Site Characterization Plan

RMI-L-203

October 1993
Revision 0

RMI Project
Ashtabula, Ohio
DOE Contract No. DE-AC05-93OR-22103

RMI TITANIUM COMPANY EXTRUSION PLANT

RMI Titanium Company
Extrusion Plant
P.O. Box 579
Ashtabula, Ohio 44004

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Site Characterization Plan

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LIST OF ILLUSTRATIONS (Continued)

LIST OF ACRONYMS AND ABBREVIATIONS

AEC	United States Atomic Energy Commission
ASME	American Society of Mechanical Engineers
$BaCl_2$	Barium Chloride
bls	below land surface
BTP	Branch Technical Position
CAMU	Corrective Action Management Unit
CFR	Code of Federal Regulations
cm^2	centimeter squared
CMS	Corrective Measure Study
cm/sec	centimeter per second
cpm	counts per minute
DOE	United States Department of Energy
DOT	United States Department of Transportation
dpm	disintegrations per minute
DQO	Data Quality Objective
EIA	Erie International Airport
EP	Extraction Procedure
ES&H	Environmental Safety and Health
F	Fahrenheit
FEMP	Fernald Environmental Management Project
FR	Federal Register
G-M	Geiger Mueller
KCL	Potassium Chloride
kVA	kiloVolt ampere
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
mg/l	milligram per liter
MEI	Maximally Exposed Individual
MSL	mean sea level
MTI	Mitchell Transport Inc.
MTU	Metric Ton Units
MW	Monitoring Well
NaCL	Sodium Chloride
NESHAP	National Emissions Standard for Hazardous Air Pollution
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	United States Nuclear Regulatory Commission
NVO	Nevada Field Office
OHD	Ohio Division

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

OSHA	Occupational Safety and Health Administration
pCi/g	picocurie per gram
pCi/l	picocurie per liter
PID	Photoionization Detector
PTI	Permit to Install
PTO	Permit to Operate
Q-Jets	rooftop stacks
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFIES	RCRA Facility Investigation Equivalency Statement
RMI	RMI Titanium Company Extrusion Plant
RWP	Radiation Work Permit
SCM	SCM Chemicals Incorporated
SCP	Site Characterization Plan
SCR	Site Characterization Report
SDMP	Site Decommissioning Management Plan
SOHIO	Standard Oil Company, Ohio
SOP	Standard Operating Procedure
SR	Scoping Report
SRQAPP	Site Restoration Quality Assurance Program Plan
SWMU	Solid Waste Management Unit
Tc	Technetium
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TEGD	Technical Enforcement Guidance Document
Th	Thorium
TOC	Total Organic Carbon
TOX	Total Organic Halogens
U	Uranium
$\mu g/kg$	microgram per kilogram
$\mu g/\ell$	microgram per liter
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
yr	year

SECTION 1

INTRODUCTION

The RMI site is currently a radiologically contaminated site listed in the NRC's SDMP. Under contract with the DOE, RMI extruded depleted, normal and slightly enriched uranium for DOE Defense Programs. Uranium and uranium alloys, were extruded for commercial clients under the RMI NRC license. Slightly enriched uranium (up to 2.1 percent weight U-235) and a limited amount of thorium metal were extruded under Exclusion Section 110 of the Atomic Energy Act. A decommissioning project is being undertaken to safely remove the facility from service and reduce the residual radioactive contamination to a level which permits the site and adjacent areas to be released for unrestricted use. Completion of the decommissioning project will allow termination of RMI's radioactive material license, SMB-602, issued by the NRC.

A final draft Decommissioning Plan (RMI 1991a) was submitted to the United States Nuclear Regulatory Commission (NRC) for RMI on December 30, 1991. The NRC issued comments on March 31, 1993 in response to the Decommissioning Plan. The RMI material license, as issued by the NRC, SMB-602, was amended to require that a Site Characterization Plan (SCP) be prepared and submitted to the NRC for review. This document is submitted to fulfill the aforementioned NRC requirement.

1.1 Purpose and Scope

The purpose of the SCP is to provide a plan for characterizing the site in support of the decommissioning effort. The SCP describes the planned characterization activities to determine the nature, level, and extent of radiological and Resource Conservation and Recovery Act (RCRA) hazardous contaminants. This information will help to identify the areas requiring remediation and establish the necessary health and safety provisions for the protection of workers, the public, and the environment.

The area to be characterized is approximately 40 acres in size and is comprised of the RMI extrusion plant site, RMI-owned land to the south and east, and potentially affected privately owned lands located to the north and west of the extrusion plant site.

1.2 Objectives

Site characterization objectives are based on guidance presented in the NRC *Draft Branch Technical Position on Site Characterization of Decommissioning Sites* (BTP) (NRC 1992-), and in general address: (1) quantification of physical and chemical characteristics of radiological contamination and their extent, (2) quantification of environmental parameters that significantly affect potential human exposure from existing and potential future radiological contamination, and (3) support for the evaluation of alternate decommissioning actions and detailed planning of a preferred approach for decommissioning. For the RMI site, the characterization objectives are described in terms of the site media--groundwater, soils, and buildings/equipment.

1.2.1 Overall Objectives

Decommissioning to meet the NRC release criteria for unrestricted use requires that the site be characterized for radiological contamination. RCRA hazardous contaminants will be identified based on the United States Environmental Protection Agency (US EPA) requirements. The overall objectives of this SCP are to satisfy a broad range of data needs relative to natural physical conditions of the site, and to the nature, level, and extent of contamination. The overall objectives are:

1) Establish a baseline for natural conditions (background) with respect to known or suspected contaminants identified in Table 4-1 of Subsection 4.1 of the SCP and review existing data, reports, and the SR that serve as a basis for development of the media-specific or topically focused work plans

2) Establish the nature, level, and extent of contaminants listed in Table 4-1 of Subsection 4.1 in Areas A through G with respect to known or suspected contaminants for the individual areas by sampling and analysis of soils, groundwater, and buildings

3) Determine site stratigraphy and hydrogeology through the use of existing geological and hydrogeological data, geologic logging of borings, and geophysical borehole logging

4) Define local groundwater flow directions through use of existing groundwater data and by installing additional monitoring wells

5) Provide data to assess the concentration or exposure hazard and determine if special precautions or monitoring of the contaminants during remediation are required

6) Provide data to support engineering evaluation, selection, and design of remediation options, and assist in preparation for the final termination survey

These overall objectives are supported by a series of media-specific objectives which provide guidance for the various site characterization work plans. Discussion and presentation of the media-specific objectives are presented in Subsection 1.2.2.

1.2.2 Media-Specific Objectives

1.2.2.1 Groundwater Objectives

Radiological and RCRA hazardous materials characterization activities for the groundwater at RMI will meet the following objectives:

1) Collect hydrogeologic information and data for areas potentially contaminated by release sources and the general site area

2) Establish background concentrations for contaminants and selected analytical screening parameters

3) Define the vertical and horizontal extent and concentration of groundwater contamination present

4) Establish initial concentrations of contaminants and selected analytical screening parameters

1.2.2.2 Soils Objectives

Radiological and RCRA hazardous materials characterization activities for the soils at RMI will meet the following objectives:

1) Evaluate the degree and lateral extent of radiological and RCRA contamination

2) Generate baseline radiological and RCRA data for potential decommissioning wastes

3) Evaluate the ability to meet disposal site waste acceptance criteria as established in *Nevada Test Site Waste Acceptance Criteria, Certification, and Transfer Requirements* (Nevada Field Office [NVO]-325, Rev. 1) (DOE 1992) and assist in development of waste volume estimates

1.2.2.3 Buildings/Equipment Objectives

Radiological and RCRA hazardous materials characterization activities for the buildings and equipment at RMI will meet the following objectives:

1) Establish baseline radiological characterization data for estimating total U, isotopic U, Th-232, and Tc-99 concentrations in potential decommissioning wastes and for evaluating the ability of these wastes to meet disposal site acceptance criteria.

2) Provide additional data to verify the levels of Th-232, Tc-99 and TRU contamination are not significant contributors to worker exposures and special precautions or monitoring of these contaminants during decommissioning are not required.

3) Provide a structured approach for identifying materials which may become a RCRA hazardous waste during building decommissioning.

4) Provide data to further define the scope of remediation activities that includes determining if the soil and utilities underneath the buildings are contaminated and the depth of penetration of contamination on selected concrete surfaces.

5) Provide data to support engineering evaluations of decontamination techniques to allow unrestricted release of equipment and building materials.

6) Provide data to support the development of dose assessments and the establishment of cleanup levels.

1.3 Site Characterization Approach

A media-specific, phased investigation approach was selected to meet the overall objectives. Having selected the specific medium of interest, a methodology for data acquisition, sampling and analysis was developed. Development of individual work plans based on the three specific media (i.e., groundwater, soils and buildings/equipment) provides a basic framework for characterization activities. Figure 1-1 illustrates the position of the work plans in the document hierarchy.

The NRC identifies the first step for site characterization as review and collection of site physical data, contamination data, and scoping survey data to provide a preliminary assessment of site conditions relative to guideline values. This activity provides data which allows for preliminary classification of the site into affected and unaffected areas. The information is summarized in a report that serves as the justification and basis for developing the overall site characterization plan.

The *Site Scoping Report* (SR) (PARSONS 1993a) was prepared to summarize existing RMI site data, radiological and non-radiological, including limited direct measurements and samples obtained from both on-site and off-site locations as of February 1993. The SR summarizes scoping activities described in draft *Manual for Conducting Radiological Surveys in Support of License Termination* NUREG/CR-5849 (NRC 1992b). Information from the SR is presented in Sections 2 through 4.

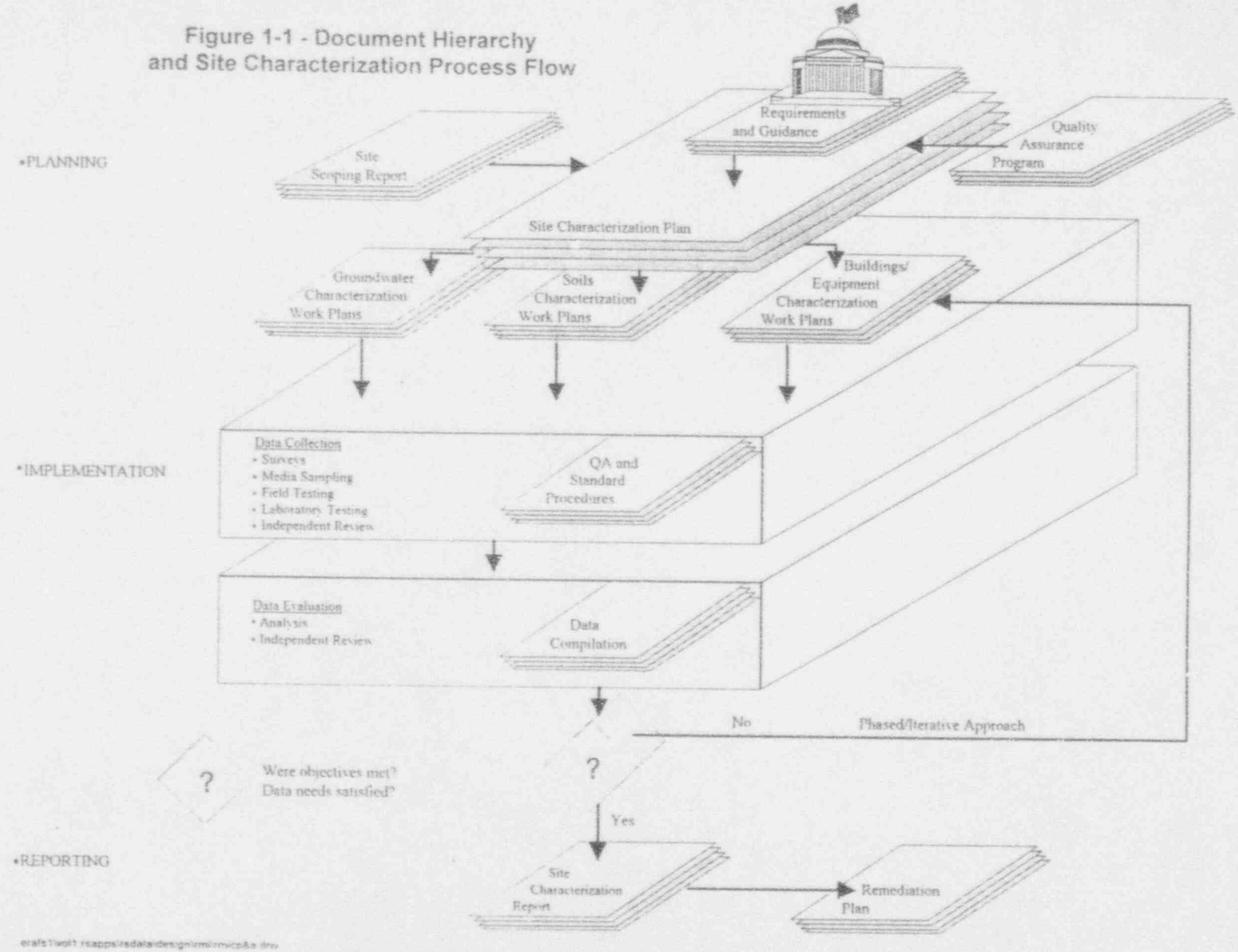


Figure 1-1 - Document Hierarchy and Site Characterization Process Flow

The SR provides only a preliminary definition of the boundaries of the affected and unaffected areas. Further site characterization efforts will refine the nature and extent of contamination in the unaffected and affected areas. The information and data contained in the SR provided the technical basis for the site characterization.

The SCP was prepared following the general guidance of the BTP. Attendant work plans address the various media. These work plans are based on data needs identified in the SR and describe the field and laboratory data collection activities required to satisfy media-specific objectives. Standard procedures developed in accordance with the *Site Restoration Quality Assurance Program Plan* (RMI 1993) are used to implement for the field, laboratory, and administrative tasks, and assure data quality.

The characterization investigations are designed to be conducted in phased steps thereby providing opportunities for in-progress evaluation of data and flexibility for program adjustment. Further details concerning the overall characterization approach are found in Section 5.

1.4 Site Characterization Plan Organization

The SCP is composed 13 sections. Sections 2 through 4 provide information to facilitate understanding of general site information, physical characteristics, and nature of contamination. The information contained in Sections 5 through 8 presents the overall guidance, approach, and technical basis for the site characterization. Summary statements describing each section are presented below.

Section 1	Introduces the RMI site as an SDMP site, the objectives of the site characterization, and provides a general overview of the site characterization approach.
Section 2	Provides a description of the site and general physical setting information.
Section 3	Describes the physical characteristics of the site.
Section 4	Identifies known or suspected contaminants and presents a preliminary evaluation of contaminant nature, level, and extent, based on the SR. A preliminary dose assessment is described and an initial delineation of radiologically affected areas is presented.
Section 5	Presents details of the overall approach to conducting the site characterization, including the overall regulations and guidance for the site characterization, a description of work plan content and format, and characterization project management organization and responsibilities.

Section 6	Presents the groundwater characterization data needs based on the SR and the technical basis for the groundwater characterization work.
Section 7	Presents the soils characterization data needs based on the SR and the technical basis for the soils characterization work.
Section 8	Presents the buildings characterization data needs based on the SR and the technical basis for the buildings characterization work.
Section 9	Discusses the quality assurance\quality control measures that will be implemented during site characterization activities.
Section 10	Identifies the health and safety requirements.
Section 11	Presents a general schedule for sequence and duration for the media specific characterization activities.
Section 12	Identifies the Site Characterization Report to be issued at the end of site characterization.
Section 13	Provides references.

SECTION 2

GENERAL

2.1 Site Location and Description

2.1.1 Location

RMI is located in northern Ashtabula County, Ohio, approximately 2 miles northeast of the center of the City of Ashtabula. Geographically, the plant is situated approximately 1 mile south of Lake Erie and approximately 15 miles west of the Ohio-Pennsylvania border (Figure 2-1). Several chemical production and metal conversion facilities are located nearby. Figure 2-2 shows the RMI site.

2.1.2 Buildings Description

2.1.2.1 Buildings Layout and Description

The RMI Extrusion Plant facility consists of 25 buildings and occupies 7 acres of a 40-acre area to be investigated (Figure 2-3). All facility buildings are surrounded by a perimeter security fence. Of the 25 buildings, RMI owns 12 and the DOE owns 13.

Each building, its floor dimension, and associated floor area are listed in Appendix A, Table A-1. Figure 2-4 shows the layout and major equipment contained in the buildings at the site. Appendix A, Table A-2 provides a brief description of each building. Appendix A, Table A-3 lists the stacks, locations, and associated uses past and present.

2.1.2.2 Utilities and Miscellaneous Structures

Various utilities were required for the operation of the RMI site. The utilities consisted of those for general metal working processes (i.e., extruding and forging). The switchgear and air compressor rooms are presented in the building section of Appendix A, Table A-2. Cleveland Electric and Illuminating owns substation located on the northeast corner of the fenced facility area. An exterior 100 KVA transformer adjacent to the Die Head Filter Building was added in 1987 to provide power for the new High Efficiency Particulate Air ventilation systems being added at that time. A 500 KVA transformer is located in the RF-6 Butler building and supplies power to that building, the Modular Offices and Lab, the RF-6 Addition, and the Northwest Warehouse. The Ashco water line (see Figure 2-5) was installed to supply water for process operations but was not used. Underground utility lines which are no longer in use have been left in place (see Figure 2-5).

