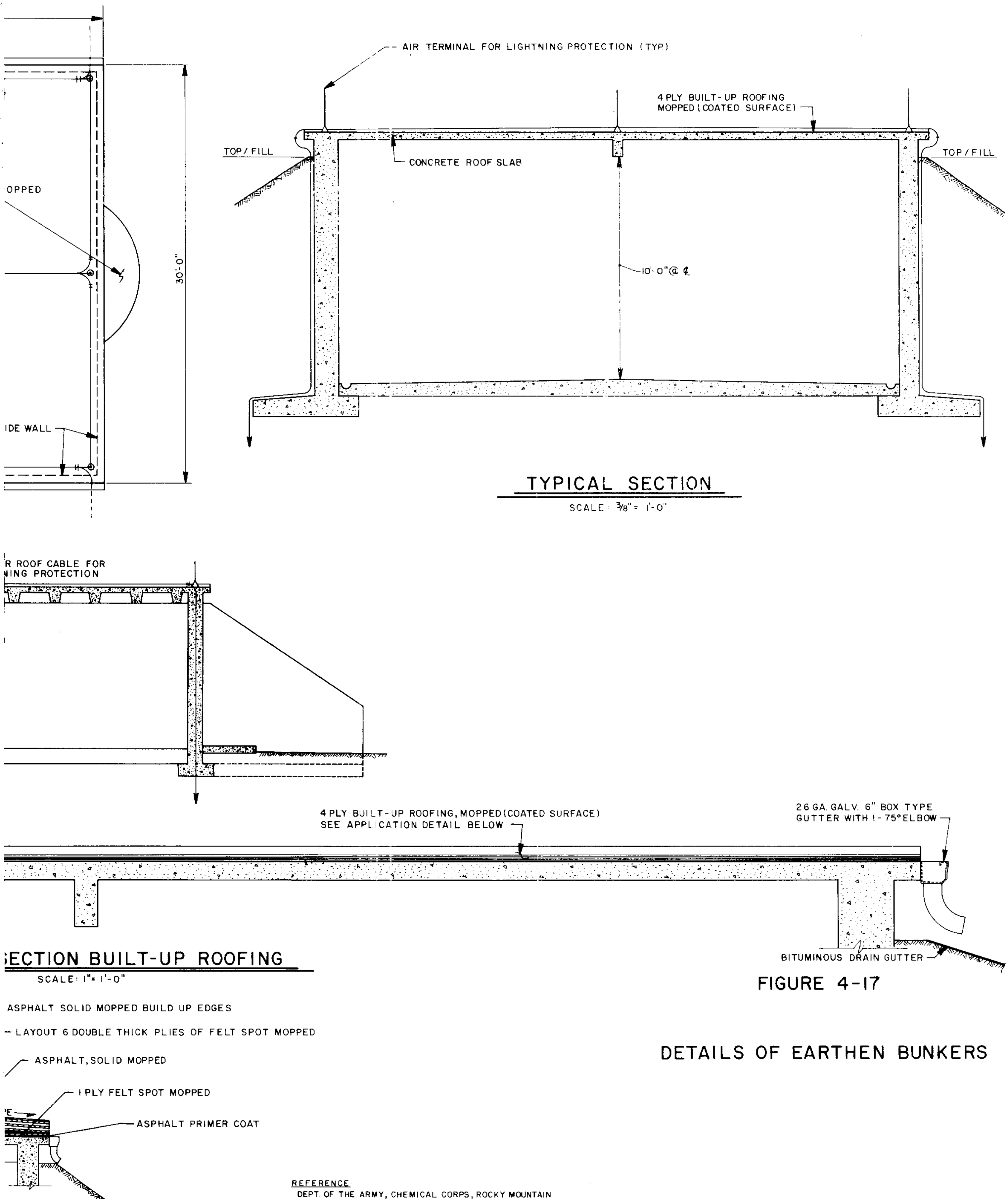


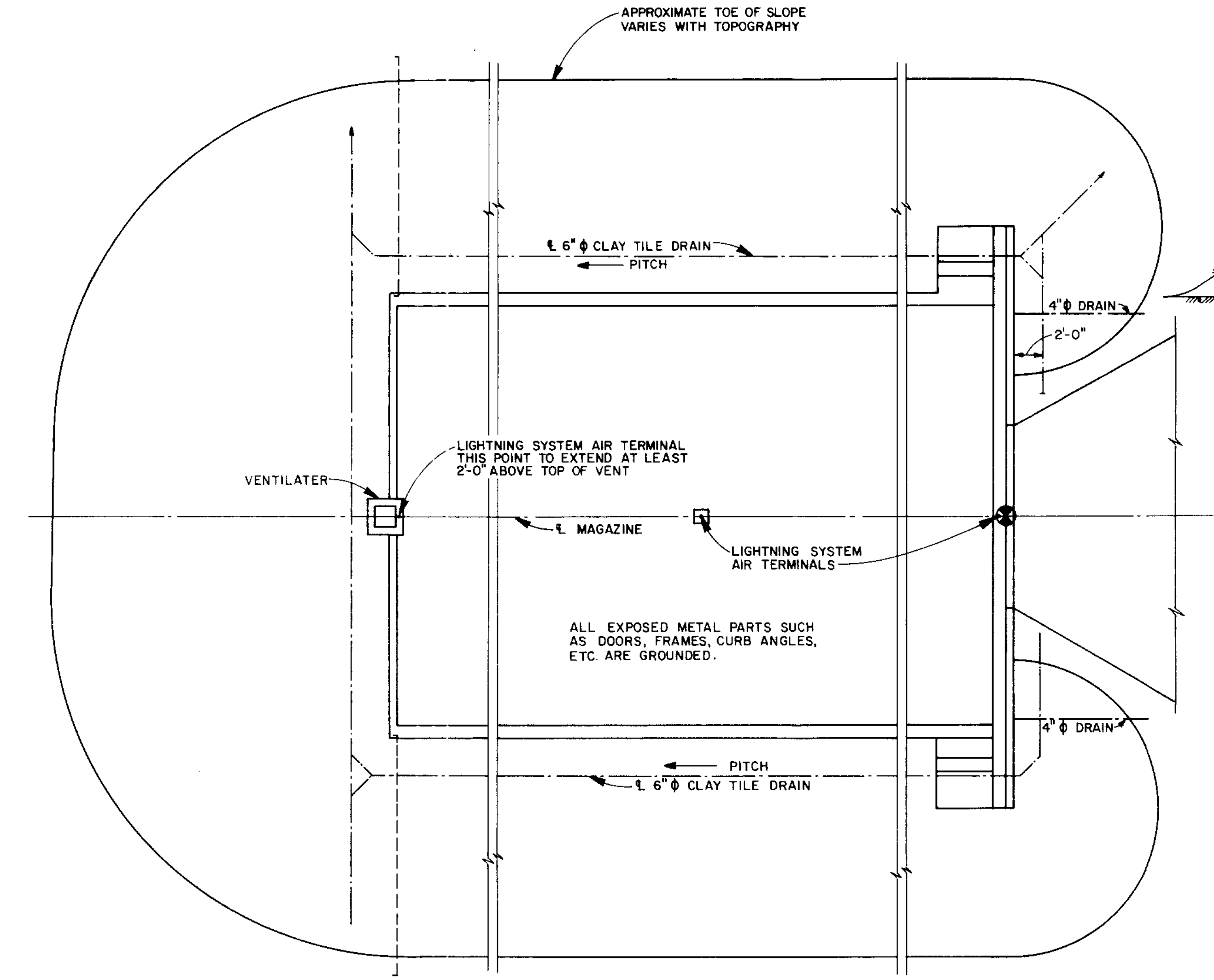
FIGURE 4-17

DETAILS OF EARTHEN BUNKERS

REFERENCE:
DEPT. OF THE ARMY, CHEMICAL CORPS, ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO DWG. No. E-3-7-21, TITLED "INSTALLATION OF NEW ROOFING ON BLDGS. No. 881, 882, 883, 884, 885, 886 PLAN & SECTIONS", DATED 7 NOV. 1958.

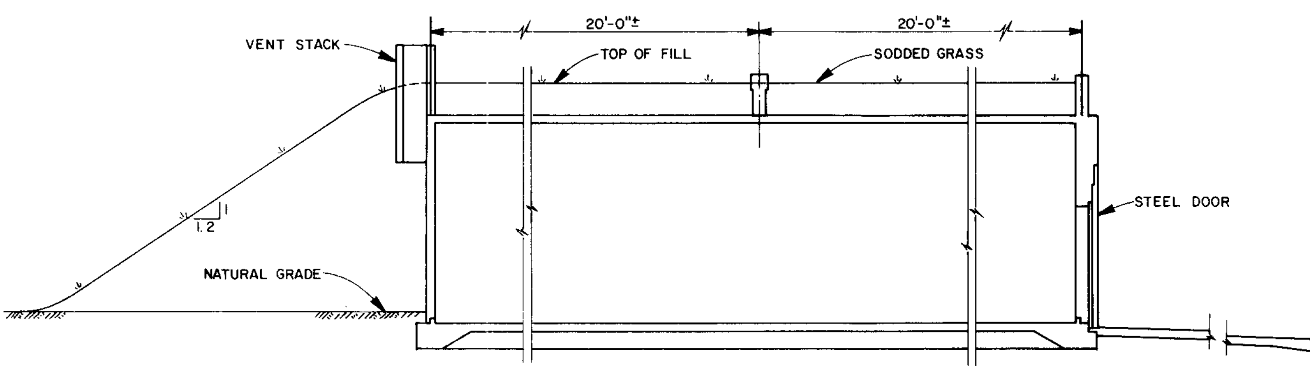
DRAWING NUMBER RM 82-1981-E10

DRAWN BY	GAM 2-26-83	CHECKED BY / APPROVED BY	PRF / JSM	2/27/83 / 2/27/83



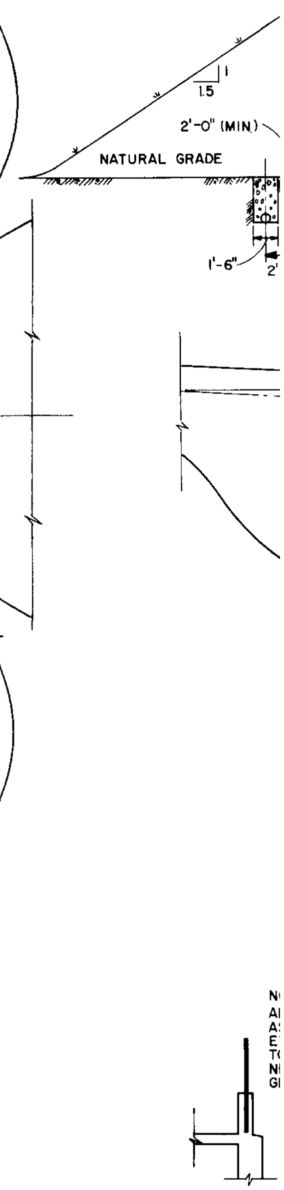
PLOT PLAN

SCALE 3/16"=1'-0"