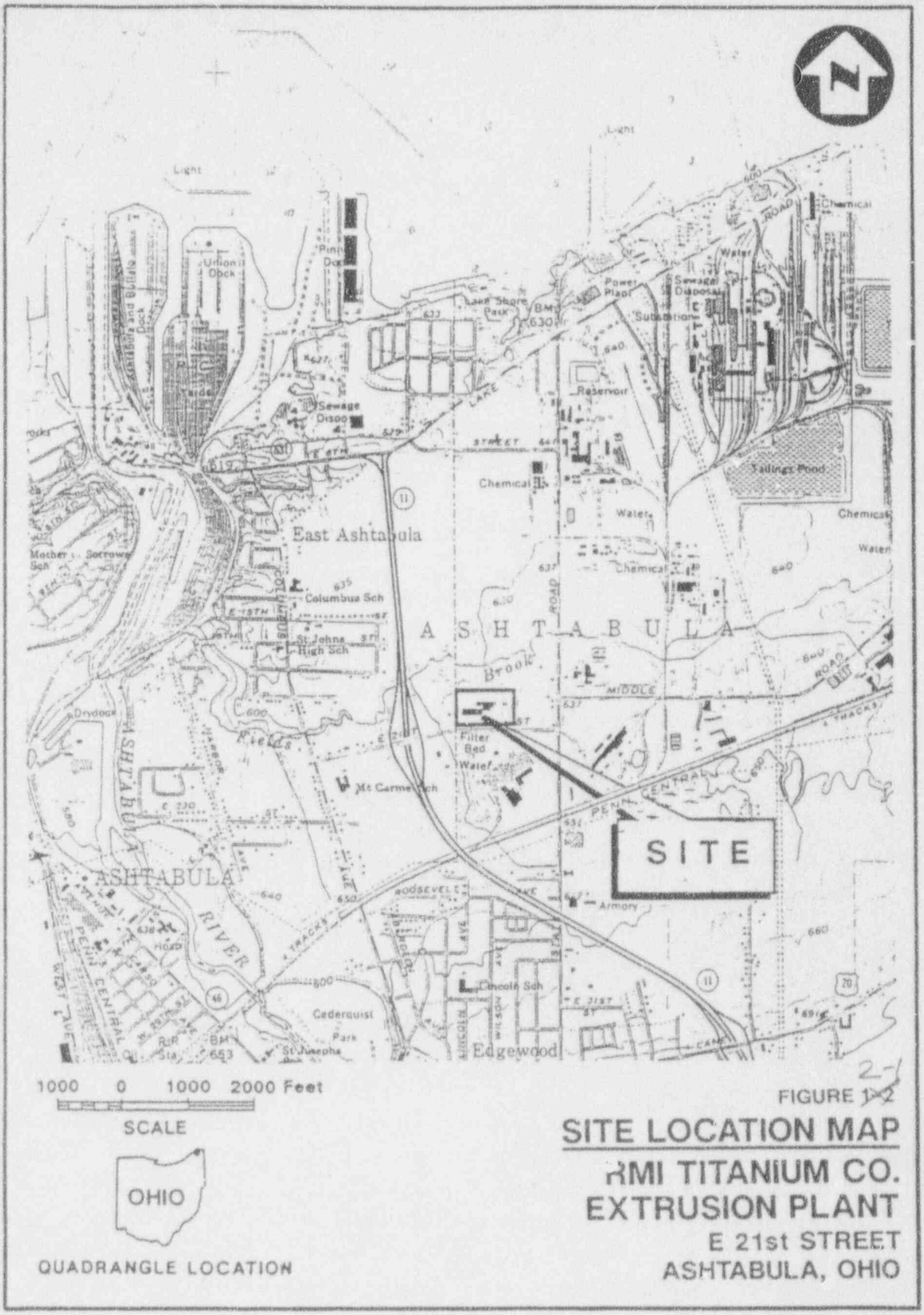


Figure 2-1 - RMI Titanium Company Extrusion Plant Site Location Map

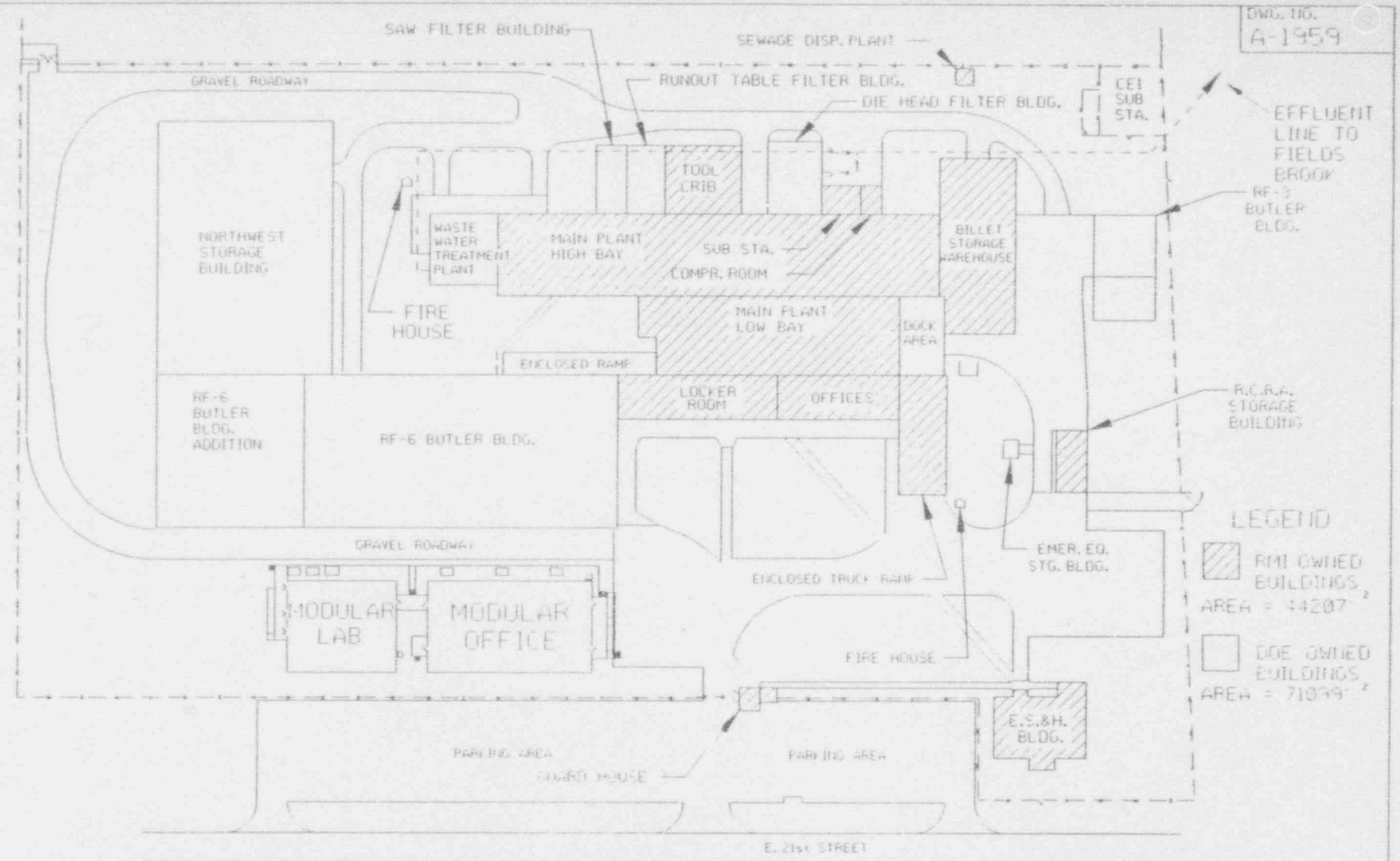


Figure 2-3 - RMI Site Buildings Layout

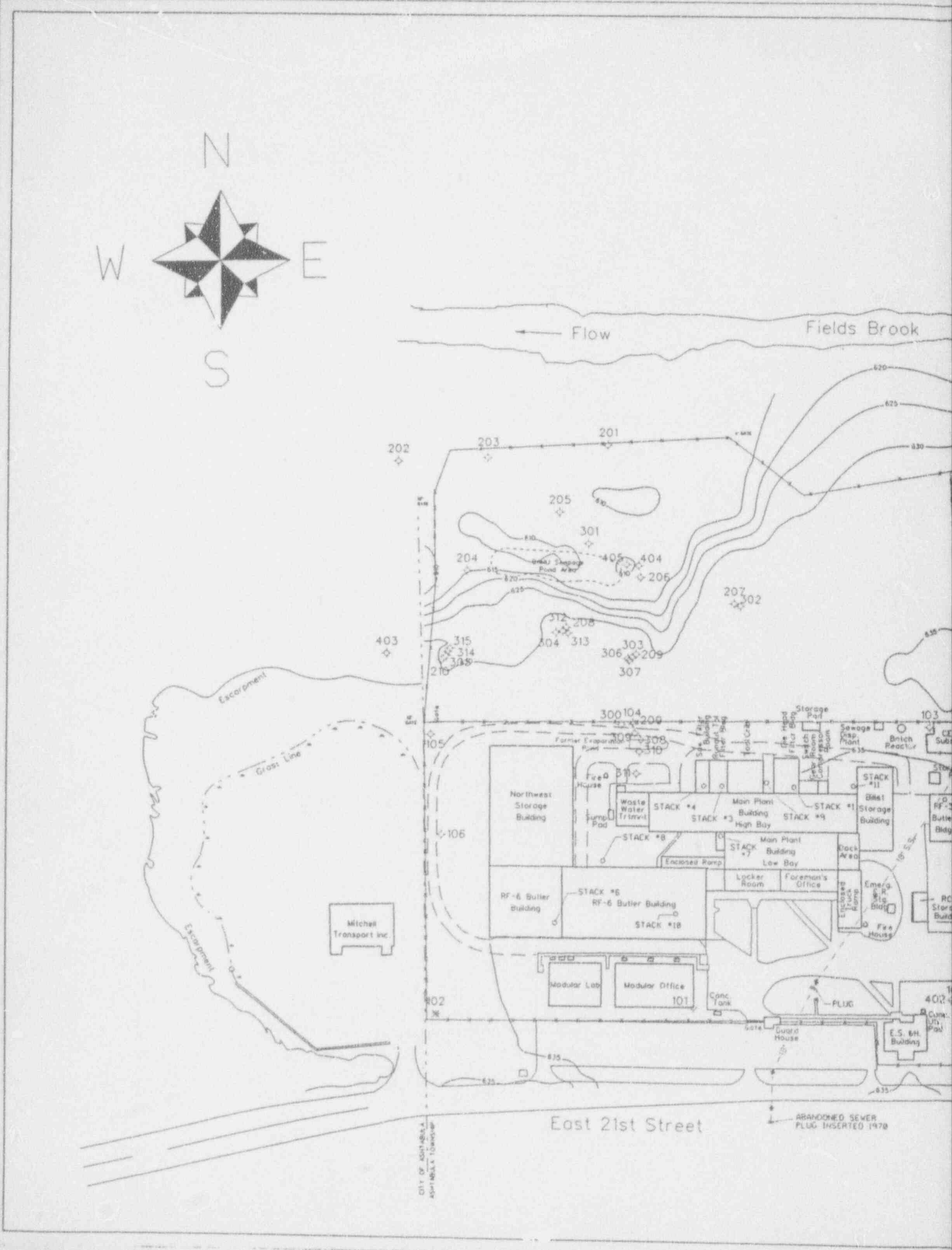
2-4

REVISION			REVISION		
DATE	NO	DESCRIPTION	DATE	NO	DESCRIPTION
4/10/92	4	CORRECTED EFFLUENT LINE LOC	3/7/91	3	ADDED EFFLUENT LINE ALSO
					CORRECTED RMI BLDG. SQ. FT.
			1/25/91	2	ADDED MODULAR OFF & LAB
			3/2/92	1	CORRECTED BLDG. AREA

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DATE	SCALE	CHK'D BY	DWN. BY	
	1"=40'		JONES	

TITLE: RMI & DOE OWNED BUILDING AREA SITE PLAN


N
W
E
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Flow
Fields Brook
202
203
201
205
301
204
405
404
206
207
302
312
208
304
313
403
315
314
210
306
303
209
307
Escarpment
Grass Line
300
104
200
103
105
Former Evaporation Pond
309
308
310
311
Storage Pad
Sewage Disp. Plant
Batch Reactor
Fire House
Northwest Storage Building
Waste Water Trtmnt
Pump Pad
STACK #4
STACK #3
Main Plant Building High Bay
STACK #9
STACK #1
STACK #11
Billet Storage Building
STACK #8
106
STACK #7
Main Plant Building Low Bay
Dock Area
Enclosed Ramp
Locker Room
Foreman's Office
RF-6 Butler Building
STACK #6
RF-6 Butler Building
STACK #10
Enclosed Truck Ramp
Fire House
Mitchell Transport Inc.
Escarpment
Modular Lab
Modular Office
101
Conc. Tank
PLUG
102
Gate
Guard House
E.S. &H. Building
East 21st Street
ABANDONED SEWER PLUG INSERTED 1970
CITY OF ASHTABULA
ASHTABULA TOWNSHIP