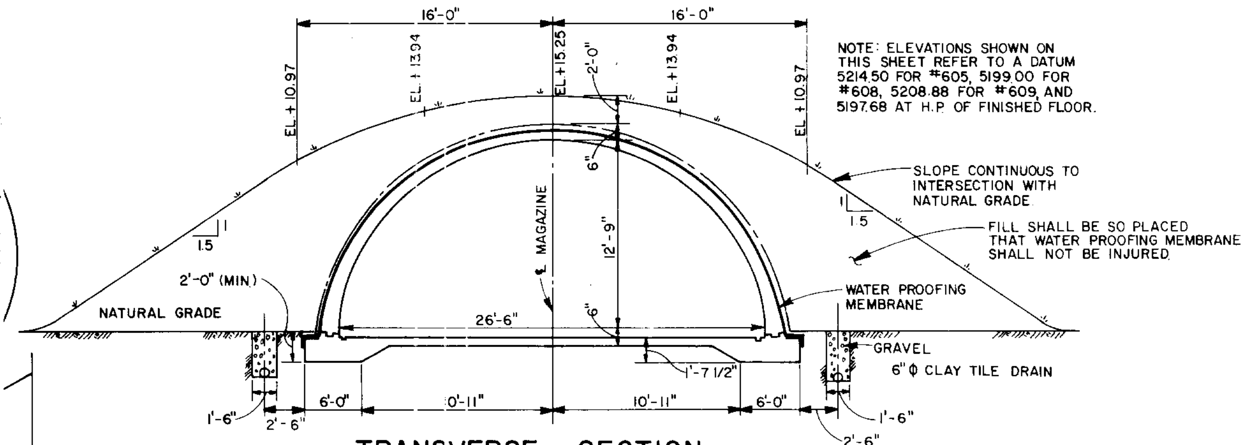
LONGITUDINAL SECTION

SCALE 3/16"=1'-0"



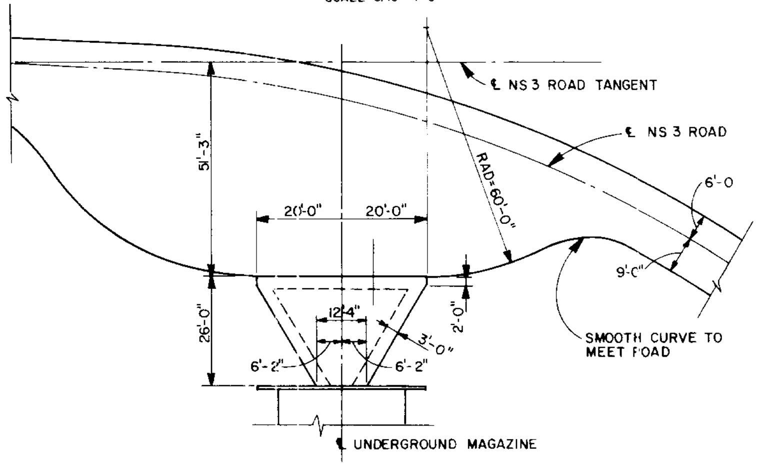
REFERENCE:

DEPT. OF THE ARMY NORTH ATLANTIC DIVISION, NEW YORK, N.Y. TITLED: INCENDIARY OIL PLANT, BUILDINGS 605, 608, 609, AND 610 PLAN AND DETAILS. DWG. NO. 37-05-61. SHEET 1 OF 5. DATED: 1-17-51.



TRANSVERSE SECTION

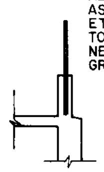
SCALE 3/16" = 1'-0"



ENTRANCE ROAD TO MAGAZINE

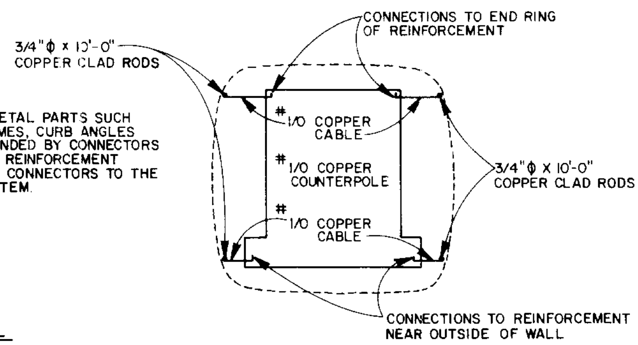
SCALE 1" = 20'

NOTE:
ALL EXPOSED METAL PARTS SUCH AS DOORS, FRAMES, CURB ANGLES ETC. ARE GROUNDED BY CONNECTORS TO THE WELDED REINFORCEMENT NETWORK OR BY CONNECTORS TO THE GROUNDING SYSTEM.



DETAIL SHOWING AIR TERMINAL

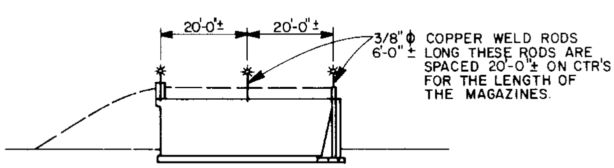
SCALE 3/16" = 1'-0"



GROUNDING SYSTEM FOR LIGHTNING PROTECTION

FIGURE 4-18

PLAN AND DETAILS OF CONCRETE MAGAZINE IGLOOS



TYPICAL ARRANGEMENT FOR LIGHTNING SYSTEM AIR TERMINALS

SCALE 1" = 20'

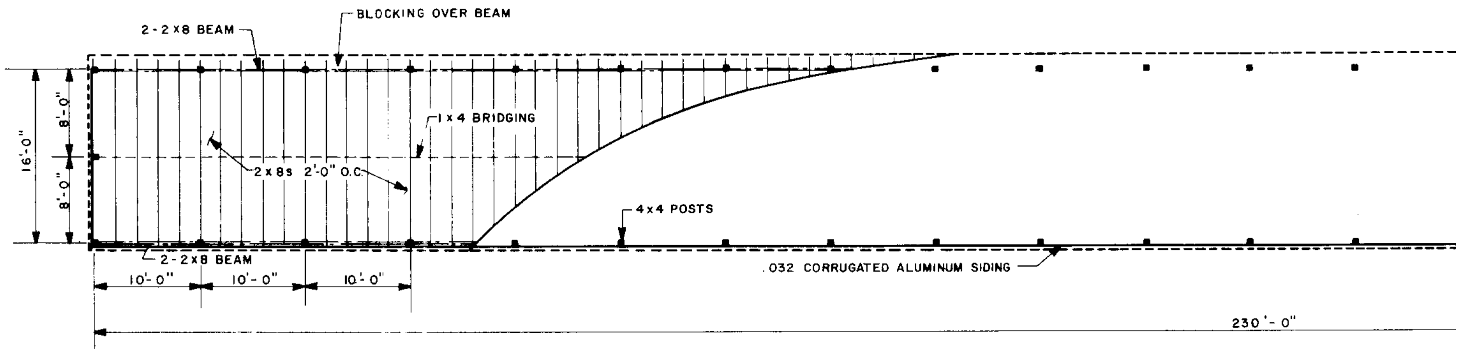
TYPICAL PLANS & SECTIONS

DRAWING NUMBER RM82-1981-E11

DRAWN BY TEJ 2-26-83

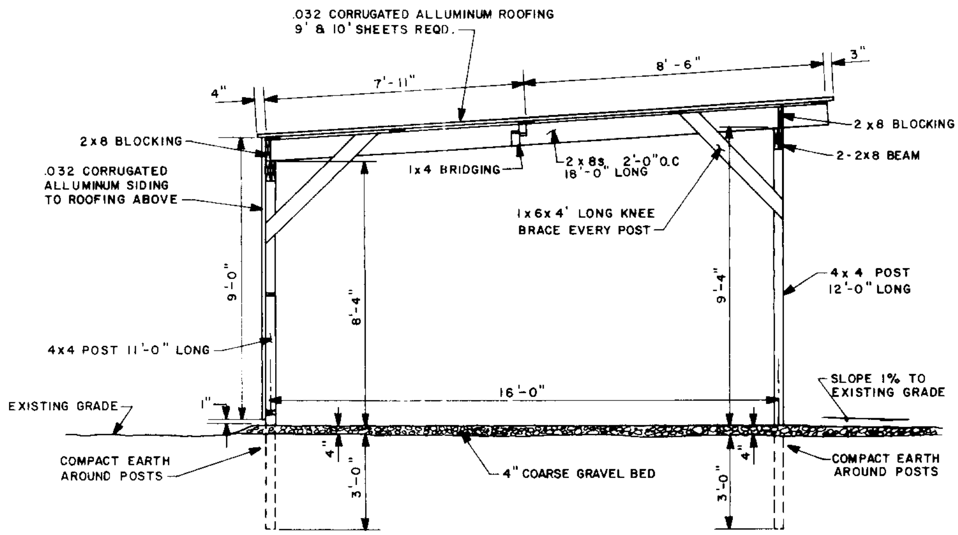
CHECKED BY 2/27/83

APPROVED BY 2/27/83



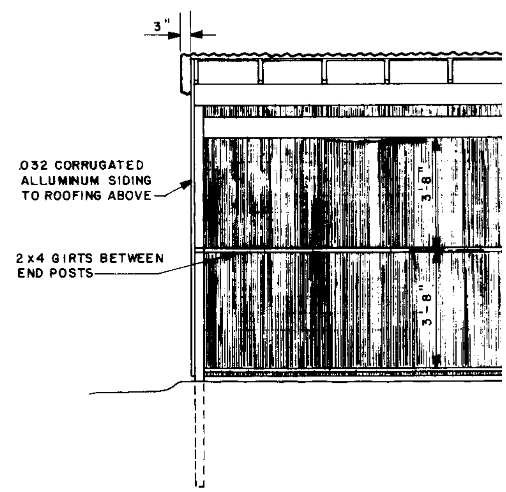
FLOOR & ROOF FRAMIN[G]

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



SECTION A-A

SCALE: 3/8" = 1'-0"

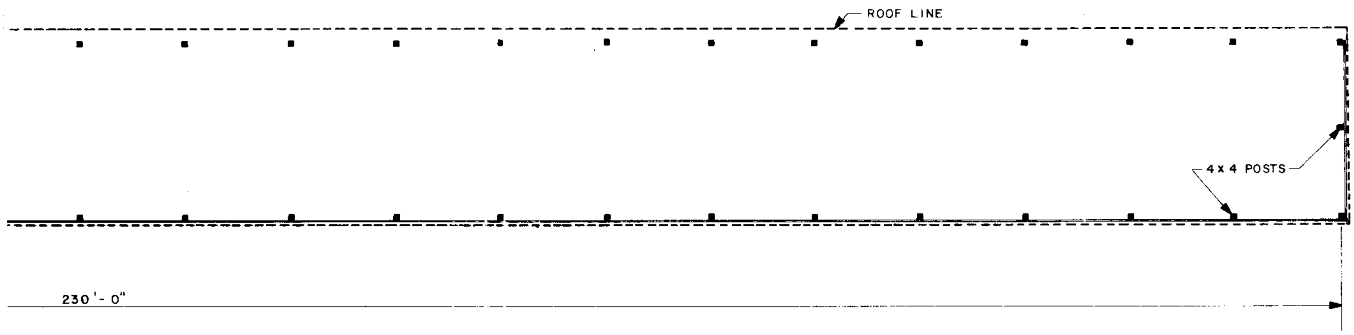


END BAY, FRONT

SCALE: 3/8" = 1'-0"

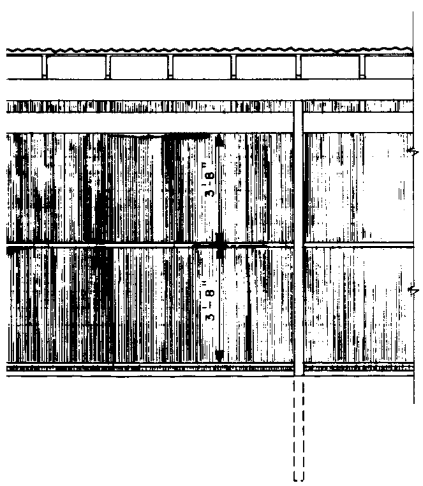
REFERENCE:
DEPT. OF THE ARMY, CHEMICAL CORPS, ROCKY MOUNTAIN ARSENAL, DENVER, COLORADO. DWG. NO. D2-71-2 TITLED: I.O.D. AREA DRUM STORAGE SHED, PLAN AND DETAILS - BLDG. NO. 1740. DATED: 5/15/53.

(2)



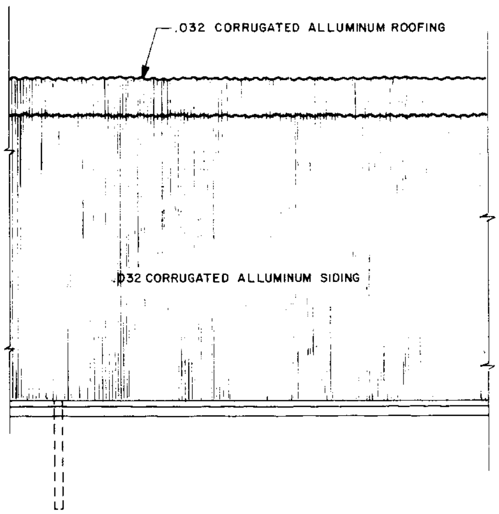
R & ROOF FRAMING PLAN

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



END BAY, FRONT ELEV.

SCALE: 3/8" = 1'-0"



TYP. BAY, REAR ELEV.

SCALE: 3/8" = 1'-0"

FIGURE 4-19

TYPICAL PLAN AND SECTION
OF STORAGE SHEDS

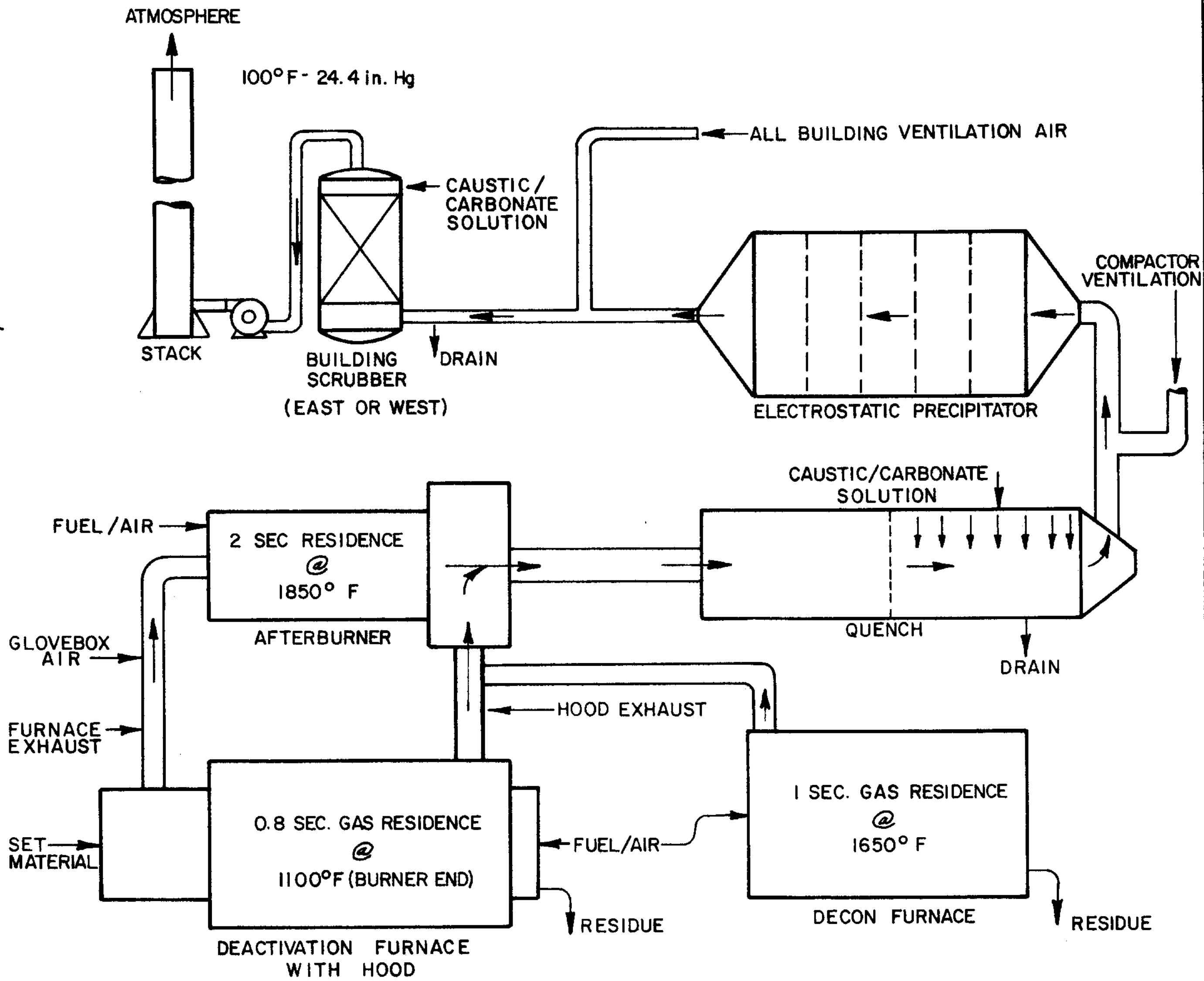


FIGURE 4-20

NORTH PLANTS INCINERATOR
FLOW DIAGRAM

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

REFERENCE:

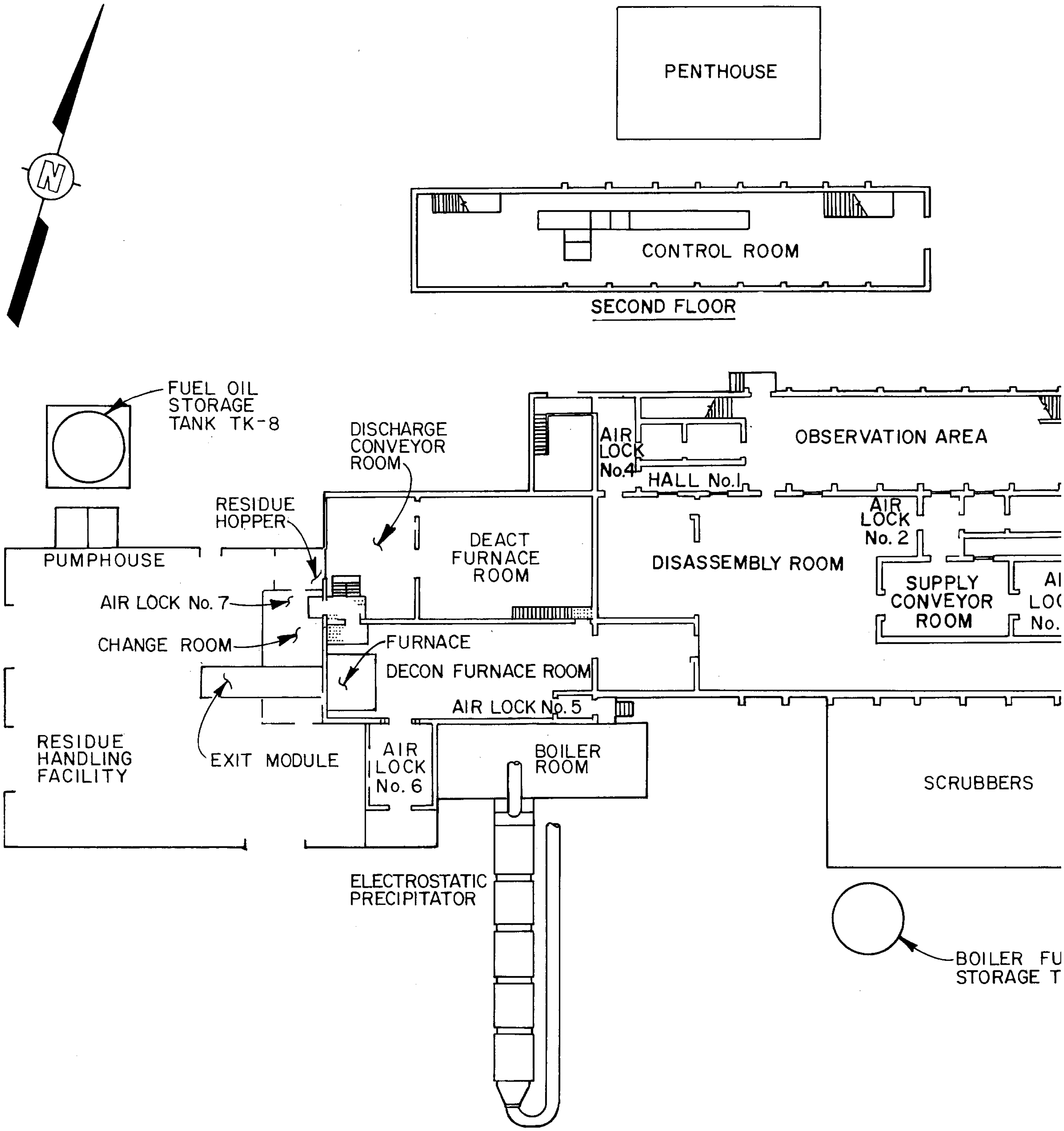
SCOTT et al. FINAL
PILOT TEST REPORT.
FIGURE 1-3, DATED: 1980.

DRAWN BY D.J. Rodriguez 11-20-82 | CHECKED BY PRF 2/21/83 | APPROVED BY JCM 2/27/83 | DRAWING NUMBER RM82-1981-A4

DRAWN BY: RDB 4-26-83

CHECKED BY / APPROVED BY: PRF 4/26/83

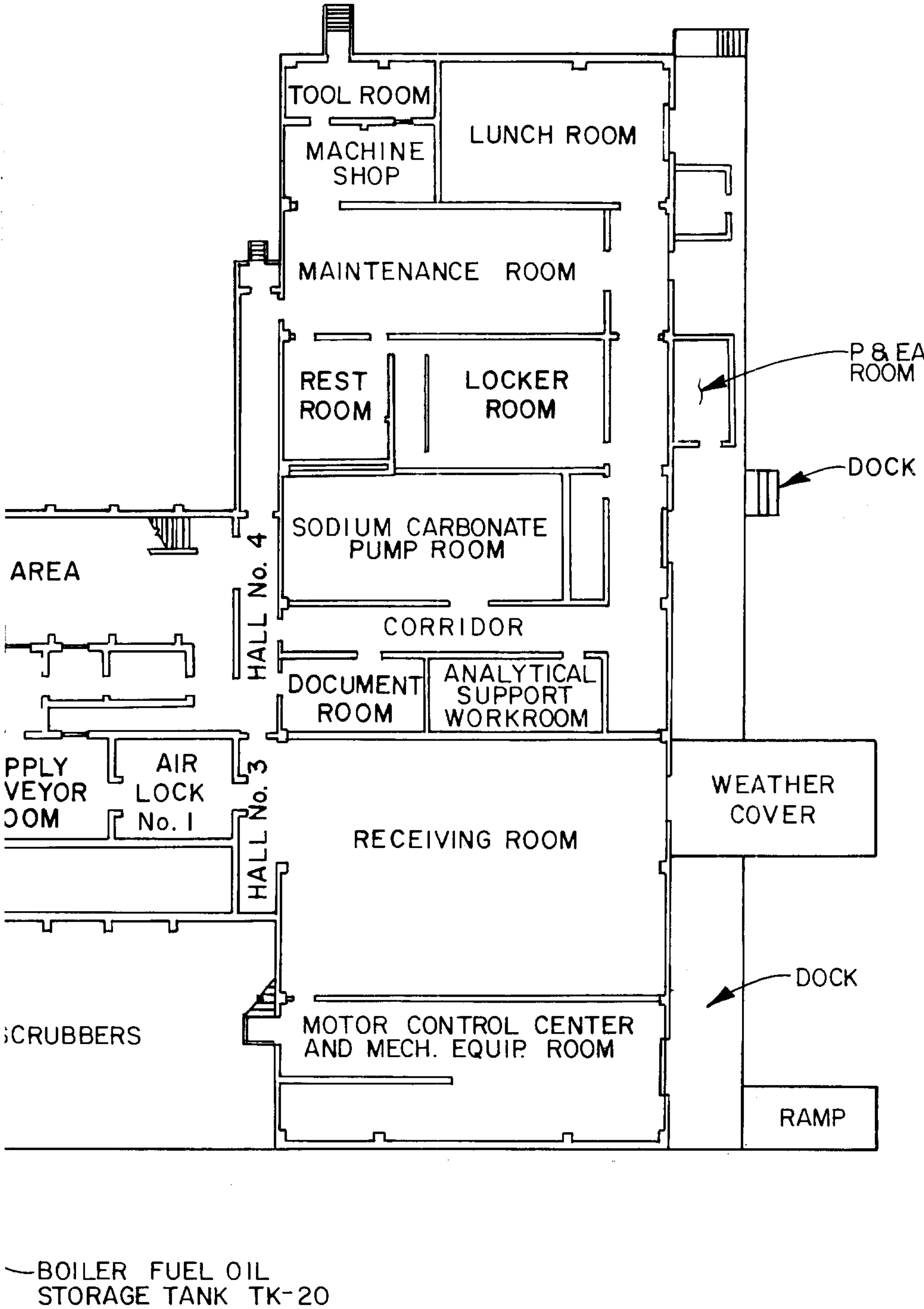
DRAWING NUMBER: RM82-1981-B14



REFERENCE:

SCOTT et al. PILOT TEST REPORT. FIGURE 1-21, DATED: 1980

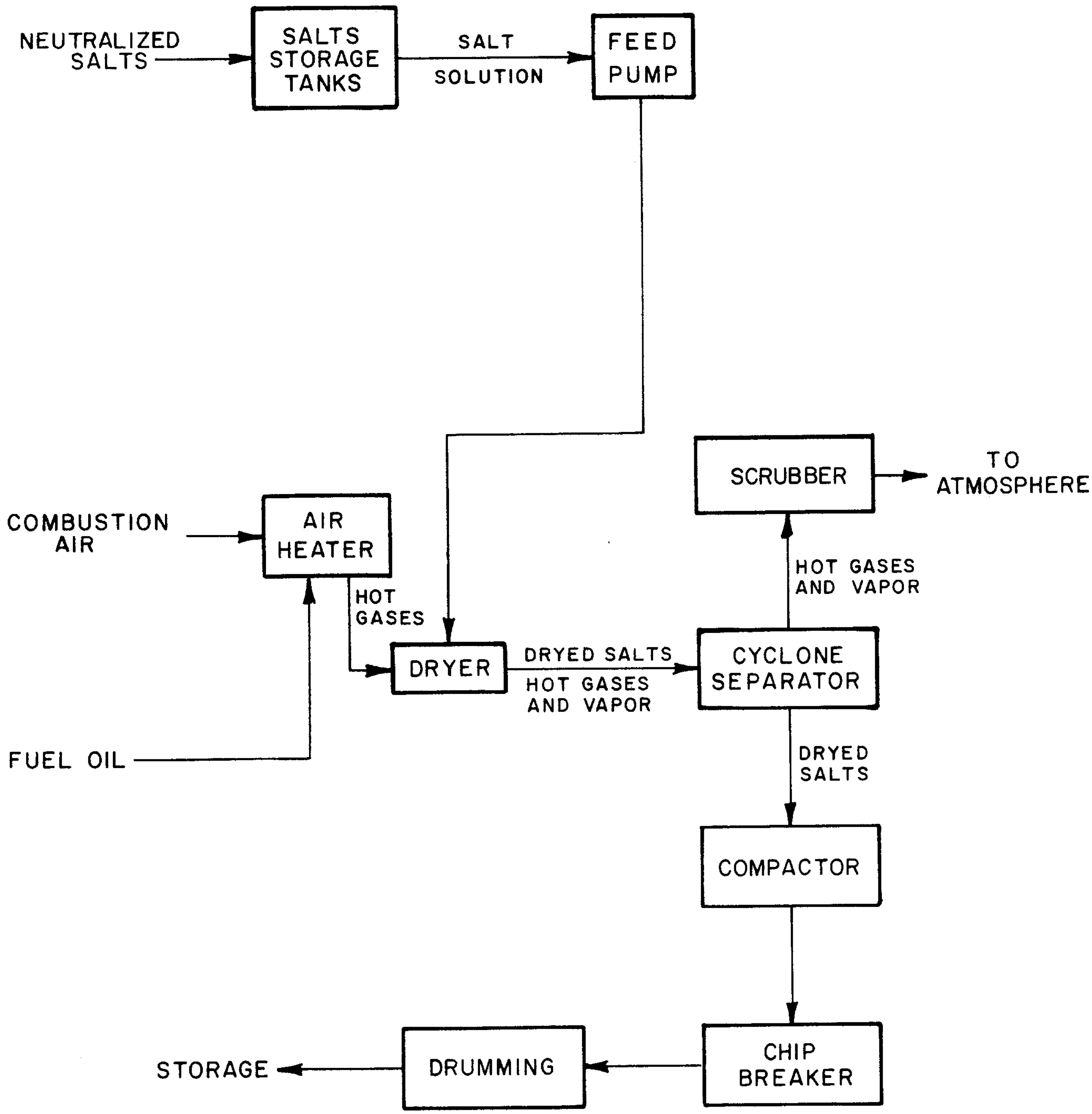
(2)



NOTE:
DRAWING NOT TO SCALE.