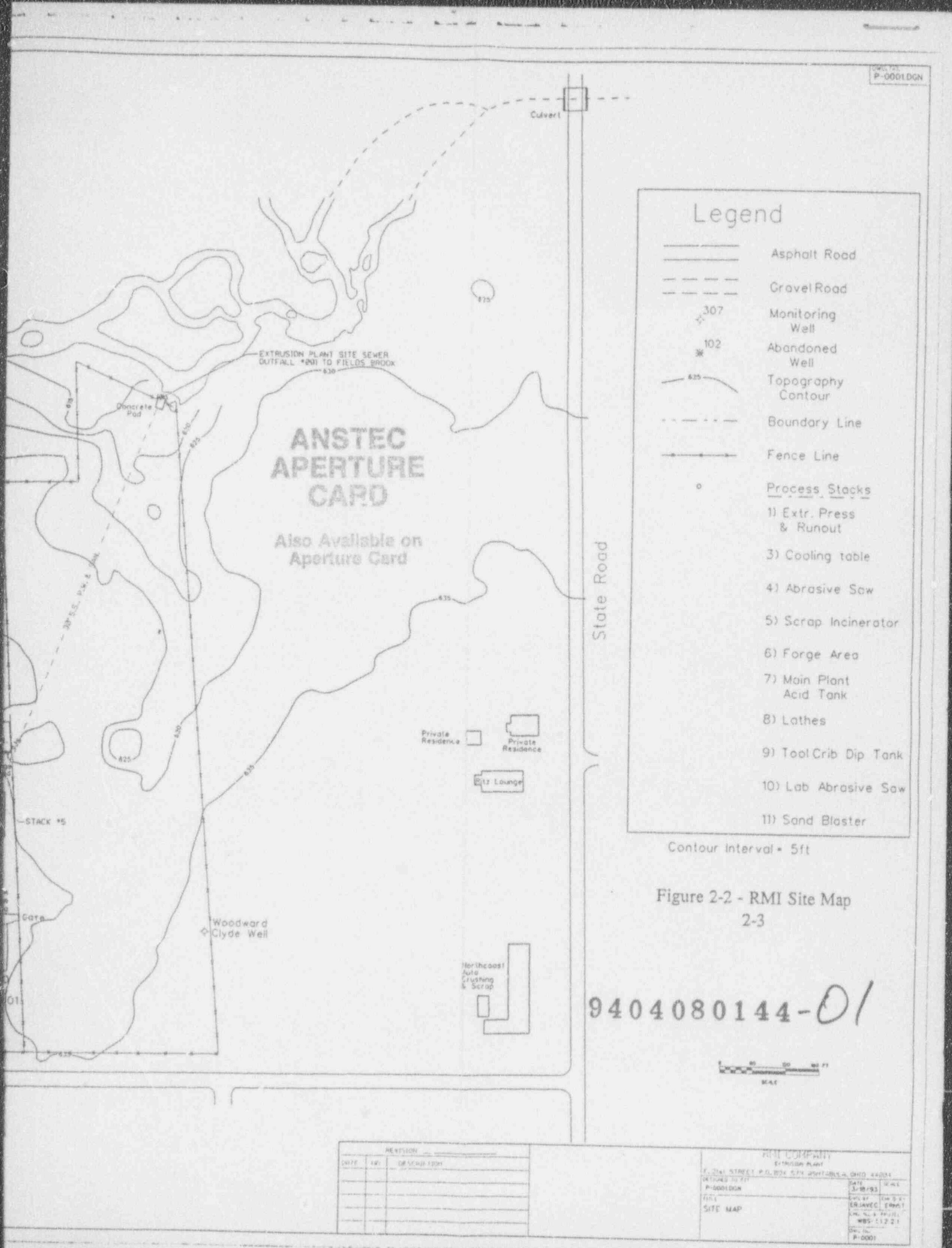


Figure 2-2 - RMI Site Map

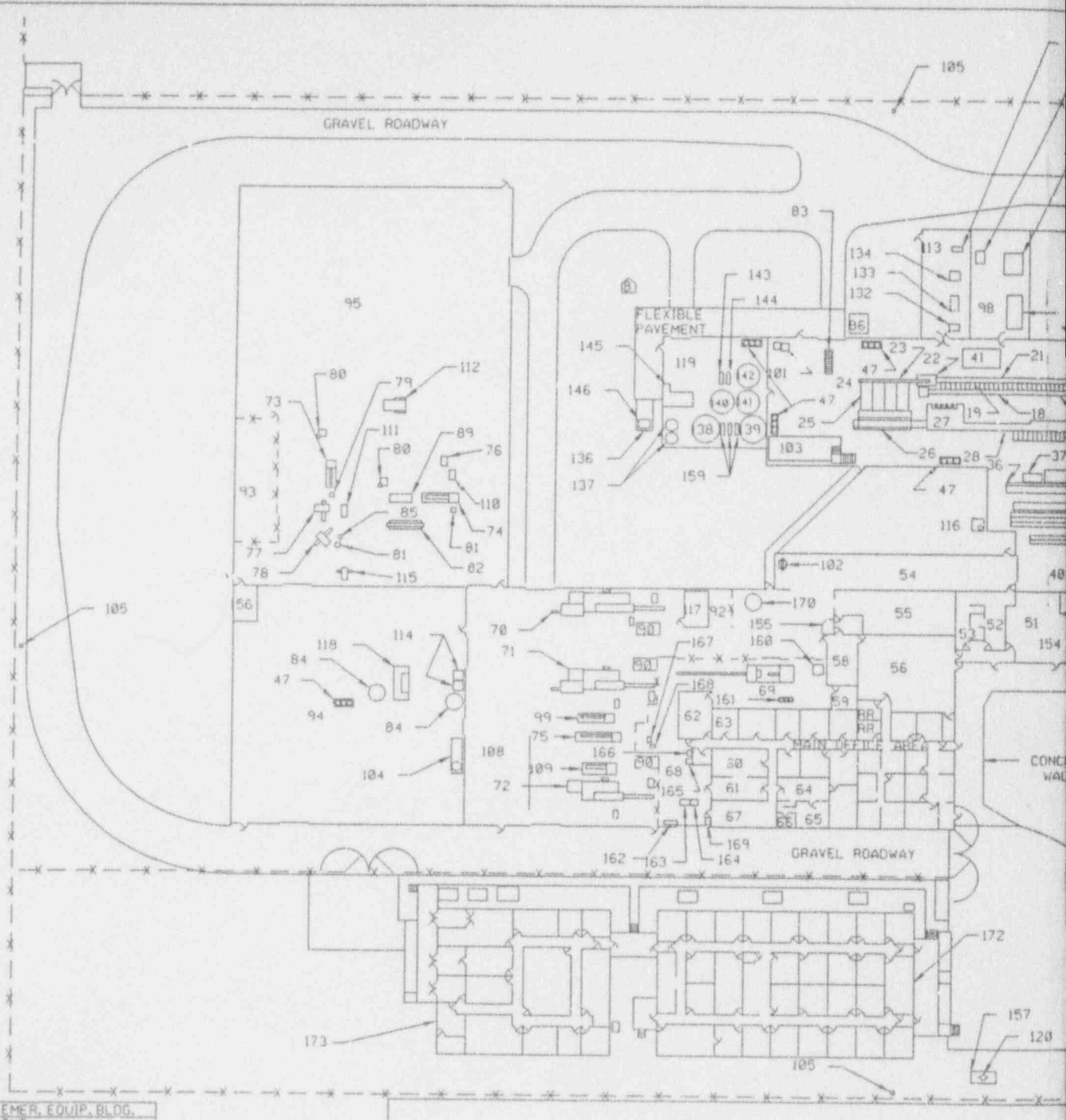


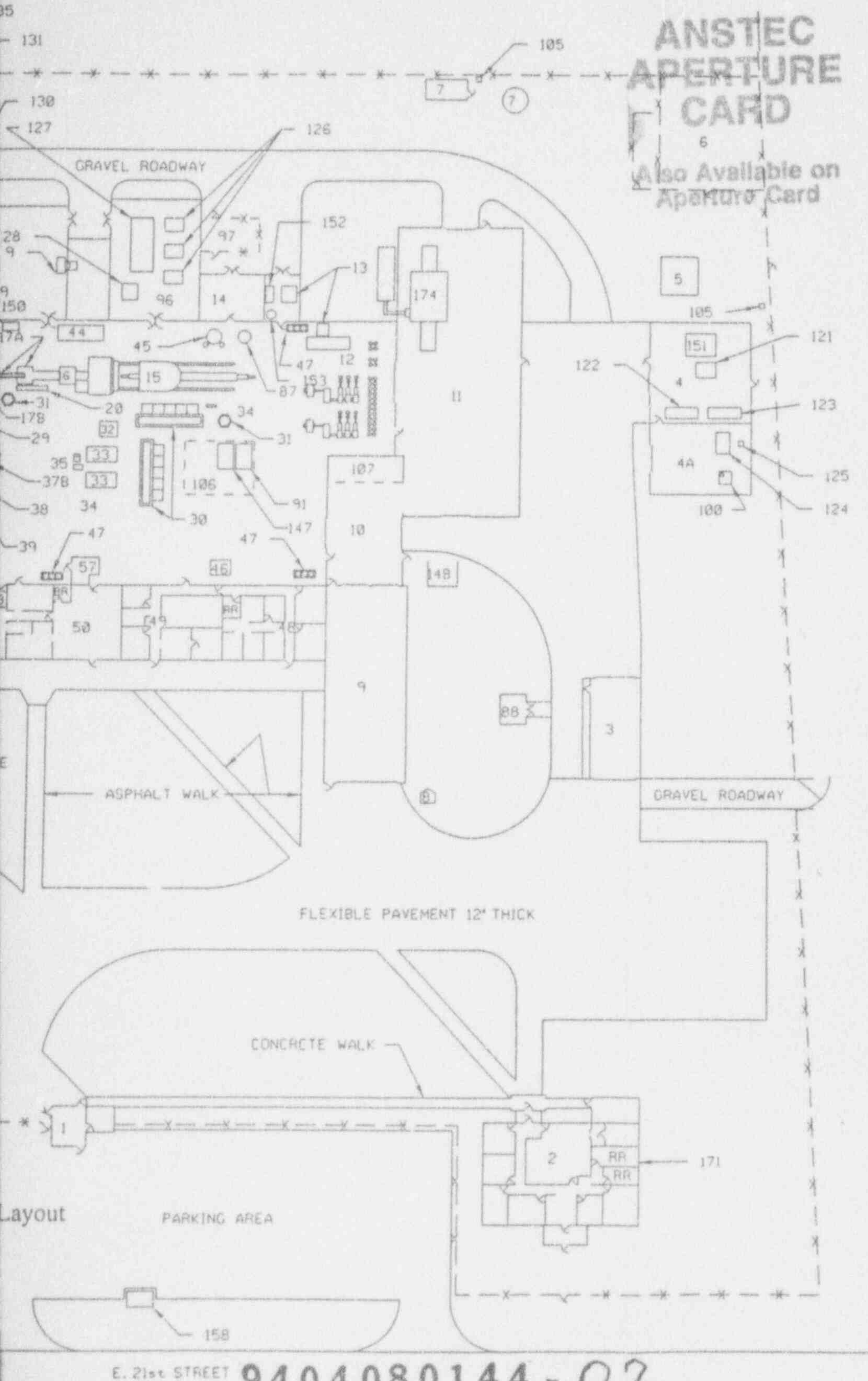
Figure 2-4 - Pla

88	HAZ. WASTE EMER. EQUIP. BLDG.
89	TOOLMEX LATHE
90	LATHE VENTILATION
91	COOLEY FURNACE
92	SUB STATION
93	STORE ROOM AREA
94	UF-6 COLD STORAGE WAREHOUSE
95	NORTHWEST STORAGE BUILDING
96	STACK *1A PRESS EXHAUST
97	OUTDOOR SUB STATION ADDITION
98	STACK *3A FILTER BUILDING
99	NORTH GISHOLT LATHE
100	FAN - STACK *5A
101	SAND BLASTER
102	EMERGENCY GENERATOR
103	MEZZANINE
104	FORGE AREA, STACK *6
105	OUTSIDE AIR SAMPLER
106	STORAGE AREA
107	EXTRUSION STORAGE AREA
108	AUXILIARY STORAGE AREA
109	SOUTH GISHOLT LATHE
110	K.R. WILSON HYDRAULIC PRESS
111	CHICAGO SHEAR
112	LIFT TRUCK HOIST
113	STACK *4A FILTER BUILDING
114	CAUSTIC TANKS
115	STARTRITE BAND SAW
116	MAIN PLANT ACID, STACK *7
117	HEALTH-SAFETY TECH'S OFFICE
118	PLATE & FRAME FILTER PRESS

119	WASTE WATER TREATMENT BLDG.
120	FIRE HYDRANT
121	CHIP CHOPPER
122	THERMAL OXIDATION TANK *1
123	THERMAL OXIDATION TANK *2
124	BAG HOUSE
125	HEPA FILTER HOUSING
126	95% & HEPA FILTER HOUSING
127	CARTRIDGE FILTER HOUSING
128	FAN - STACK *1A
129	CARTRIDGE FILTER HOUSING
130	95% & HEPA FILTER HOUSING
131	FAN - STACK *3A

132	MOISTURE SEPARATOR
133	CARTRIDGE FILTER HOUSING
134	95% & HEPA FILTER HOUSING
135	FAN - STACK *4A
136	CLEAR WELL
137	PRESSURE FILTERS
138	DETENTION TANK *2
139	DETENTION TANK *1
140	PROCESS TANK *1
141	PROCESS TANK *2
142	PROCESS TANK *3
143	SLUDGE PUMP *2
144	SLUDGE PUMP *1

145	PRESS FILTER
146	BACKWASH PUMPS
147	HMC FURNACE
148	LUMBER RACK
149	TOOL COATING VENT & STACK
150	TOOL GRINDING BOOTH
151	HOLDING TANK
152	D.C. EXCITERS
153	RECEIVER
154	WATER HEATER ROOM
155	PROJECT STORAGE CAGE
156	MAINTENANCE TOOL STORAG
157	INCOMING H2O & H2O METER PI



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LEGEND		DWG. NO. DD-1095
No.	DESCRIPTION	
1	GUARD HOUSE-CONTRACTOR EMER. ASS'Y AREA	
2	EMERGENCY ASSEMBLY AREA	
3	HAZARDOUS WASTE STORAGE BUILDING	
4	RF-3 BUILDING	
4A	RF-3 BUILDING ADDITION	
5	EQUIPMENT CLEANING AREA	
6	ELECTRICAL SUB STATION	
7	SEWAGE DISPOSAL	
8	FIRE HOUSE	
9	TRUCK RAMP ENCLOSURE	
10	SHIPPING & RECIEVING DOCK	
11	NORTHEAST BILLET STORAGE WAREHOUSE	
12	ACCUMULATOR STATION	
13	AIR COMPRESSOR	
14	SUB STATION	
15	3850 TON LOWEY HORIZ. EXTRUSION PRESS	
16	DIE HEAD	
17A	RUNOUT TABLE (MOVABLE SECTION)	
17B	POWERED RUNOUT TABLE	
18	HORIZONTAL EXTRUSION QUENCH TANK	
19	EXTRUSION COOLING & TRANSFER TABLE	
20	ROTATING NPR EXTRUSION COOLING TABLE	
21	EXTRUSION TRANSFER CONVEYOR TO CAMPBELL SAW	
22	ABRASIVE CAMPBELL SAW	
23	EXTRUSION TRANSFER CONVEYOR FROM CAMPBELL SAW	
24	INSPECTION AFTER SAWING	
25	TRANSFER TABLE TO ROLL STRAIGHTNER	
26	ROLL STRAIGHTNER ENTRANCE CONVEYOR	
27	ROLL STRAIGHTNER	
28	ROLL STRAIGHTNER EXIT CONVEYOR	
29	IN PROCESS TRANSFER & STORAGE TABLE	
30	SALT BATH	
31	VERTICAL EXTRUSION QUENCH TANK	
32	SUNBEAM FURNACE	
33	IFSI FURNACE	
34	SALT BATH LOADING AREA	
35	RECEIPT INSPECTION AREA	
36	MK-31 RINSE TANK	
37A	COMMERCIAL PICKLE TANK	
37B	COMMERCIAL RINSE TANK	
38	EXTRUSION WASH TANK	
39	EXTRUSION PICKLE TANK	
40	INSPECTION WEIGHING & PACKING TABLE	
41	CONTAINER PREHEAT FURNACE	
42	TOOL CRIB	
43	GUAGE ROOM	
44	TOOL PREHEAT FURNACE	
45	PREFILL TANK	
46	FLOOR SCALE	
47	AREA HEATING FURNACE	
48	ENGINEERING OFFICE AREA	
49	FOREMANS OFFICE AREA	
50	MENS HOURLY CLEAN LOCKER ROOM	
51	PORTAL ROOM	
52	WOMENS DIRTY LOCKER ROOM	
53	WOMENS CLEAN LOCKER ROOM	
54	ENCLOSED RAMPWAY	
55	STORE ROOM	
56	LUNCH ROOM	
57	ELECTRICAL SHOP	
58	SALARY CHANGE ROOM	
59	LAB TOOL ROOM	
60	WET CHEMICAL ROOM	
61	METALOGRAPHICAL ROOM	
62	CONFERENCE ROOM	
63	COMPUTER ROOM	
64	CHEMIST/TECHNICIANS OFFICE	
65	PRINT ROOM	
66	DARK ROOM	
67	ANALYTICAL ROOM	
68	DEVELOPEMENT LAB & QUALITY CONTROL AREA	
69	350 TON LOMBARD HORIZ. EXTRUSION PRESS AND VENTILATION	
70	*1 GIDDINGS & LEWIS CNC LATHE	
71	*2 GIDDINGS & LEWIS CNC LATHE	
72	*3 GIDDINGS & LEWIS CNC LATHE	
73	SMALL MONARCH LATHE	
74	LODGE & SHIPLEY LATHE	
75	LARGE MONARCH LATHE	
76	ROCKWELL DRILL PRESS	
77	RACINE SAW	
78	CINCINNATI MILL MACHINE	
79	STANLEY GRINDER	
80	DO ALL SAW	
81	U.S. ELECTRICAL TOOL CO. GRINDER	
82	CINCINNATI GILBERT DRILLING MACHINE	
83	STAIRWAY DOWN TO BOILER ROOM SEE DWG. B-1590	
84	ACID NEUTRALIZATION TANK	
85	ENGLEBERG BELT SANDER	
86	EVAPORATOR	
87	MANDREL QUENCH TANK	

58	INCOMING NATURAL GAS & GAS METER
59	FILL PUMPS
60	ABRASIVE SAW
61	SALT POTS
62	SHELDON LATHE
63	FISHER SCIENTIFIC ISOTEMP LAB REFRIDGERATOR
64	ROSS TEMP ICE MAKER
65	COOLEY FURNACE
66	NEYTECH FURNACE
67	WALKER-TURNER DRILL PRESS
68	DELTA BAND SAW
69	PNEUMOTIVE AIR COMPRESSOR
70	RF-6 SUMP

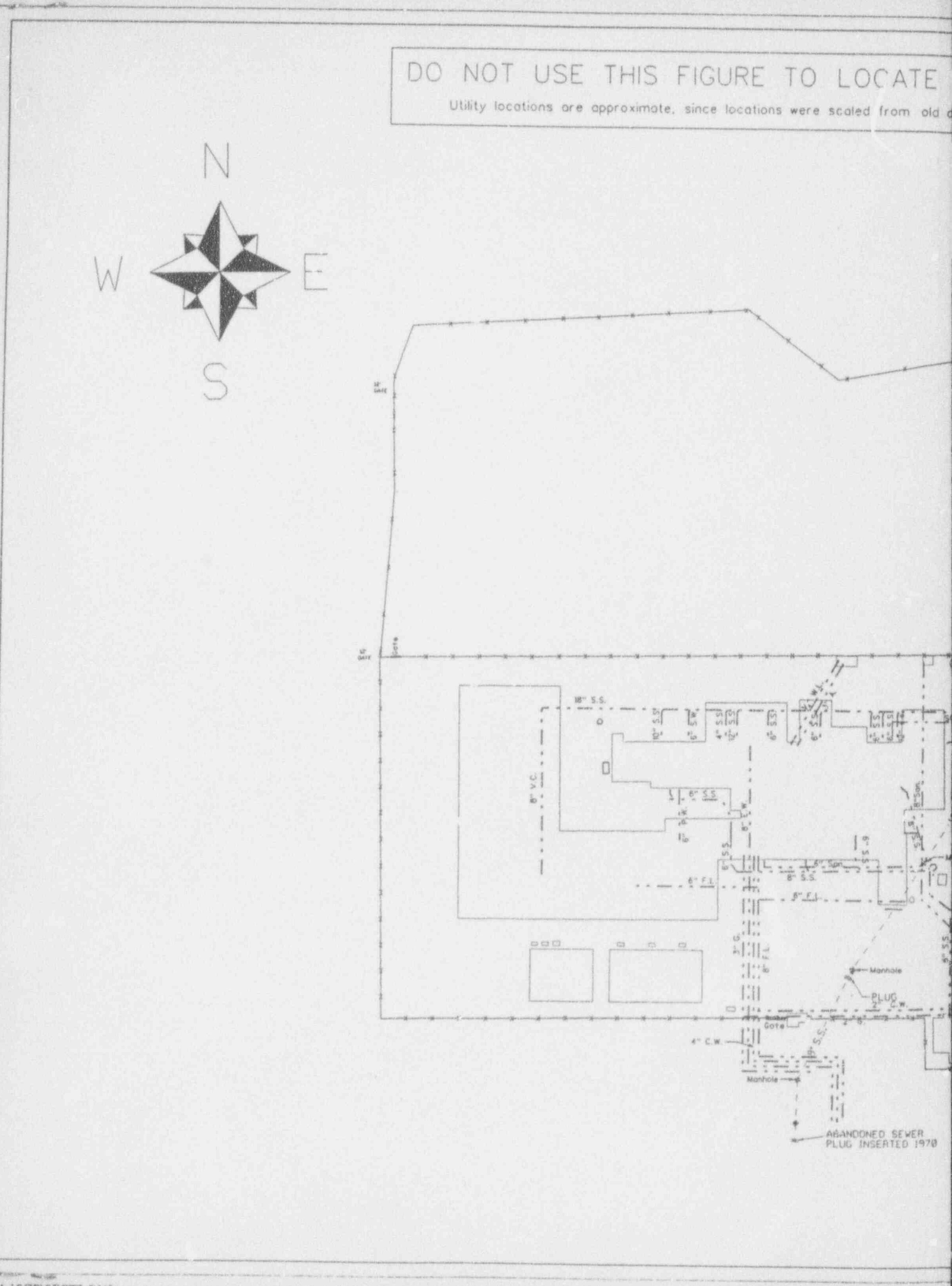
171	ENVIRONMENTAL, SAFETY & HEALTH BUILDING
172	MODULAR OFFICE BUILDING
173	MODULAR LAB BUILDING
174	EMPIRE SAND BLASTER

REVISION		
DATE	NO	DESCRIPTION
5/3/86	6	REVISED TO CURRENT LAYOUT & INSTALLED IN CAD
5/17/90	7	GENERAL REVISIONS
4/27/91	8	ADDED MODULAR OFFC & LAB
1/16/92	9	ADDED *174 SAND BLASTER
9/24/93	10	CHANGED DESCRIPTIONS 50 AND 51

- DIAS TO BE CONCENTRIC WITHIN — T.I.R.
- FACES TO BE SQUARE WITH ℄ WITHIN —
- * STAMP PART & SERIAL NUMBER
- DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
- TOLERANCES UNLESS OTHERWISE SPECIFIED
  WHOLE NUMBERS & FRACTIONS ± 1/64
  TWO PLACE DECIMALS ± .010
  THREE PLACE DECIMALS ± .005
  ANGLES ± 15 MIN.

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

MATERIAL	HARDNESS	DATE 1/25/83	SCALE 1"=30'-0"
DESIGNED TO FIT		DWN JONES	CHK'D
		ENG. NO. & PROJECT 403	
TITLE PLANT LAYOUT		DWG. NO. DD-1095	


DO NOT USE THIS FIGURE TO LOCATE
Utility locations are approximate, since locations were scaled from old d
N
W
E
S
18" S.S.
8" V.C.
6" S.S.
6" F.L.
8" S.S.
8" F.L.
Manhole
PLUG
4" C.W.
Gate
ABANDONED SEWER
PLUG INSERTED 1970

ANSTEC APERTURE CARD

Also Available on Aperture Card

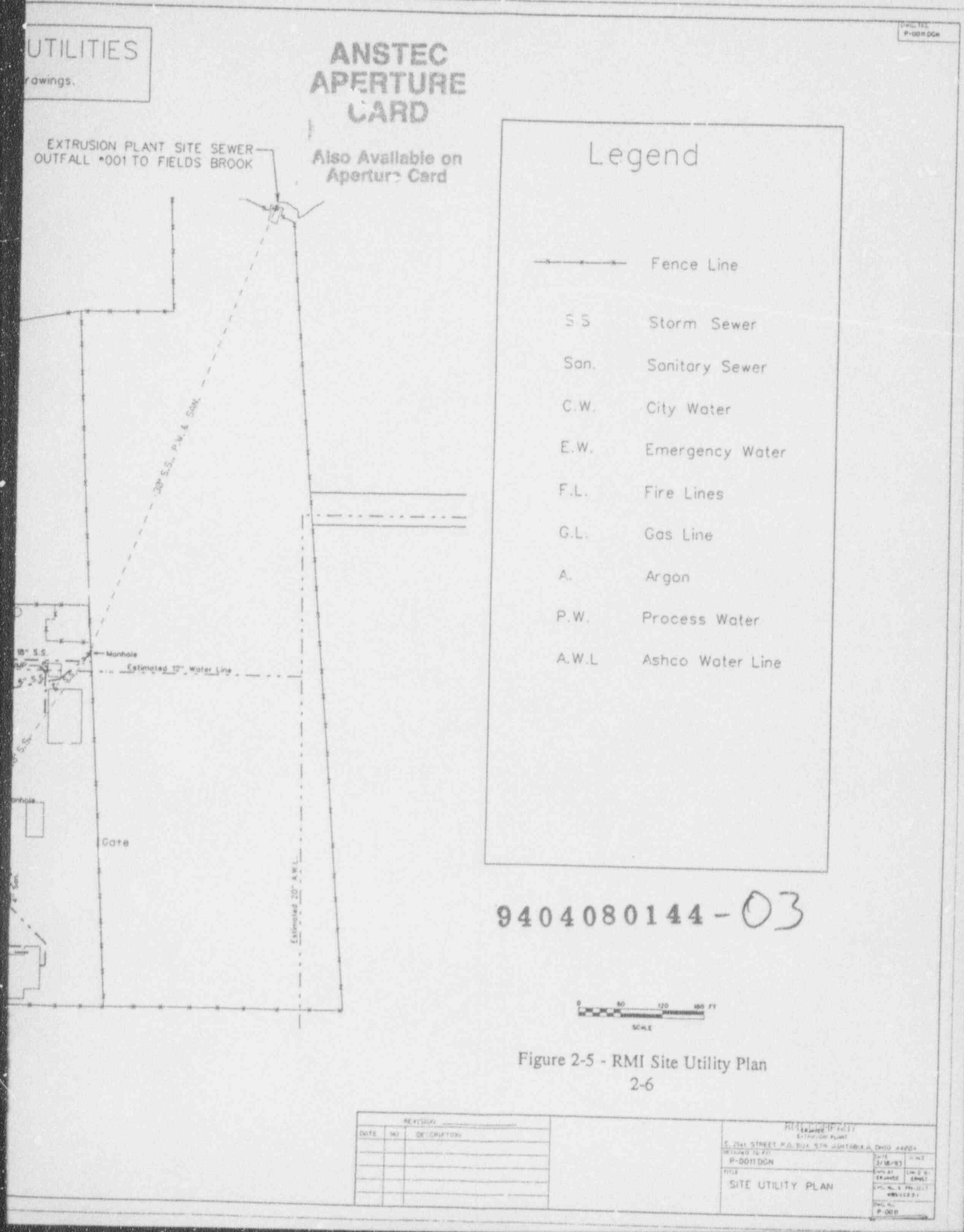


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Figure 2-5 - RMI Site Utility Plan

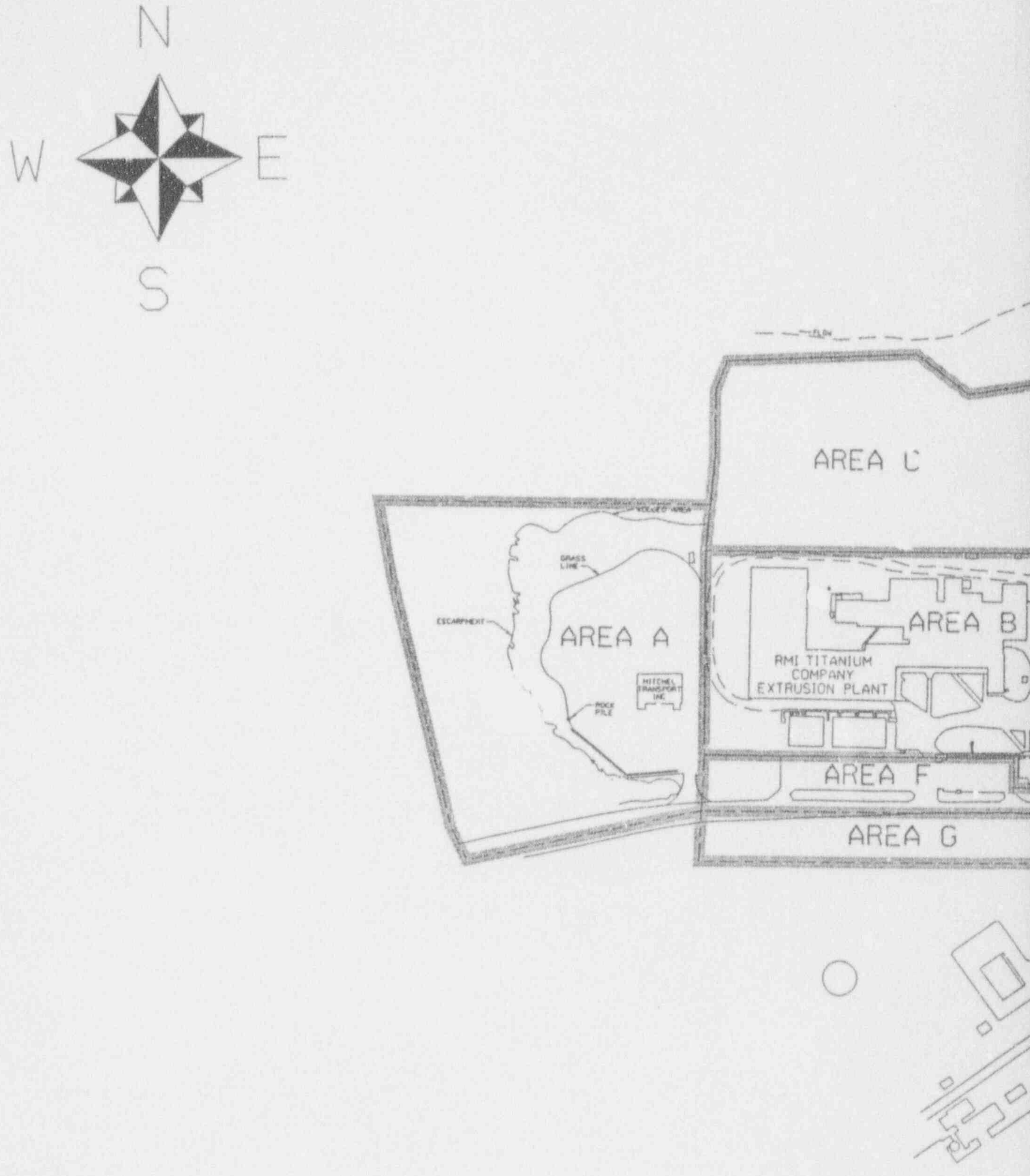
The sewage treatment plant includes a batch reactor, sample pit, wet well, and pre-engineered metal building. The batch reactor sits on a concrete pad. The sample pit is a rectangular concrete tank with a sump at one end.

2.1.3 Grounds Description

The entire area being characterized has been subdivided into Areas A through G in part to facilitate discussions, and the subdivision is in general, based on a combination of ownership and land use. Both RMI property and adjacent property owned by others make up the areas to be characterized. Figure 2-6 shows the locations of Areas A through G. Table 2-1 provides a brief description of each area.

Table 2-1 - Description of Areas A through G

Area Designator	Owner	Approximate Size	Description
A	Mitchell Transport, Inc.	5.5 Acres	Motor freight firm property located adjacent to and west of the fenced RMI Extrusion Plant Area (Area B)
B	RMI Titanium Company, Inc.	7 Acres	Fenced property containing the RMI Extrusion Plant Facility buildings
C	SCM Chemical, Inc. (SCM)	6 Acres	Fenced, undeveloped property located north of Area B. Fields Brook, which flows to the west, lies north adjacent to Area C
D	RMI Titanium Company, Inc.	7 Acres	Fenced, undeveloped property located adjacent to and east of Areas B and C
E	RMI Titanium Company, Inc.	11 Acres	Undeveloped property located adjacent to and east of the northern part of Area D.
F	RMI Titanium Company, Inc.	2 Acres	RMI Extrusion Plant parking area, bounded to the south by the approximate centerline of 21st St.
G	RMI Titanium Company, Inc.	1.5 Acres	30 by 250 meter parcel located south of the RMI Extrusion Plant Facility, along the south side of 21st Street.



A:\SCP\SECT2.RV0

P-0012.DGN

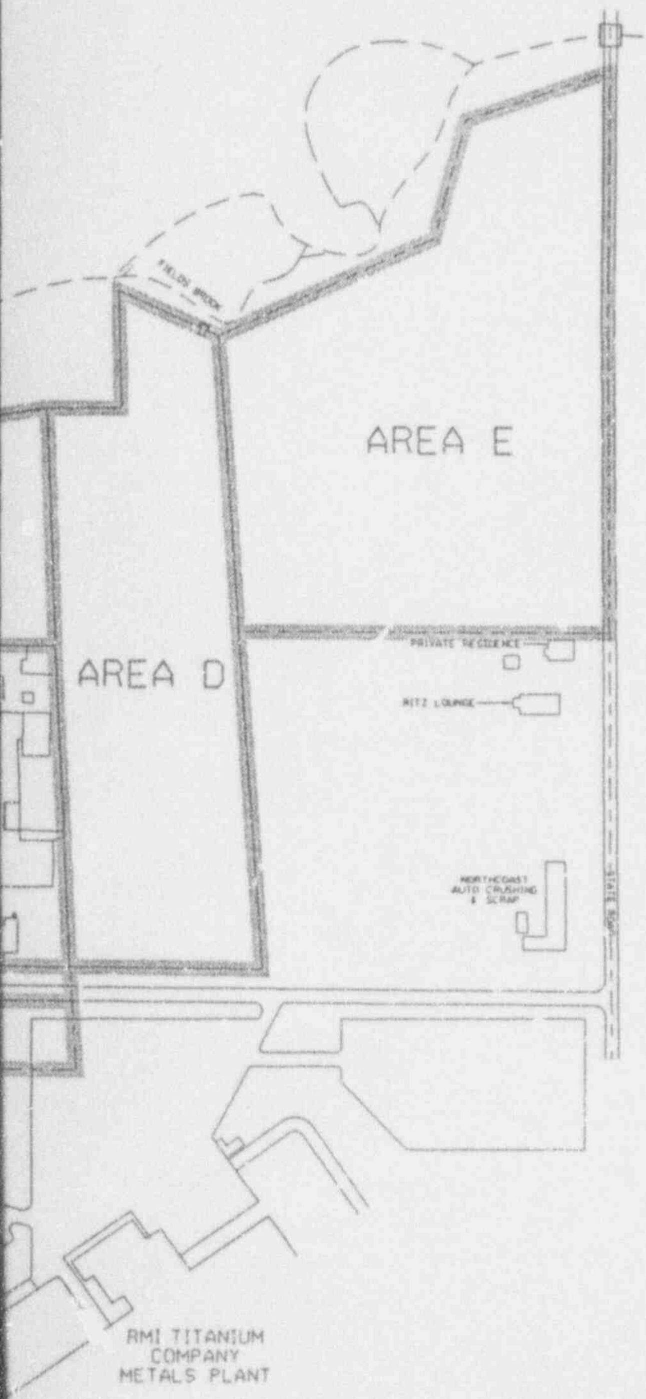


Figure 2-6 - Areas A through G
2-8

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REVISION		
DATE	NO.	DESCRIPTION

RMI COMPANY
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DESIGNED TO FIT P-0012.DGN
DATE 8/31/93
TITLE AREAS A THROUGH G
L.GEORGE
ERNST
WBS 1.1.2.2.1
P-0012

Rev. No.: 0

2.2 Site History

2.2.1 General

The original RMI-owned buildings were constructed by the Mallory Sharon Company in the 1950s in order to house a titanium/zirconium sponge compaction facility; however, these buildings were never used for that purpose. In 1961, the facility buildings were modified to house an AEC-owned 3,850-ton Loewy extrusion press and associated process support equipment moved to the site from Adrian, Michigan.

The facility began uranium metal extrusion operations for the DOE and its predecessor agencies in January 1962. The facility was upgraded in the ensuing years by the addition of improved processing and support equipment, additional buildings, and the installation of improved environmental effluent control equipment. RMI conducted extrusion operations for commercial companies, NRC licensed clients, and the DOE.

Extrusion of uranium metal at RMI stopped at the end of September 1988. All extrusion operations ceased on October 31, 1990. RMI site remediation is being performed under DOE guidance and funding. The current DOE mission for the RMI site consists of environmental restoration, decontamination, and decommissioning to terminate the NRC license so the site may be returned to RMI for unrestricted use (RMI 1991a).