FIGURE 4-21

BUILDING 1611
FLOOR PLAN



DRAWN BY r. bricker 16 Nov. 82 | CHECKED BY PRF 2/27/83 | APPROVED BY JCM 2/27/83 | DRAWING NUMBER RM82-1981-A2

FIGURE 4-22

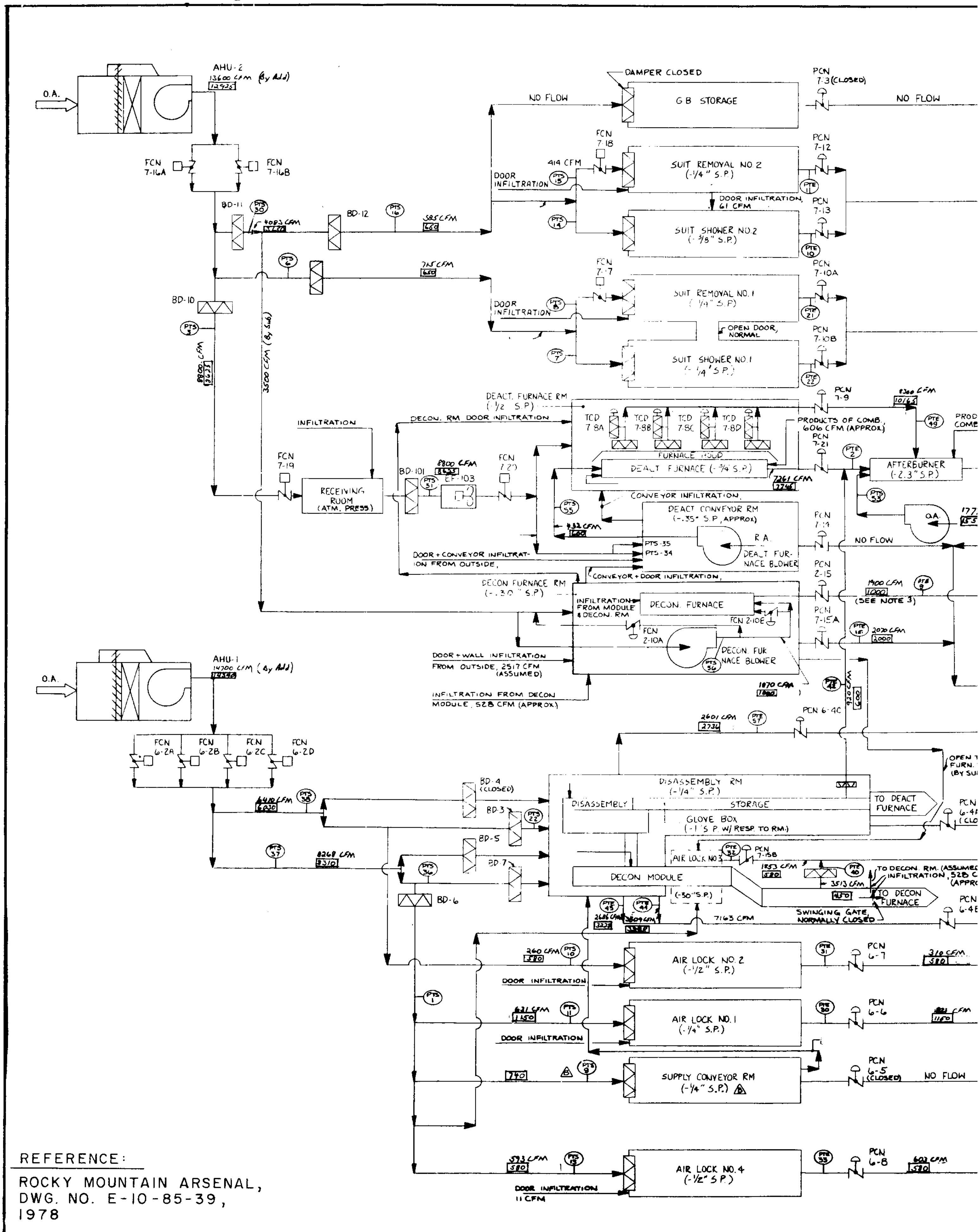
SALT SOLUTION STORING, DRYING AND DRUMMING BLOCK DIAGRAM

PREPARED FOR

DEPARTMENT OF THE ARMY
ROCKY MOUNTAIN ARSENAL
COMMERCE CITY, COLORADO

REFERENCE:
DEMILITARIZATION AND DISPOSAL OF THE M34 CLUSTER AT ROCKY MOUNTAIN ARSENAL, FINAL PLAN. DATED: FEBRUARY 1973.

①



REFERENCE:

ROCKY MOUNTAIN ARSENAL, DWG. NO. E-10-85-39, 1978

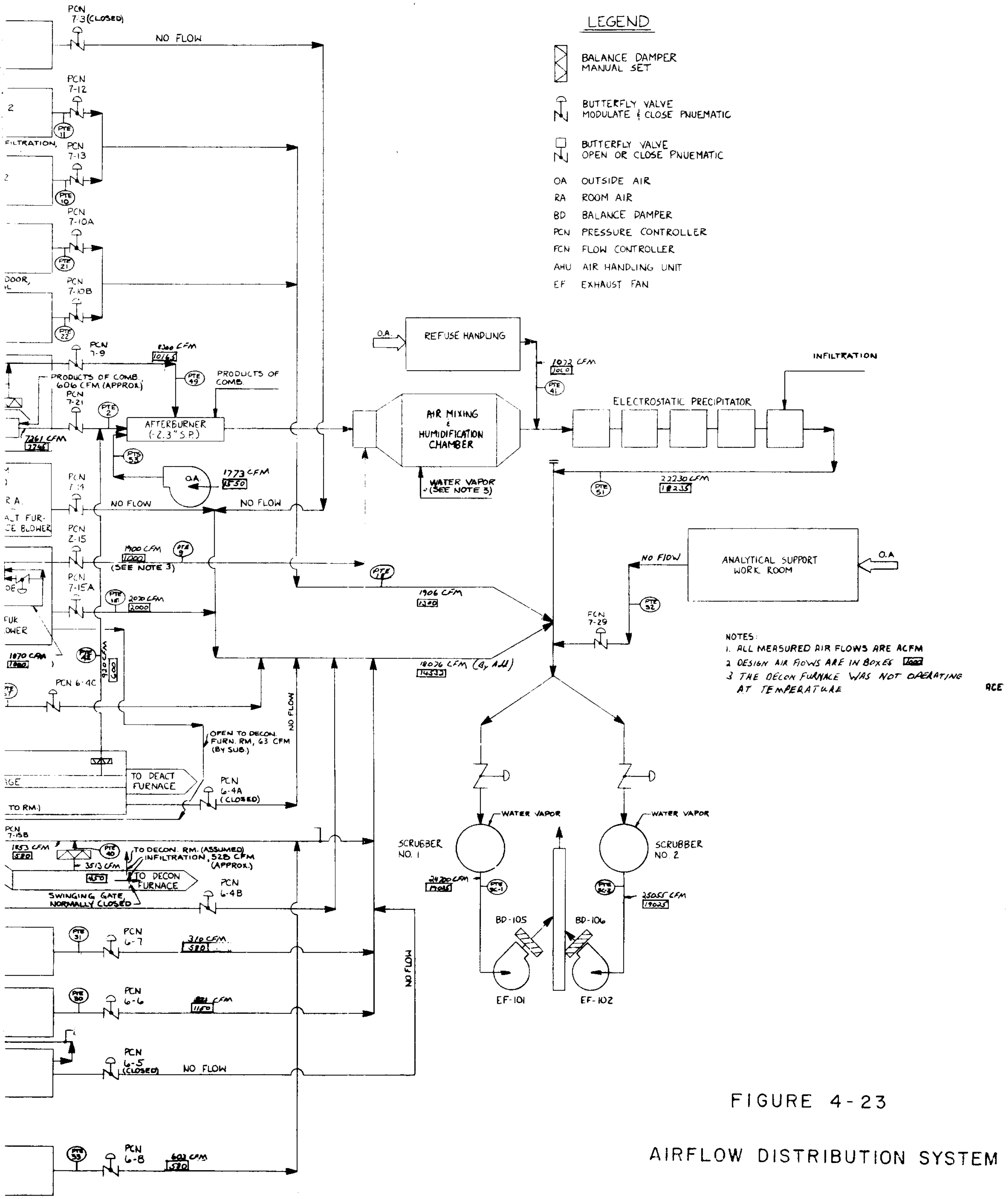
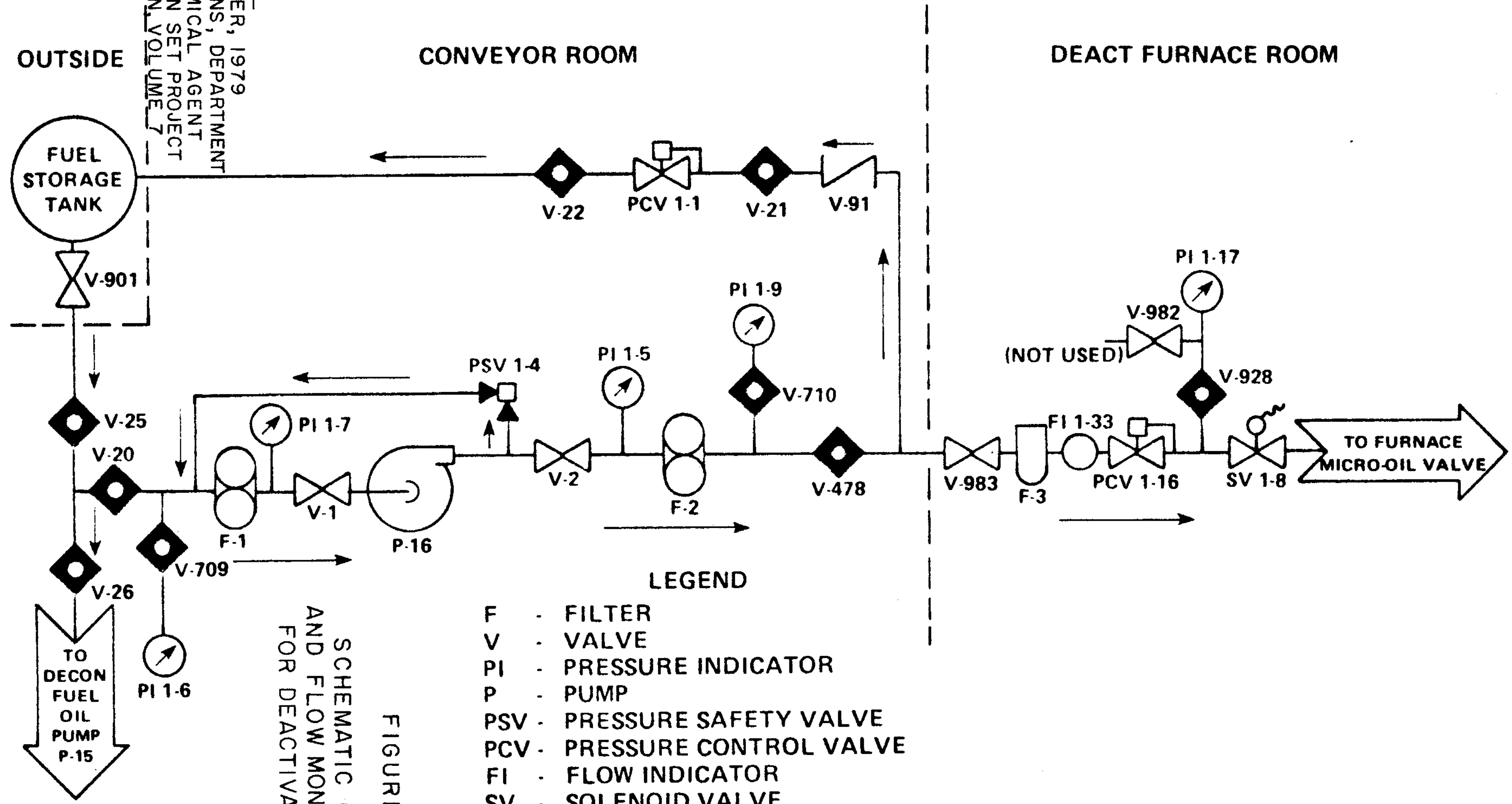


FIGURE 4-23

AIRFLOW DISTRIBUTION SYSTEM



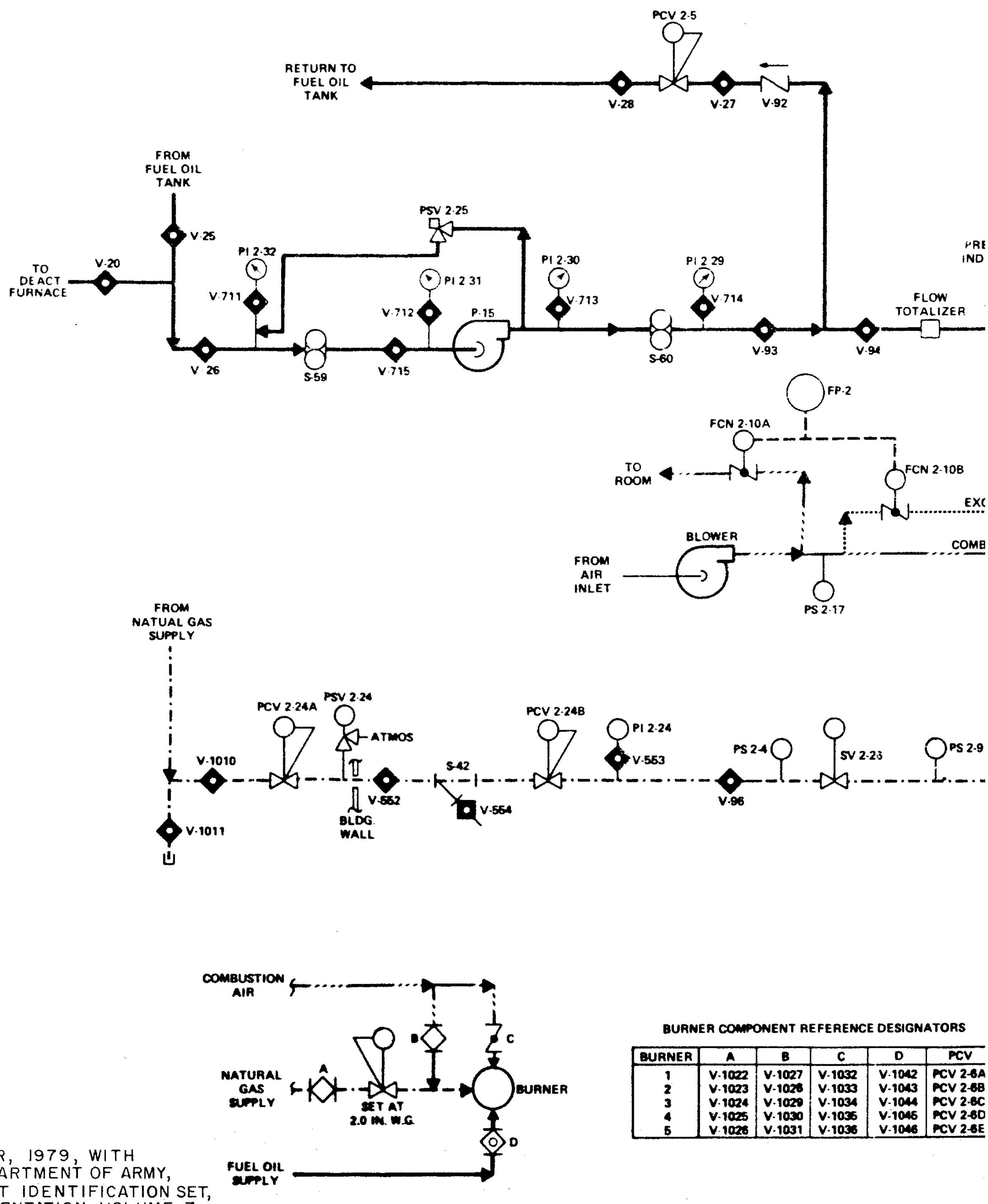
REFERENCE:
STEARNS-ROGER, 1979
WITH REVISIONS, DEPARTMENT
OF ARMY, CHEMICAL AGENT
IDENTIFICATION SET PROJECT
DOCUMENTATION, VOLUME 7

LEGEND

F - FILTER
V - VALVE
PI - PRESSURE INDICATOR
P - PUMP
PSV - PRESSURE SAFETY VALVE
PCV - PRESSURE CONTROL VALVE
FI - FLOW INDICATOR
SV - SOLENOID VALVE
→ - DIRECTION OF FLOW