2.2.2 Operating

2.2.2.1 License History

NRC license SMB-602 was originally issued to the Bridgeport Brass Company. In the early 1960s, Bridgeport Brass Company sold its share of the site to what is now RMI. On May 27, 1964, the AEC amended license SMB-602 to indicate that Reactive Metals, Inc. was the licensee. On October 31, 1973, the AEC again amended the license to indicate that RMI was the licensee. In May 1990, RMI applied for renewal to this license which is currently under NRC review. Licensed nuclear material is used only at RMI's facility at East 21st Street in Ashtabula, Ohio.

The license allows RMI to possess both natural and depleted uranium metal. The maximum amount of nuclear material that RMI is allowed to possess at any one time is 5,000 kilograms of natural uranium metal and 300,000 kilograms of depleted uranium metal. RMI is authorized to use this nuclear material for possession, storage, and use in the conversion (extrusion) of ingots or billets into tubes or rods.

Slightly enriched uranium metal (up to 2.1 percent weight U-235) and a small amount of thorium metal were extruded at RMI under Exclusion Section 110 of the Atomic Energy Act of 1954.

2.2.2.2 Process Description

The purpose of this section is to provide a brief description of the processes at RMI which involved radioactive materials and other materials extruded. Figure 2-7 shows the general process flow.

The primary function of RMI from 1962 until 1988 was the extrusion and/or closed-die forging of metallic depleted, normal, and slightly enriched uranium as an intermediate step in the production of nuclear fuel elements for use in DOE plutonium production reactors at the Hanford Reservation near Richland, Washington, and the Savannah River Site, near Aiken, South Carolina. RMI also performed other extrusion operations in accordance with a DOE contract during the same time frame, which included work for both the DOE and, indirectly, other governmental agencies.

In accordance with the DOE contract, the extrusion and processing of various other materials for the commercial sector was done. Commercial materials that were extruded consisted mainly of copper or copper alloys and followed the same basic production methods used to produce material for the DOE or under RMI's NRC license. The overwhelming majority of the work performed at the site was uranium metal production for the DOE. Table 2-2 presents a summary of the production processes and the quantities of material processed.

2.2.2.3 Disposal Practices

This section provides an overview of the RMI wastes streams and their management. General categories of wastes are used to provide a scope of the nature of the wastes.

Solid Waste

RMI generates solid waste by various methods including: (1) performance of site specific decommissioning tasks, (2) routine and non-routine maintenance tasks and, (3) office work. All waste streams are characterized for both radioactive contamination and RCRA hazardous constituents. The bulk of wastes currently generated are nonhazardous and consist of general trash (i.e., paper, plastic, sweepings, wood, etc.). In addition to the trash wastes, a small amount of residues continue to be generated through normal site operations including operation of the waste water treatment facility, clean out of sumps, etc.

Wastes are separated as best as possible by area of generation and type. Characterization of the wastes is based upon actual sampling and analyses, and historical knowledge.

Since the former production areas of the site are radiologically contaminated, the majority of the wastes generated in these areas are uranium contaminated. Only a small amount of RCRA hazardous and/or mixed (both radiologically contaminated and RCRA hazardous) wastes is currently generated.

RMI TITANIUM COMPANY EXTRUSION PLANT PROCESS FLOW DIAGRAM

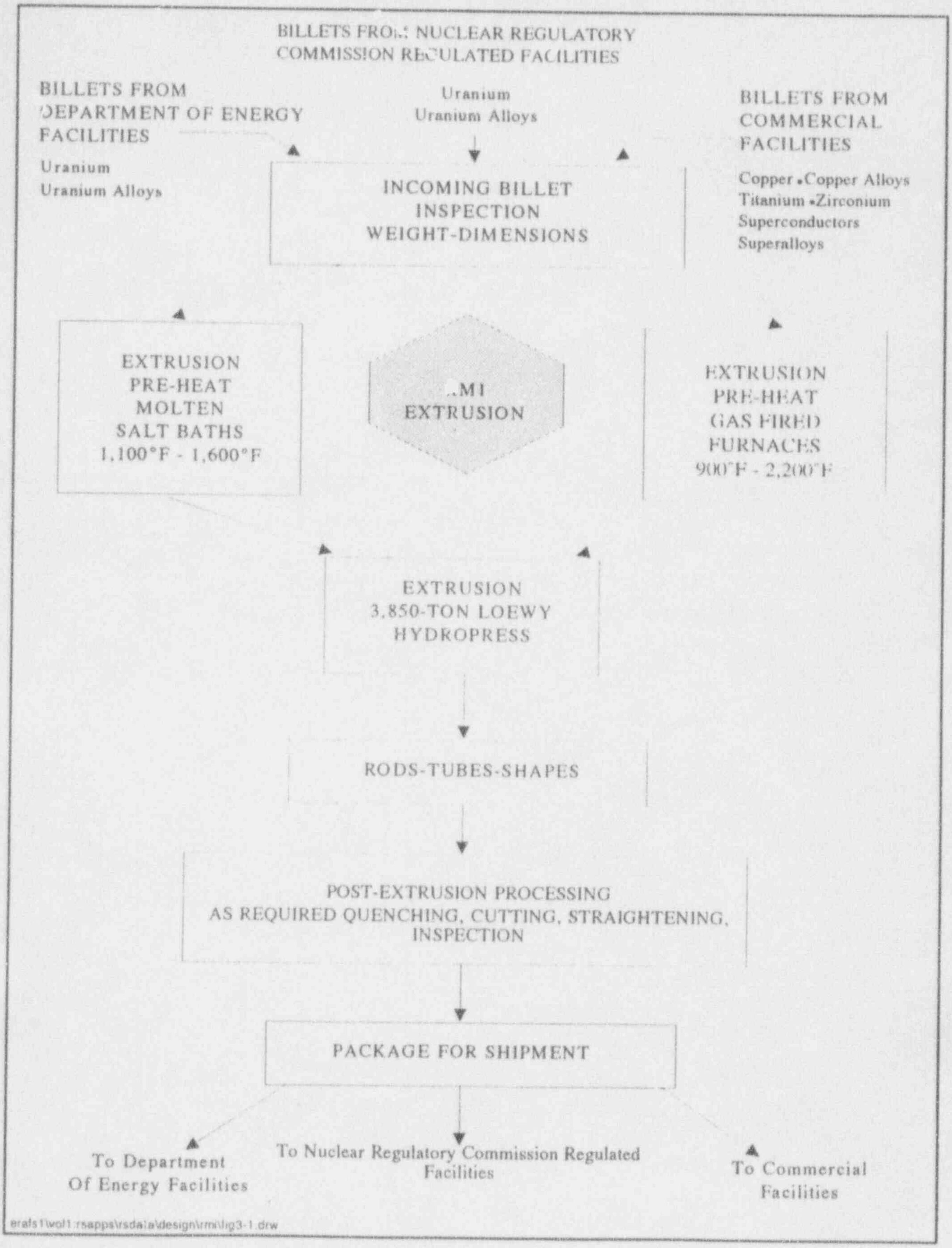


Figure 2-7 - RMI Titanium Company Extrusion Plant Process Flow Diagram

Table 2-2 - Proc s Description Summary

Process	Description	Period of Production	Approximate Production (MTU)						
			0.14% and 0.20% U-235	0.711% U-235	0.86% U-235	0.95% U-235	1.25% U-235	2.10% U-235	Thorium
N-Reactor Production	Primary extrusion process followed by a forging process. The materials were heated in a saltbath, extruded, quenched and cut into lengths. The product was then vapor degreased, water rinsed, inspected and packaged for storage and shipment. In the late 1960's, the vapor degreasing was changed to nitric acid pickling.	1962-1988		12,7C4		24,327	8,108	941	
Savannah River Production	Extrusion process for material destined for the Savannah River Production facility. The materials were heated in salt baths, extruded, cooled (after 1966 water quenched), sawed, heated in hot oil bath (1962-1964), or heated in an induction heater (1964 -1965) or after 1965 not heated, straightened and the vapor degreased (1962-1964), and water quenched. After 1964, extrusions were water rinsed.	1962-1988	54,950	12,474	3,932	3,788			
Commercial Production	Commercial and other government agency production at RMI consisted of a variety of metals dependent on the customer's particular need. Ingots were heated, extruded, water quenched or air cooled, pickled and water rinsed.	1974-1985	3,488						
Thorium Production (Minor Production Process)	Thorium billets were normally preheated in the salt baths in steel cans and filled with clean salt to prevent contamination. Extruded rods were cut with an abrasive saw, vapor degreased with TCE, and water rinsed.	1961-1972							16
Penetrator Bullet Extrusion	Produce armor-piercing projectiles for Department of Defense	?	?						

Residues generated by the extrusion and forging process during DOE production were processed and packaged in the RF-3 Building and returned to the Fernald Environmental Management Project (FEMP). Scrap metal from DOE production was also returned to the FEMP after processing and packaging in the Main Plant. A current inventory of 381 drums of residue remains on site and is summarized in Table 2-3 (RMI 1992b).

Table 2-3 - RMI Residue Inventory

Residue Type	Quantity	Source
Proposed Recoverable Enriched	163 Drums	Incinerator Oxides
Proposed Recoverable Other Enriched	32 Drums	Quench Sludge, Sodium, Pit Sludge, Trench Sludge
Non-Recoverable Enriched	65 Drums	Quench Sludge, RF-3 Sump Sludge, Evaporator Residue, Trench Sludge, Filter Sludge, Sodium,
Non-Recoverable Depleted	121 Drums	Incinerator Oxide, Quench Sludge, Saw Sludge, Ventilation Residue, Pit Sludge, Trench Sludge, Evaporator Residue

Liquid Wastes

RMI has two wastewater treatment systems. The first treatment system is a sequencing batch reactor which is used for treatment of sanitary waste and uses a combination aeration and microbial action. The discharge occurs through a National Pollutant Discharge Elimination System (NPDES) permitted internal monitoring station. The second wastewater treatment system, is used to treat process wastewater and consists of a batch treatment through a combination of lime/settle/filter technology.

The treated wastewater from both systems combines with non-contact cooling water and stormwater to form the final NPDES permitted effluent. This combined effluent is discharged directly to Fields Brook. Both DOE and NRC release limits are met for the outfall line to Fields Brook.

Air

No wastes are currently discharged to the air as a disposal method. RMI maintains Ohio EPA permits for all stack emissions. There has been a decrease in the airborne emissions since RMI has ceased production. None of the equipment having emissions covered by these permits are in routine operation except the Empire Sandblast.

Selected buildings at RMI have rooftop stacks (Q-Jets) for the discharge of ventilation air. The rooftop stacks do not operate continuously. Since production processes are not active within these buildings, little contamination is entering the ventilation air, therefore, little is being discharged to the air.

2.2.2.4 Operational Occurrences, Practices and Spills

Information on operational occurrences, practices, and spills at RMI has been gathered from RMI records and personnel familiar facility operations. This information identifies areas or systems that are known, or suspected to be contaminated and is summarized in Table 2-4.

2.2.3 Former Evaporation Pond

A small evaporation pond was located on the north side of the plant (Figure 2-2). The pond was used for disposal of spent sodium nitrate solution (used in pickling processes) which contained small quantities of uranium and Technetium-99 (Tc-99). The Tc-99 is a contaminant associated with the enrichment process and subsequent recycling of uranium within the DOE Weapons Programs. Trichloroethylene (TCE) was used at the plant as a degreasing agent from 1962 to 1966. A TCE tank was retained until 1972 for degreasing extrusion tooling. It is believed that an unauthorized disposal of TCE into the evaporation pond occurred during or before 1972. The evaporation pond was closed in 1984 (Eckenfelder 1989b).

As a condition of the RCRA Hazardous Waste Management Facility permit issued to RMI by the US EPA in June 1989, RMI submitted a RCRA Facility Investigation Equivalency Statement (RFIES) to the US EPA which addressed the former evaporation pond. The area comprises part of the Corrective Action Management Unit (CAMU), as identified by the US EPA. The other components of the CAMU are a groundwater plume which is contaminated with uranium, Tc-99, and TCE associated with the former evaporation pond, wet weather pond at the base of the escarpment located north of the RMI facility, and a drainage swale between the two ponds. The US EPA approved the RCRA Facility Investigation Equivalency Statement (RFIES) in August 1990.

In September 1992, RMI submitted a Corrective Measures Study (CMS) to the US EPA for the CAMU (Eckenfelder 1992). The CMS evaluates corrective measure alternatives for remediation of the CAMU. The alternatives evaluation focused on four criteria: technical, environmental, human health, and institutional considerations. Five alternatives were evaluated. The recommended treatment is ex-situ vapor stripping for soils, and groundwater being pumped, air stripped for TCE, run through the wastewater treatment facility for metals extraction, and discharged via the NPDES permitted wastewater discharge. The US EPA has given conditional approval for the clean-up levels proposed in the CMS (US EPA 1992). The conditional CMS clean-up levels are given in Table 2-5.

Table 2-4 - Summary of Operational Occurrences/Spills

Location	Description
Former Evaporation Pond	A one-time release of TCE into the former evaporation pond has been extensively documented. This pond was used for the disposal of spent sodium nitrate solution which contained small quantities of uranium and Tc-99. A Hydrogeological investigation has indicated that uranium, Tc-99, and TCE has migrated down gradient within the groundwater from the former evaporation pond.
Stack Effluents	Most of the uranium operations were ventilated to the environment through eight point sources. Each of the stacks were permitted and operated within the permit limits. These operations produced large particles prior to system upgrades. Since uranium is very dense, a large percentage of the material emitted through the stacks is believed to have settled to the ground close to the source, either onto the plant roof or surrounding surface soil.
Traffic	Outdoor foot and vehicular traffic in the operations area is expected to have contributed to the spread of contamination on the grounds immediately surrounding the facility.
Equipment and Drum Storage	Miscellaneous obsolete equipment, contaminated to various degrees, was stored along the fence line north and east of the main plant, and at other site locations. Contamination is expected to have migrated from this equipment to the surrounding surface soil. The majority of equipment stored along the fence has been covered, containerized, and/or removed. Various vehicles and equipment in the area immediately north of the main plant were decontaminated.
Extrusion Press Hydraulic Water Leaks	Periodically during the operation of the extrusion press, the hydraulic system would leak a mixture of water (98%-98.5%) and a light water soluble oil (1.5%-2%) from unions, valves, main ram seals, die-head cylinder seals, or other places within the press. These leaks were occasionally large enough to flood the trench and sump system. To prevent flooding of the main plant floor, the press hydraulic water was on several occasions pumped out of the main plant sump system onto the ground along the north side of the main plant high bay building. The hydraulic system is a closed system, therefore the press hydraulic water is not expected to have been contaminated with uranium. Residual contamination may have been picked up from contamination in the sump system. This practice was discontinued in the early 1980s.

Table 2-4 - Summary of Operational Occurrences/Spills (Continued)

Location	Description
Evaporation Tank Overflow	In 1986, RMI purchased a used steel tank to hold evaporation water during periodic cleaning out of sludge from the evaporator. The steel tank had a makeshift plug located on the side of the tank about 26 inches from the bottom of the tank. On January 6, 1987, the evaporator liquid was pumped into the steel tank. The makeshift plug was forced out of the side of the container due to the pressure on the plug from the contents of the tank. The evaporator liquid consisted of wastewater from the neutralizing of nitric acid with sodium hydroxide. The sodium hydroxide causes most of the uranium to precipitate solution. The solid residue contained 65% uranium by weight and the waste water was several times more dilute. Approximately 150 gallons of this liquid spilled and pooled into two puddles approximately 60 and 120 feet from the evaporator. Both puddles were approximately 45 feet from the north fence and no water was released off site. The puddles were located in frozen clay soil; therefore, minimal leaching is expected to have occurred. The water was vacuumed and returned to the repaired holding tank the same day. Approximately 250 gallons were recovered which accounted for the 150 gallons spilled plus melted snow and ice from the hot wastewater. No soil was excavated because conditions allowed for the recovery of most of the wastewater and the surface soil in the area had pre-existing surface contamination.
Outdoor Trash Burner	Light combustible trash such as cardboard and wood, some of which may have been contaminated, was burned in an outdoor cement block structure from approximately 1962 to 1975. The structure was later used to store contaminated equipment and to house sandblast facilities. The cement block structure and surrounding soils are assumed to be contaminated to varying degrees from these activities.
Fence Lines	Used oil mixtures (potentially radiologically contaminated) and, possibly, used solvent mixtures were used on occasion around the immediate perimeter fence lines and buildings to control weeds. Although no longer practiced, the extent and frequency of this activity is not known.

Table 2-4 - Summary of Operational Occurrences/Spills (Continued)

Location	Description
Fire Road	Radiologically contaminated oils may have been spread on the Fire Road (the dirt and gravel road which extends around the immediate perimeter of the buildings) for dust control. This activity is thought to have been an infrequent occurrence, since the road did not sustain significant traffic. The section of fire road outside the RF-6 Butler building south side roll-up door was occasionally used as a lay down area during steam rinsing of uranium contaminated equipment and vehicles. Small quantities of used solvent may also have been released by maintenance personnel in this area on an irregular and infrequent basis. Limited analytical data indicates that there is layered uranium contamination in the fire road in this area and adjacent to the footings on the south side of the RF-6 Butler Building. It is suspected that on occasion, just outside the door located to the south of the former maintenance area damaged extrusion tooling was separated from uranium with the use of an electric-arc cutoff torch, thus contributing to additional soil contamination.
Plant Buildings	All plant process water was directed to a sump and, subsequently, to a processing facility in the main plant high bay area prior to discharge. Possible cracks and leaks in drains, sumps, and trenches near areas in which uranium operations occurred may have resulted in releases of radioactive material to soil beneath concrete floor surfaces. In addition, floor drains and building subsurface drain lines and adjacent soils may contain or have leaked radioactive material.
Pickling Operations	In late 1970, a quantity of nitric acid pickling solution containing dissolved uranium escaped from the pickle tank into the pits and trenches leading to the effluent filter room and wastewater filtration system. Prior to construction of the existing wastewater treatment facility in the late 1980s, additional small volume leaks may have allowed uranium bearing nitric acid to be similarly discharged into the pits and trenches. It is possible that acid-dissolved contaminants were released into the trench system and discharged to the underlying soils through trench, pit and sump cracks and joints.
Soil Piles	Radiologically contaminated soil, asphalt, stone, and construction rubble have been and are currently stored at various locations primarily to the north of the plant buildings. These materials may have become contaminated prior to excavation, removal, or through settling of uranium dust emissions during production operations.

Table 2-4 - Summary of Operational Occurrences/Spills (Continued)

Location	Description
Outdoor Cutting and Welding	Periodic cutting of contaminated scrap metal with an electric carbon arc torch and welding activities were conducted in the area immediately north of the main plant and outside of the RF-6 building outside roll-up door. These practices were discontinued in the early 1980s.
Asphalt Areas	The asphalt area immediately south of the plant was initially paved in 1966. Fixed contamination is suspected to be present due to the deposition of uranium dusts from production. The contaminated asphalt has been sealed several times since the initial construction. Additionally, the areas have been repaved several times.
Backfilled Areas	Fill was placed at the grass areas south of the main plant and the front yard area south of the RF-6 building at various times during the plants operational period. The fill was obtained primarily from excavation during the construction of the RF-6 Building. During 1990 and 1991, soil in the front yard area was characterized and contaminated soil was removed prior to construction of the modular offices/laboratory. Soil contaminated with uranium was found to depths of 48 inches. Removal of the contaminated backfill was reviewed and approved by the NRC.

Table 2-5 - Conditional CMS Clean-Up Levels

Constituent of Concern	Media	Clean-Up Level
TCE	Groundwater	5μg/l
TCE	Soils	64μg/g
Tc-99	Seep and Groundwater	900pCi/l
U	Seep and Groundwater	20μg/l

2.2.4 Groundwater Monitoring

The 38 monitoring wells (MWs) installed on RMI and adjoining properties were constructed in four separate phases between June 1985 and August 1988. The wells were constructed in response to geological, geochemical, and geophysical investigations that took place before and during this time period. These investigations observed groundwater within three zones beneath the site. These zones are (1) an unconfined water zone within a glacial till unit; (2) a partially confined aquifer at the glacial till/bedrock interface; and (3) a confined zone within the shale bedrock. Subsection 3.6 provides further description of site hydrogeology.

In 1984, during closure and removal activities at the plant's evaporation pond, elevated levels of beta and gamma radiation were detected in soils at approximately 2 to 3 feet below the water table (Eckenfelder 1989b). Further investigations revealed the presence of uranium in the evaporation pond materials. In June 1985, six monitoring wells were installed to determine the potential migration of contaminants into the glacial till zone.

In July 1985, samples were obtained from MWs 100, 101, 103, 104, 105, and 106 (Figure 2-2) and analyzed for total organic halogens (TOX), total organic carbon (TOC), volatile organic compounds (VOCs), pH, chloride, nitrate, and specific conductance. In September 1985, samples from the same wells were analyzed for gross alpha, gross beta, and total uranium. Elevated levels of trichloroethylene were discovered in monitoring well 104 along with elevated levels of TOX, chloride, gross alpha, gross beta, and total uranium (Eckenfelder 1989a).

Following field reconnaissance and geophysical (conductivity and resistivity) surveys performed in December 1985, 11 additional MWs (MWs 200 through 210) were installed at locations within and north of the plant boundaries. The wells were installed during January and February 1986. Four wells were screened in the glacial till, six within the till/bedrock interface, and one well (200) in bedrock (Dames & Moore 1986). Although MW 200 was screened in the shale lithostratigraphic unit, this well was later found to be partially screened in the till/shale interface hydrostratigraphic unit (Eckenfelder 1989a). Therefore, groundwater samples from MW 200 are not representative of the bedrock water bearing zone.

In April, August, and September 1987, a total of 16 monitoring wells (MWs 300 through 315) were installed as part of a site hydrogeologic study. Nine of the wells were screened in the till/bedrock interface and seven were screened in the glacial till. The wells were installed both on and off site property (Figure 2-2). Methods and results of these investigations are summarized in the *Hydrogeologic Assessment--RMI Extrusion Plant, Ashtabula, Ohio* (AWARE 1988). Groundwater results are presented in Subsection 4.3.1.

From August through December 1988, surface water, sediment, and ambient air samples were collected as part of a RFIES (Eckenfelder 1989b). Following the collection and analysis of 48 shallow soil samples in May 1988, a supplemental hydrologic assessment was initiated (Eckenfelder 1989a). Five monitoring wells (MWs 401 through 405) were installed within and north of the RMI plant property boundary (Figure 2-2). Three of the wells were screened in bedrock water-bearing zone and two were screened in the till/bedrock interface.

In August 1988, additional borings were drilled to characterize the nature and extent of contaminant migration near the former evaporation pond. During September and October 1988, surface water samples were collected in the seepage pond and swale area north of the RMI property. Surface water samples were also collected from Fields Brook. In January 1989, sediment samples were collected from the seepage pond and swale (Eckenfelder 1989a). RMI personnel routinely monitor various parameters in air, soil, and surface water. An RFIES was prepared in August 1989 which summarized all existing groundwater, surface water, soil, and air information (Eckenfelder 1989b). A draft CMS Report, prepared and submitted to US EPA in September 1992, summarized radionuclide and volatile organic compound groundwater data through December 1991 (Eckenfelder 1992).

Of the 38 monitoring wells drilled since June 1985, three (MWs 208, 209, and 210) have been abandoned. These wells were abandoned in accordance with appropriate regulations and requirements by means of pressure grouting, to prevent acting as a pathway for contaminant migration. Until recently, the remaining wells were selectively sampled quarterly for VOCs, uranium, Tc-99, gross alpha, gross beta, pH, specific conductance, TOC, and TOX.

Recently, as part of the groundwater monitoring protection management program, RMI has begun sampling all wells in the monitoring network semiannually. Sampling will be conducted once during the spring (wet season) and once during the autumn (dry season). Groundwater samples will be analyzed for pH, specific conductance, gross alpha, temperature, isotopic uranium (U-234, U-235, and U-238), Tc-99, and halogenated volatile organic compounds. Also, since barium, lead and thorium have been identified as components of the plant's processes, sampling will be conducted to confirm their presence or absence (PARSONS 1992b).

2.3 General Physical Setting

2.3.1 Physical Site Characteristics

The RMI site lies between two natural drainage features that lead to Fields Brook. The majority of the site is relatively flat, with the exception of a shallow gully draining a portion of the eastern section of the site. The north side of the site drains toward Fields Brook and the west side toward land owned by Mitchell Transport, Inc. The area extending to the southeast between the two drainage features is characterized by 5 to 10 feet of relief (Dames & Moore 1987).

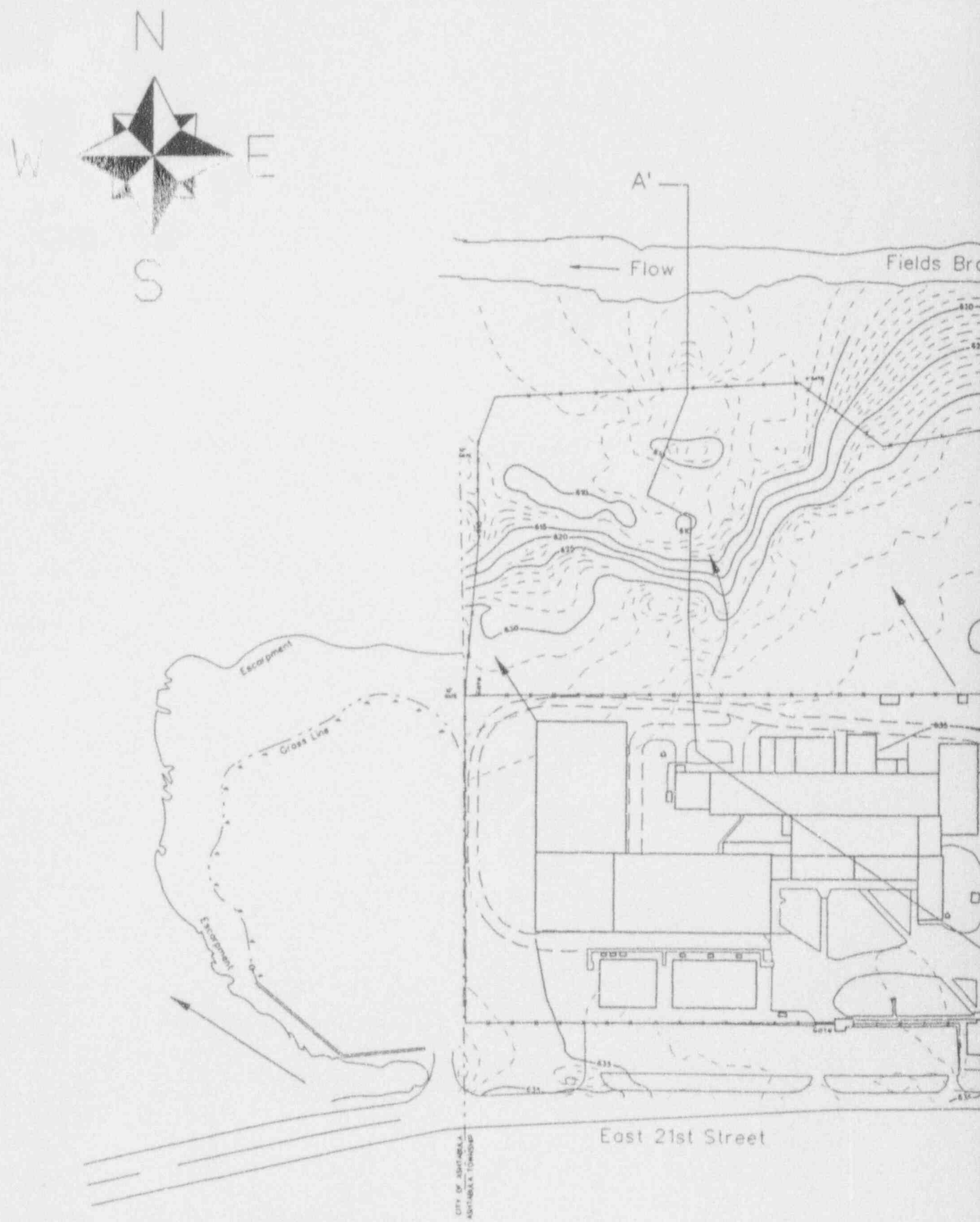
The maximum elevation variation of the area occupied by the facility buildings is approximately four feet. Off site and immediately north of the facility, at distances varying from 500 to 1,500 feet north of the RMI fence, is a southwest-northeast trending escarpment which has 20 to 30 feet of relief. The escarpment slopes into the flood plain of Fields Brook. Fields Brook flows west and joins the Ashtabula River which then empties into Lake Erie. Figure 2-8 shows the general site topography.

Vegetation found at RMI is typical for this region and consists of a variety of grasses, brush, and trees. The area north of the main plant is wooded with a variety of deciduous hardwoods and conifers. This plant diversity provides abundant food and cover for wildiife. The wooded area along Fields Brook, north of the SCM Chemical Incorporated (SCM) fence line, provides cover for animals and provides nesting areas for various species of birds.

2.3.2 General Information on Exposed Populations

The area immediately adjacent to the site is sparsely populated with only one permanent residence contiguous to the property. This residence is approximately 0.2 miles to the east of the main manufacturing building. Approximately 0.25 miles west of the facility, across State Route 11, are more homes and an area containing a retirement condominium, a church, and an elementary school. In an arc from the northwest to the south of the facility, beginning at a distance of approximately 0.5 miles, are more heavily populated residential areas.

Table 2-6 summarizes the exposed population as determined in a pathway analysis for the existing RMI site conditions (PARSONS 1993b). The most recent data were from the RMI 1990 National Emission Standards for Hazardous Air Pollutants (NESHAP) report.


N
W
E
S
A'
Flow
Fields Bro
Escarpment
Grass Line
Escarpment
East 21st Street

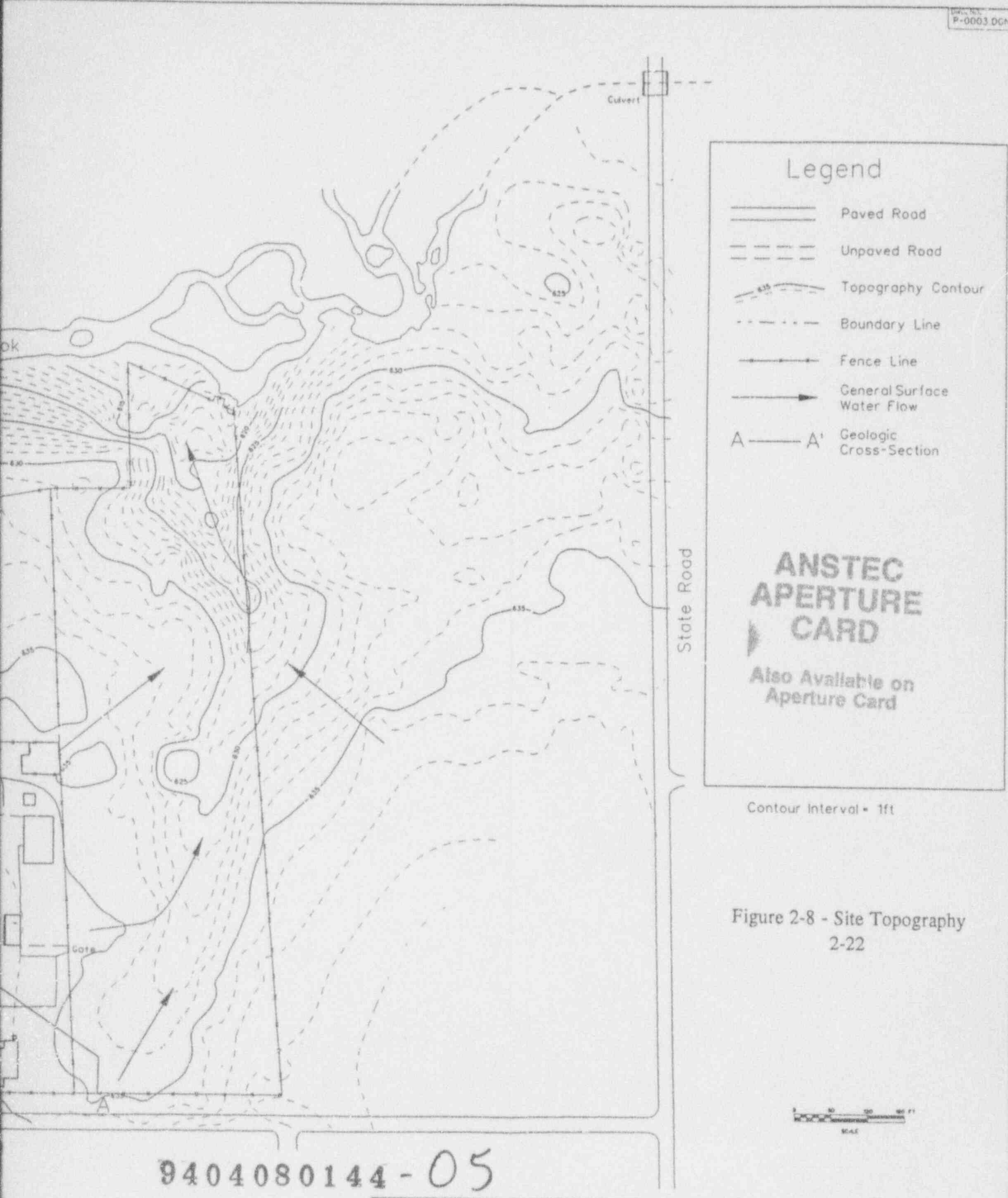


Figure 2-8 - Site Topography
2-22

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Table 2-6 - RMI Population Data for 1990

Compass Direction	Distances outward from site (m)									
	800	**2400**	**4000**	**5600**	**7200**	**12100**	**24100**	**40200**	**56300**	**72400**
S	775	1630	1386	329	114	1859	6066	5804	19520	133343
SSW	329	2878	4211	1050	440	1192	3714	6083	17107	30109
SW	135	1106	1361	708	525	3232	8809	12451	37588	184332
WSW	135	1512	774	203	151	3590	21272	50333	118384	272255
W	333	1956	2007	444	256	122	2	0	0	0
WNW	444	2101	64	0	0	0	0	0	0	0
NW	317	67	0	0	0	0	0	0	0	0
NNW	70	90	0	0	0	0	0	0	0	0
N	60	122	0	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	0	0	0	0
NE	1	0	9	1	0	0	0	0	0	0
ENE	1	1	6	44	412	3463	13030	15915	127814	66027
E	1	231	117	327	922	1327	3644	5975	18839	13523
ESE	17	416	696	180	74	923	2234	5263	30698	8919
SE	148	234	169	150	73	781	2322	5781	10256	10042
SSE	425	1079	171	206	214	845	2019	5410	17811	67

SECTION 3

PHYSICAL CHARACTERISTICS OF THE SITE

3.1 Surface Features

The RMI site lies between two natural drainage features that lead to Fields Brook. The majority of the site is relatively flat, with the exception of a shallow gully draining a portion of the eastern section of the site. The north side of the site drains toward Fields Brook and the west side toward land owned by Mitchell Transport, Inc. The area extending to the southeast between the two drainage features is characterized by 5 to 10 feet of relief (Dames & Moore, 1987).