FIGURE 4-24

SCHEMATIC OF PRESSURE AND FLOW MONITORING DEVICES FOR DEACTIVATION FURNACE



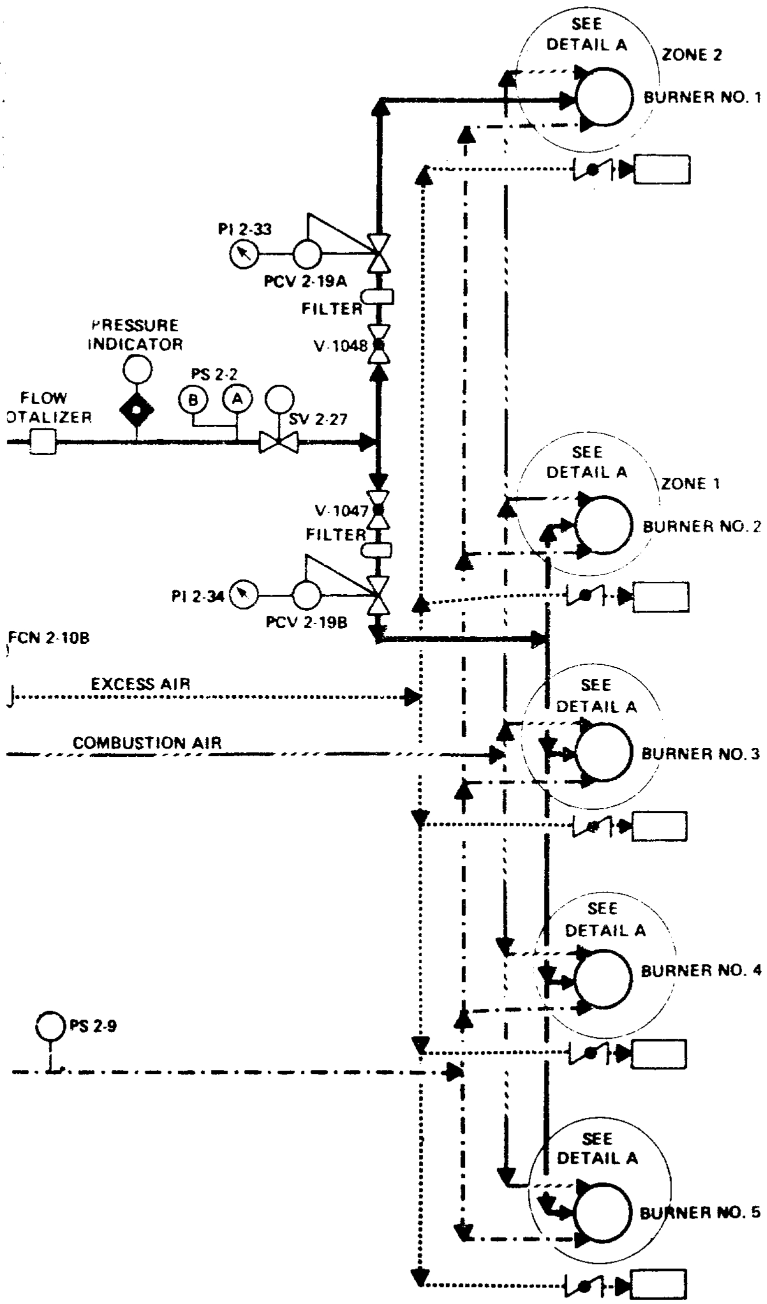
BURNER COMPONENT REFERENCE DESIGNATORS

BURNER	A	B	C	D	PCV
1	V-1022	V-1027	V-1032	V-1042	PCV 2-6A
2	V-1023	V-1028	V-1033	V-1043	PCV 2-6B
3	V-1024	V-1029	V-1034	V-1044	PCV 2-6C
4	V-1025	V-1030	V-1035	V-1045	PCV 2-6D
5	V-1026	V-1031	V-1036	V-1046	PCV 2-6E

REFERENCE:

STEARNS-ROGER, 1979, WITH REVISIONS, DEPARTMENT OF ARMY, CHEMICAL AGENT IDENTIFICATION SET, PROJECT DOCUMENTATION, VOLUME 7

(2)



LEGEND

- FCN - FLOW CONTROL DAMPER
- P - PUMP
- PCV - PRESSURE CONTROL VALVE
- PI - PRESSURE INDICATOR
- PS - PRESSURE SWITCH
- S - STRAINER
- SV - SOLENOID VALVE
- V - VALVE
- ——— FUEL OIL LINE
- -·-·- NATURAL GAS LINE
- ----- COMBUSTION AIR LINE
- ······· EXCESS AIR LINE
- — — — ELECTRICAL

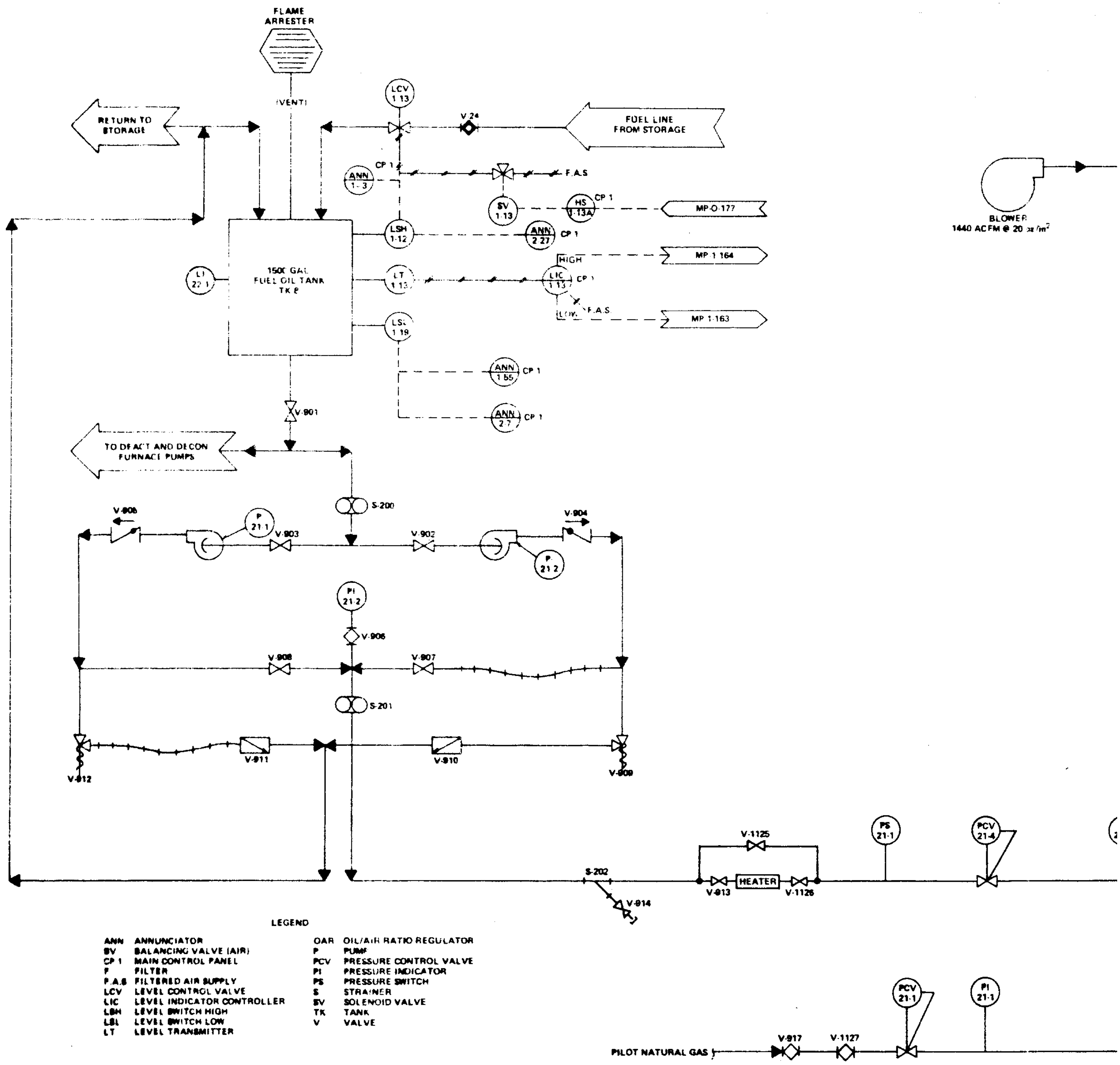
GNATORS

	PCV
42	PCV 2-6A
43	PCV 2-6B
44	PCV 2-6C
45	PCV 2-6D
46	PCV 2-6E

FIGURE 4-25

SCHEMATIC OF PRESSURE AND FLOW MONITORING DEVICES FOR DECONTAMINATION FURNACE

1



REFERENCE:

STEARNS-ROGER, 1979 WITH REVISIONS, DEPARTMENT OF ARMY, CHEMICAL AGENT IDENTIFICATION SET, PROJECT DOCUMENTATION, VOLUME 7

(2)