The maximum elevation variation of the area occupied by the facility buildings is approximately 4 feet. Off site and immediately north of the facility, at distances varying from 500 to 1,500 feet north of the RMI fence, is a southwest-northeast trending escarpment which has 20 to 30 feet of relief. The escarpment slopes into the flood plain of Fields Brook. Fields Brook flows west and joins the Ashtabula River which then empties into Lake Erie. Figure 2-8 shows the general site topography.

Vegetation found at RMI is typical for this region and consists of a variety of grasses, brush, and trees. The area north of the main plant is wooded with a variety of deciduous hardwoods and conifers. This plant diversity provides abundant food and cover for wildlife. The wooded area along Fields Brook, north of the SCM fence line, provides cover for animals and provides nesting areas for various species of birds.

3.2 Meteorology and Climatology

The Ashtabula area has a continental climate, although Lake Erie has a moderating effect on the entire area near the site. Annual precipitation averages approximately 37 inches in Ashtabula. The average daily maximum temperature ranges from a low of 35 degrees Fahrenheit in January to 80 degrees Fahrenheit in July (USDA 1973).

For the purpose of determining off-site impacts of airborne releases, RMI uses meteorological data from the National Oceanic and Atmospheric Administration's National Weather Station at the Erie, Pennsylvania, International Airport (EIA) and the National Climatic Data Center to characterize atmospheric dispersion conditions at RMI. The EIA is located approximately 30 miles east of the RMI site and is in nearly the same geographic setting relative to Lake Erie. Measurements of atmospheric conditions at the EIA are made by a qualified meteorologist. A determination of acceptability of this source was completed by the National Oceanic and Atmospheric Administration (NOAA) in a study entitled, *Analysis of Wind Data Intercomparison Between Erie, Pennsylvania, and Ashtabula, Ohio.* The study was conducted during a 4-month period (December 1988 through March 1989 and analyzed wind data (i.e., speed and direction) collected at the Erie International Airport and the RMI site in Ashtabula (White and Przbylowicz 1992).

The letters which transmitted the study results from NOAA to the DOE and RMI noted that concentration calculations for Ashtabula made with Erie International Airport wind data would transport the effluent material in the correct direction, but would underestimate the concentration because of the higher wind speed observed at Erie. However, the transmittal letters also noted that unless the predicted concentrations are close (within a factor of five) to some significant health-related or legal threshold, the use of Erie winds at the Ashtabula site would be acceptable (Hosker 1992a and 1992b).

3.3 Surface Water Hydrology

The area occupied by the RMI plant area is relatively flat with less than 4 feet of elevation variation. All surface water drainage from the site flows north toward Fields Brook. A shallow gully east of the plant drains the eastern portion of the site. The western portion of the site drains toward the property of Mitchell Transport, Inc. The north central portion of the site drains directly into Fields Brook. North of the plant is a southwest-northeast trending escarpment which has 20 to 30 feet of relief sloping in to the flood plain of Fields Brook. Fields Brook flows west and joins the Ashtabula River which empties into Lake Erie. Figure 2-8 shows the general direction of surface water flow.

3.4 Geology

3.4.1 Regional Geology

Ashtabula County is situated within portions of two major physiographic provinces. The 3- to 5-1/2-mile-wide Lake Plain Belt located along the northern edge of the county (Figure 3-1) is part of the Central Lowland Province. The remainder of the county is part of the Allegheny Plateau of the Appalachian Plateau Province. The Lake Plain is separated from the Plateau area by a 1- to 3-mile-wide escarpment belt of Mississippian bedrock with overlying and adjacent glacial end moraines. The site is located on the Lake Plain (Dames & Moore 1985).

A series of sandy and gravelly ridges traverses the Lake Plain, oriented parallel to the present Lake Erie Shoreline. The ridges represent beaches of earlier lakes located at higher water levels than the present Lake Erie. The remainder of the Lake Plain is relatively flat and is characterized by poor drainage. fields Brook parallels the Lake Erie shoreline as a result of the presence of these subparallel gravel deposits. Fields Brook drains a 5.6 square mile watershed in Ashtabula County (including the RMI Extrusion Plant site area) and flows west into Ashtabula river, about 8,000 feet upstream of the river's discharge to Lake Erie (Eckenfelder 1989a).

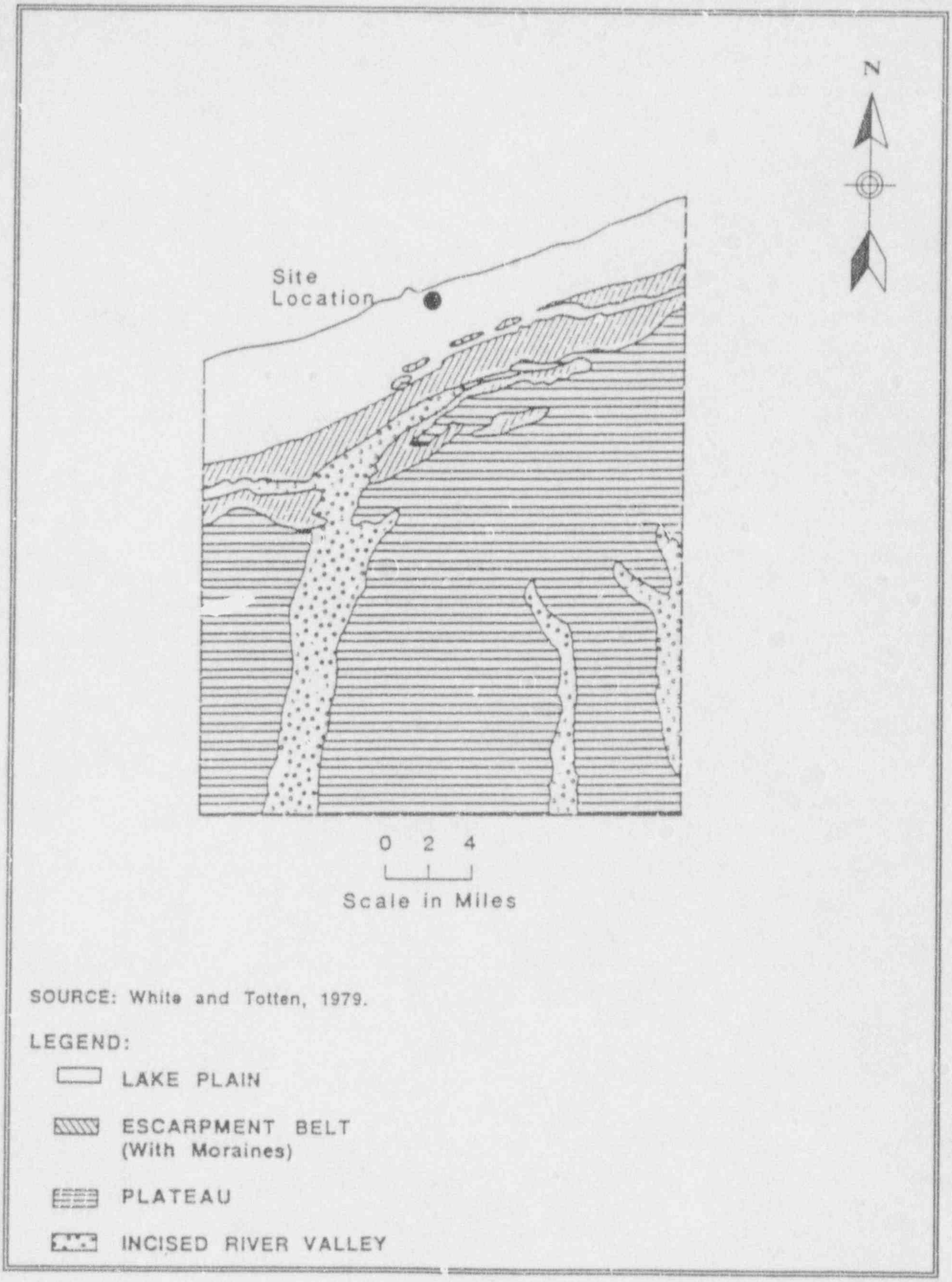


Figure 3-1 - Physiographic Regions of Ashtabula County

The base of the bedrock section in northeastern Ohio is a Precambrian Basement complex of metamorphic and igneous rocks occurring at depths of 8,000 to 10,000 feet. The Paleozoic strata that overlies the Precambrian basement are sedimentary deposits of sandstone, shale, and limestone (Dames and Moore 1985).

Most of Ashtabula County (including the RMI site) is underlain by the Devonian Chagrin Shale, which can be as thick as 1,200 feet (Figure 3-2). The Chagrin Shale is a relatively soft, blue-gray, sparsely fossiliferous shale, with occasional thin siltsone interbeds. Unconsolidated pleistocene glacial deposits overlie bedrock in most of northeastern Ohio. Most of the material is glacial till consisting of an unsorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. The glacial deposits of Ashtabula County are predominantly from the Wisconsin Stage, which is the most recent stage in glacial history (Table 3-1). The tills were deposited as part of the Grand River Lobe (Figure 3-3), which advanced southward form the Lake Erie basin. These deposits generally overlie bedrock and extend upward to near ground surface where they are covered with a veneer of topsoil. A composite cross section of Ashtabula County is presented in Figure 3-4 (Dames & Moore 1985).

The regional water table occurs at depths ranging from 2 to 10 feet and is generally found in the low permeability lacustrine and glacial till deposits of the Lake Plain Belt. This shallow water table is a result of the impervious nature of both the soils and underlying shale bedrock. Regionally, the groundwater flow direction is expected to be northward toward Lake Erie. Locally flow is generally toward rivers and tributaries (Eckenfelder 1989b).

The clay till present in the Lake Plain is generally a poor source of water, as is the underlying shale bedrock. Water in the shale bedrock carries elevated levels of dissolved solids (Eckenfelder 1989b). Salt water may be encountered as shallow as 50 ft into the shale bedrock. With the exception of beach ridge areas, wells in the Lake Plain generally yield less than 3 gallons per minute, and the area is rated poor for developing even minimal domestic supplies. Except for the City of Orwell in the southwestern portion of the county (approximately 15 miles away), all of the municipalities in Ashtabula County use Lake Erie or river impoundments (reservoirs) as public water supply sources (Eckenfelder 1989b). Ashtabula receives its water from Lake Erie via the Ohio American Water Co., Ashtabula District (RMI 1992a).

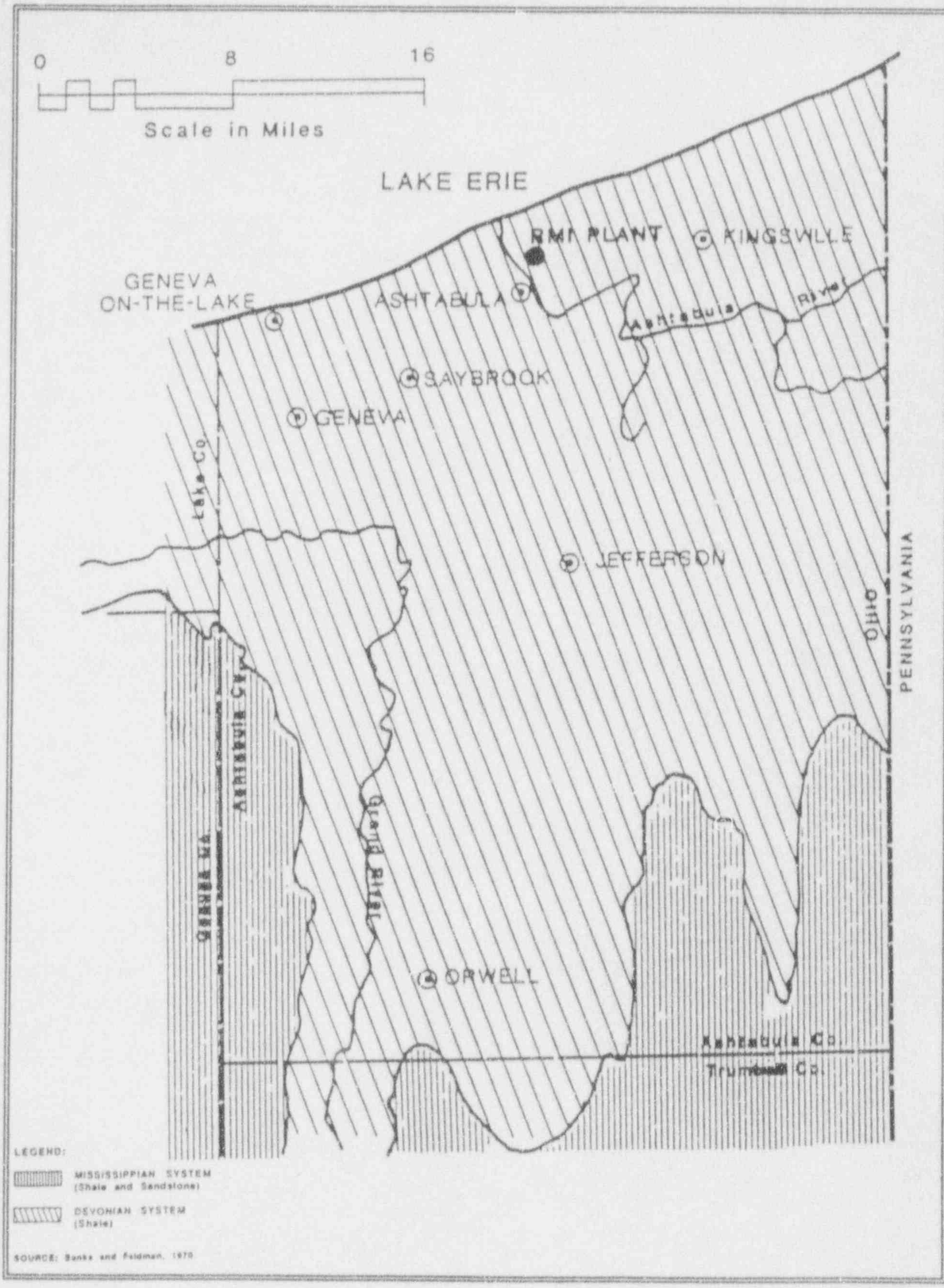
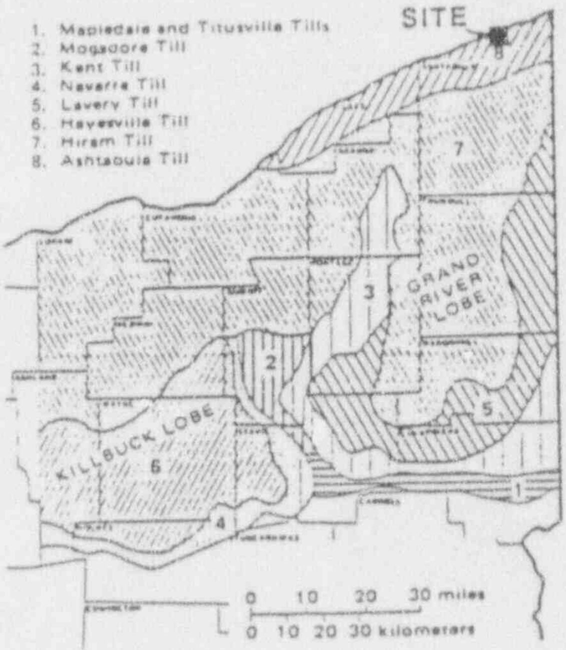