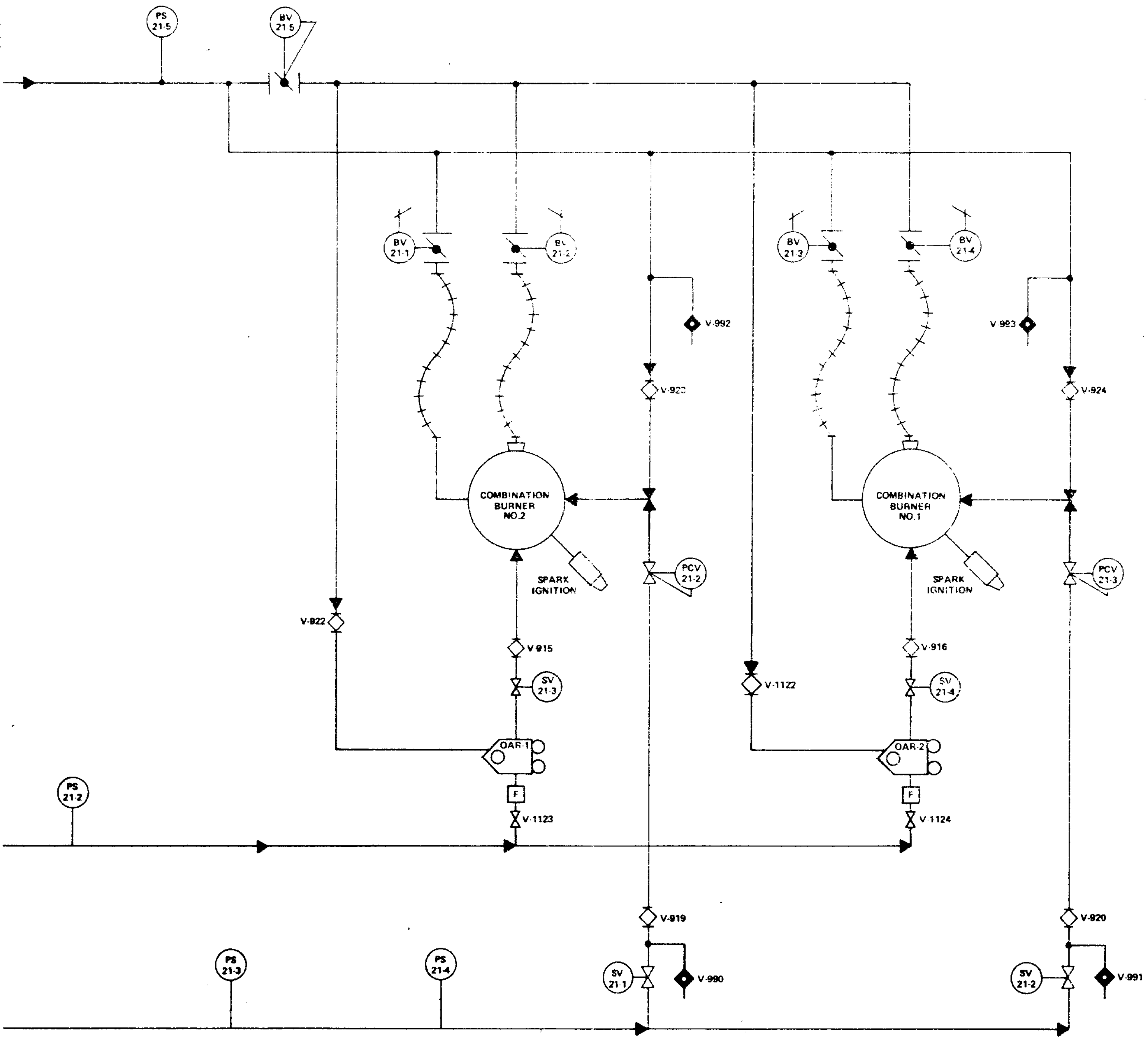
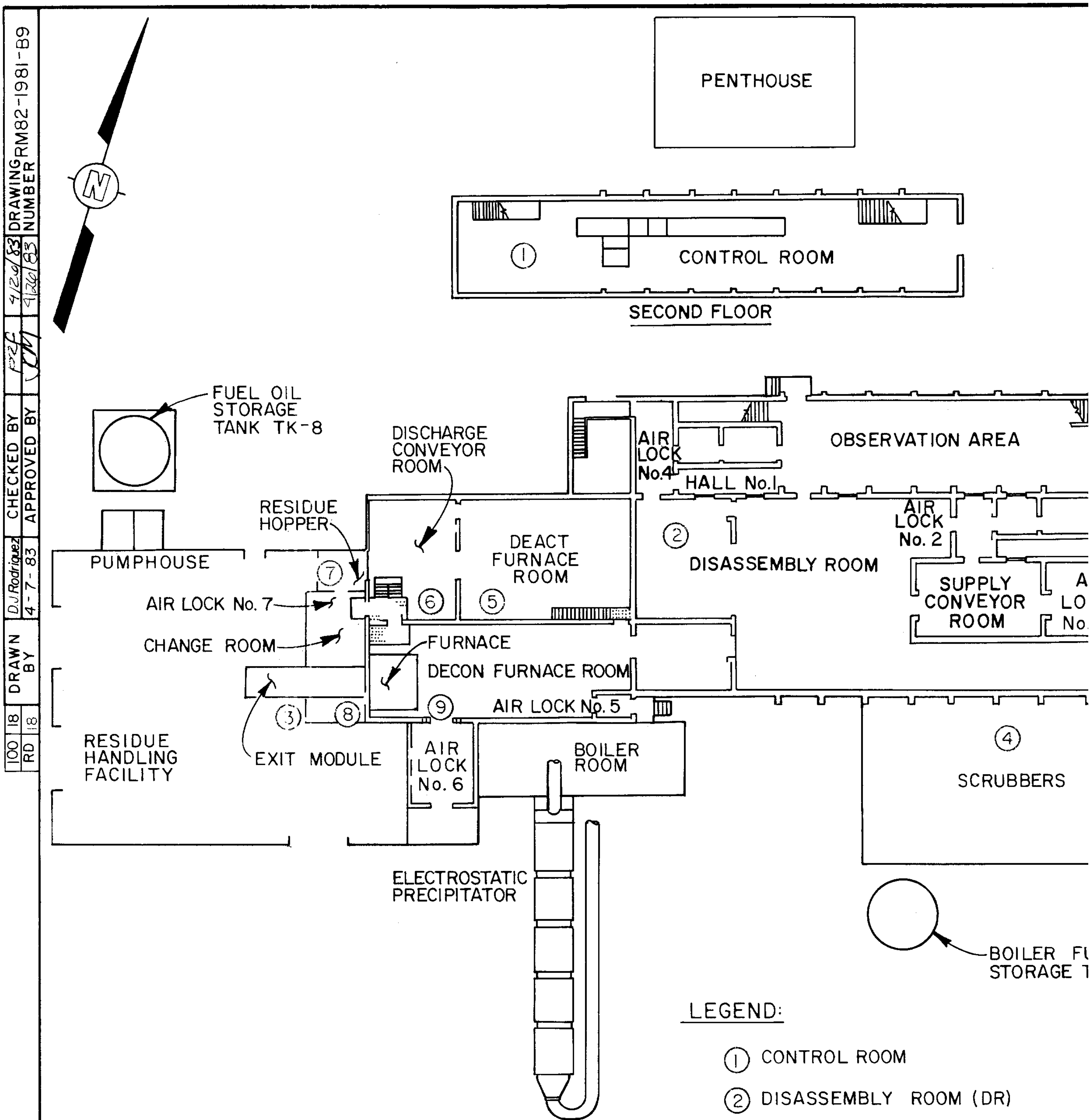


FIGURE 4-26

SCHEMATIC OF PRESSURE AND FLOW MONITORING DEVICES FOR AFTERBURNER

(1)

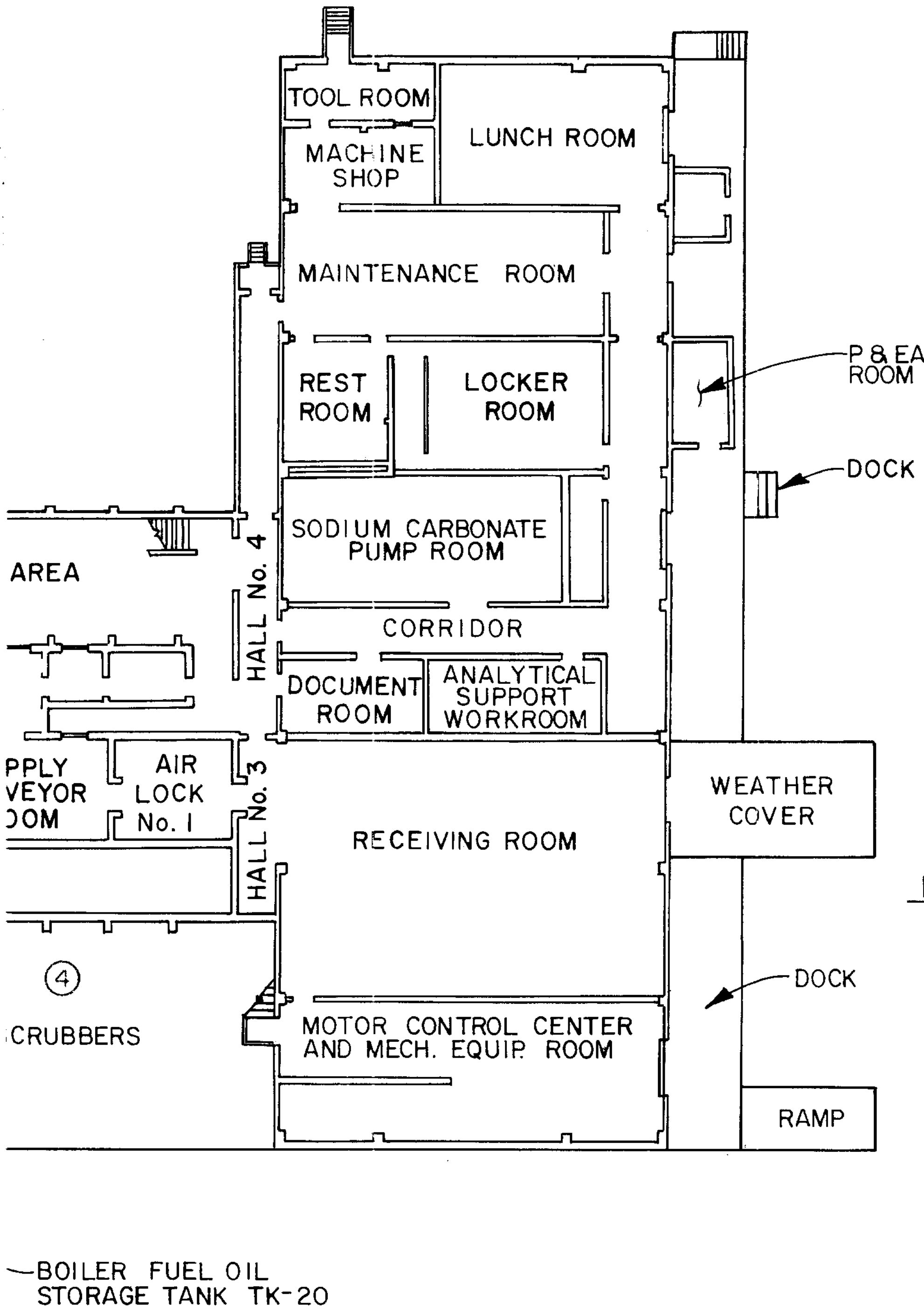


LEGEND:

1. CONTROL ROOM
2. DISASSEMBLY ROOM (DR)
3. RESIDUE AREA (RA)
4. STACK (ST)
5. DEACTIVATION FURNACE ROOM (D
6. CONVEYOR ROOM (CR)

REFERENCE:

SCOTT et al. FINAL PILOT TEST REPORT. FIGURE 1-21, DATED: 1980.



NOTES:

1. SAMPLING POINTS 10 AND 11 ARE IN THE SPRAY DRYER WHICH IS ADJACENT TO BUILDING 1611 IN BUILDING 1703.
2. DRAWING NOT TO SCALE.

(7) HOPPER ROOM (HR)

(DR) (8) EXIT SHROUD (EX)

(9) DECONTAMINATION FURNACE ROOM (DC)

(10) SPRAY DRYER STACK (DS)

ACE ROOM (DE) (11) SPRAY DRYER WORK AREA (SD)

)

FIGURE 4-27

LOCATION OF
AGENT SAMPLING POINTS