Figure 3-2 - Bedrock Geology of Ashtabula County

Table 3-1 - Glacial Deposits in Ashtabula County

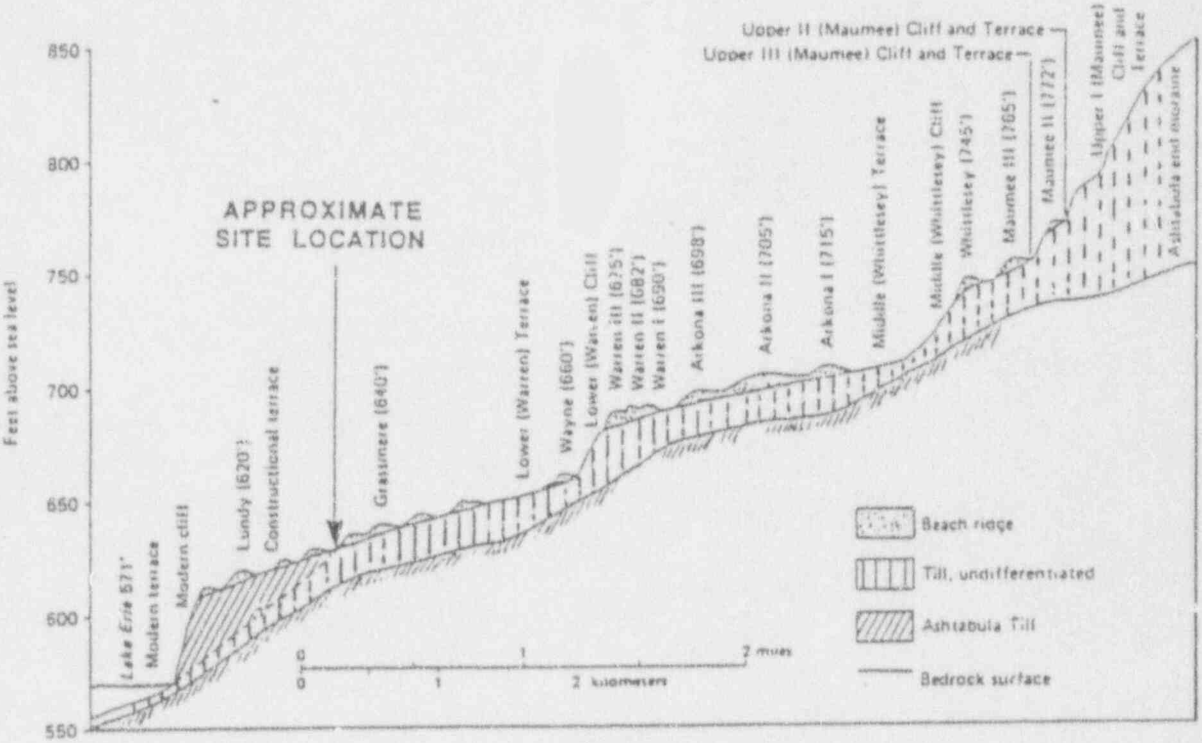
Epoch	Stage	Substage	Unit	Color (oxidized)	Color (unoxidized)	Texture
Pleistocene	Wisconsinan	Woodfordian	Ashtabula Till	Brown	Gray	Silty, clayey, many siltstone and shale fragments
			Hiram Till	Dark brown	Gray	Clayey, few pebbles
			Lavery Till	Brown	Gray	Silty, clayey, moderate number of pebbles
			Kent Till	Yellow brown	Gray	Sandy, coarse
			Paleosol			
		Altonian	Titusville Till	Olive brown	Gray	Sandy, stony, very hard
	?	Early Altonian or Illinoian	Keefus Till	Red to red brown	Red to brownish red	Silty, very hard
	Pre-Wisconsinan		Unnamed till(s)	?	Gray	In deep subsurface in Austinburg; rare elsewhere

Source: White and Totten, 1979.



SOURCE: White and Totten, 1979.

Figure 3-3 - Glacial Lobes and Tills in Northwestern Ohio



NOTE: Elevations of beach ridges are for the western border of the county; many elevations rise to the east.

SOURCE: White and Totten, 1979.

Figure 3-4 - Composite Cross Section of Ashtabula County

3.4.2 Site-Specific Geology

From the installation of monitoring wells and soil borings, it has been observed that approximately 30 feet of glacial till overlies the Chagrin Shale Bedrock in the plant area. Hydrogeologic Section A-A' indicates that the till thins abruptly along the escarpment that lies 100 to 300 feet north of the plant boundary (Figure 3-5). The till is approximately 10 feet thick from the escarpment to Fields Brook (Eckenfelder 1989a).

Near the plant, the upper 6 to 8 feet of the till are composed of a mottled orange-gray silt with clay and some fractured or broken shale fragments. Also in the vicinity of the plant, large vertical and minor horizontal fractures have been observed at depths of 9 to 12 feet. These fractures are typically oxidized, occasionally wet, and most likely result from weathering of the till. Beneath the clay-like silt near the plant, at ground surface south of the plant, and in the Fields Brook floodplain, the till is composed of a dark gray, very dry to moist, plastic clay with varying amounts of silt and reworked shale. Rounded pebbles of quartz become more prevalent in the lower portion of the till (Eckenfelder 1989a).

The glacial till also contains isolated sandy zones. In borings near the former evaporation pond, a localized sand lens was encountered at a depth of 6 to 7 feet. A similar sandy zone appears 50 feet north of the evaporation pond at 12 feet below the surface. In the pond area north of the escarpment, another thin sand layer occurs at 3 to 5 feet below the surface (Eckenfelder 1989a).

Soil boring records indicate that the zone consists of friable shale and displays relict bedding planes. The till/bedrock interface occurs at approximately 25 feet below the ground surface. North of the escarpment, this interface lies at approximately 5 feet below the surface (Eckenfelder 1989a).

The bedrock consists of a dark gray, platy, dry shale. Depth to bedrock is approximately 30 feet on the south side of the escarpment and averages 10 feet on the north side of the escarpment (Eckenfelder 1989a).

Soil boring logs for the 38 monitoring wells and 6 soil test borings can be found in the *Supplemental Hydrogeologic Assessment* (Eckenfelder 1989a).

Information about subsurface conditions beneath the main plant buildings is described in a foundation investigation report prepared by Dames & Moore (Dames & Moore 1957). The subsurface soil conditions were investigated by drilling six exploration borings to depths ranging from 13.5 to 27.5 feet below the then existing ground surface elevations (approximately 634 to 636 feet mean sea level [MSL]). The main plant building was subsequently built at the locations investigated by five of the borings. The sixth boring was drilled at the location near where the guard house building now stands.

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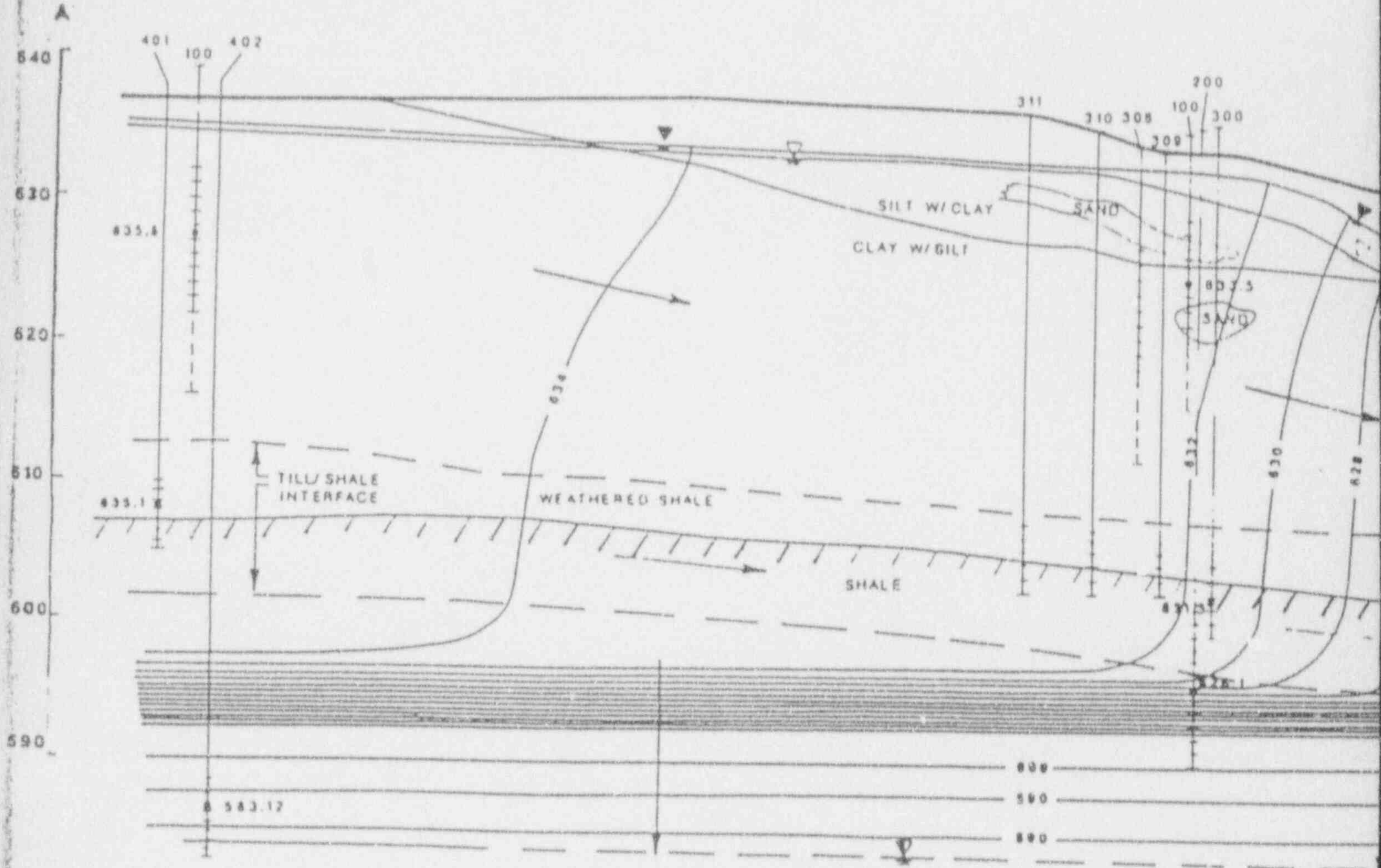

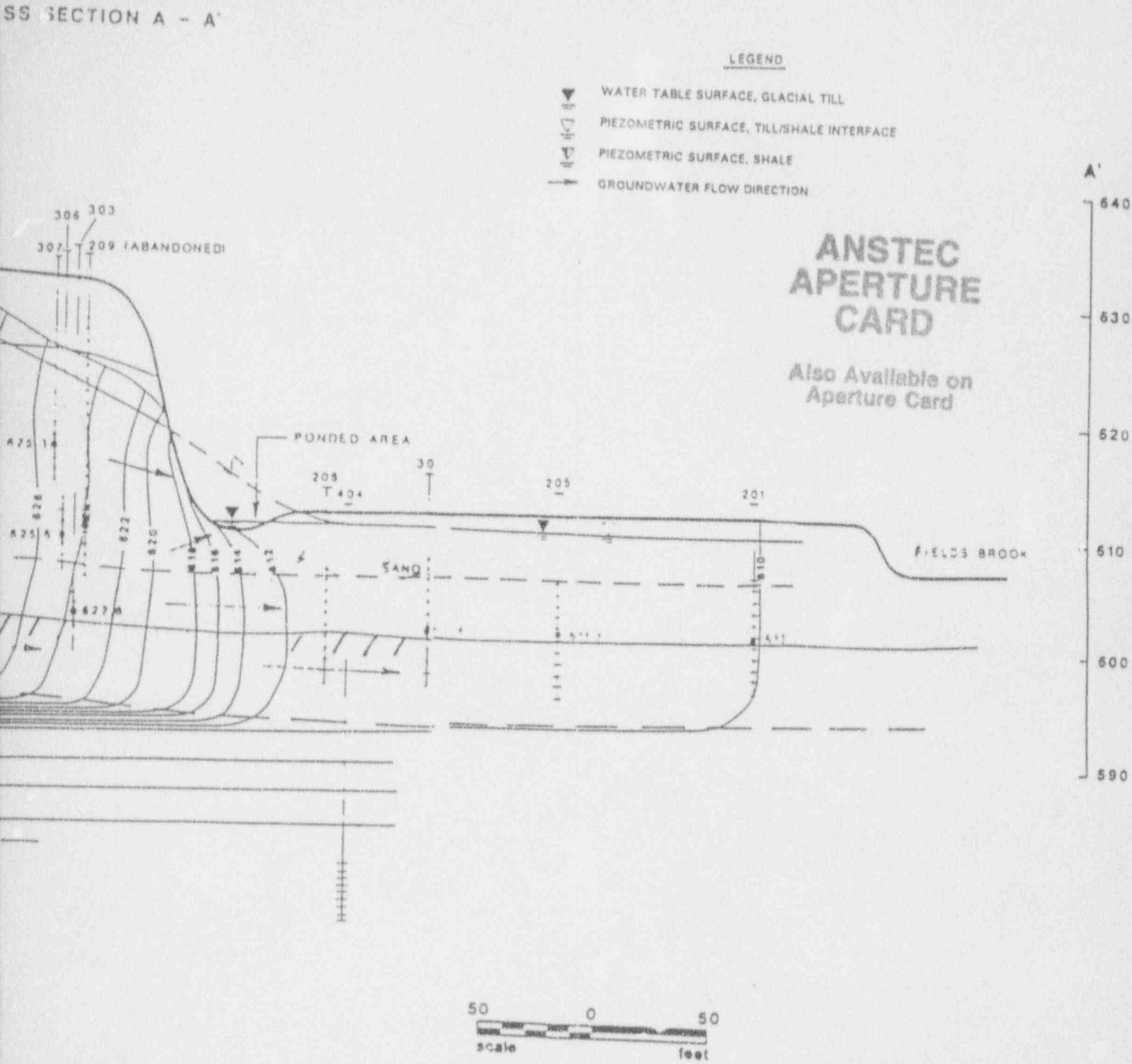

Figure 3-5 - Hydrogeologic
Cross Section A-A' of
RMI Site
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The test borings revealed that the site was blanketed by a dark brown silty loam topsoil containing roots. The topsoil varied in thickness from 6 to 18 inches and was soft and compressible. The topsoil was underlain by a stratum of moderately firm mottled brown and gray silty clay loam which extended to a depth of approximately 7 feet below the then existing ground surface. The upper 6 to 8 inches of this stratum was soft due to the infiltration of surface water and the stratum was interspersed with lenses and pockets of silt. The mottled brown and gray silty clay loam is underlain by firm bluish gray clay containing gravel (Dames & Moore 1957). The descriptions of subsurface conditions and boring logs found in the 1957 Dames & Moore report are, in general, consistent with the conditions encountered during subsurface investigations of the CAMU.

In September 1988, geotechnical tests were conducted on eight soil samples from well borings 402 and 403. These tests included grain size analyses, natural moisture content, unit weight, Atterberg limits, and specific gravity (Eckenfelder 1989b). Table 3-2 summarizes these results. Grain size analysis curves for these samples can be found in the RFIES (Eckenfelder 1989b). Limited geotechnical laboratory test results for soils samples taken during the subsurface exploration can be found in the 1957 Dames & Moore Report. These results include direct shear, unconfined compressive strength and moisture content data.

3.5 Demography and Land Use

The area immediately adjacent to the site is sparsely populated, with only one permanent residence contiguous to the property. This residence is approximately 0.25 miles to the east of the main manufacturing building. Approximately 0.25 miles west of the facility, across State Route 11, are more homes and an area containing a retirement condominium, church, and an elementary school. In an arc from the northwest to the south of the facility, beginning at a distance of approximately 0.5 miles, are more heavily populated residential areas. The population of the City of Ashtabula is approximately 21,630 people (1990 Census).

Table 3-2 - RMI Soils - Physical Characteristics Data

Well Boring No.	Sample Depth (feet)	Boring Log Description	USCS Symbol	Percentage			Natural Moisture Content(%)	Atterberg Limits			Specific Gravity
				Gravel	Sand	Silt/Clay		Liquid Limit	Plastic Limit	Plasticity Index #	
402	2-4	Mottled orange-brown clay, some to little silt, little sand, slightly moist	CL	0	7	93	16.5	36	52	16	2.66
402	8-10	Dark brown clay, some silt, trace sand (6 inches)	CL	4	18	78	14.6	33	47	14	2.71
402	14-16	Stiff gray-orange clay, very moist, fragments of weathered shale	CL	2	19	79	13.8	26	35	9	2.75
402	26-28	Medium gray clay, increasing shale fragments, very dry, platey structure	CL	2	22	76	11.5	29	40	11	2.79
403	2-4	Mottled orange-brown-gray silt and clay, trace sand, slightly moist	CL	1	9	90	18.7	47	70	23	2.74
403	6-8	Orange-brown clay, some silt, trace sand, moist	CL	2	14	84	19.8	35	51	16	2.71
403	12-14	Gray clay, some to little silt, shale fragments and pebbles	C[illegible]	4	16	80	12.0	29	40	11	2.75
403	20-22	Dark gray clay, little silt with fragments of weathered shale and rounded pebbles	CL	2	24	74	11.3	27	37	10	2.76

Notes:

1. Data Sources:
   (1) *RFI Equivalency Document for the RMI Extrusion Plant*
   (2) *Supplemental Hydrogeologic Assessment, RMI Extrusion Plant*

3.6 Hydrogeology

Thirty-eight monitoring wells have been installed at the RMI site (Figure 2-2). Monitoring well construction data for each well are presented in Table 3-3. From these wells, groundwater has been observed to occur within three zones beneath the RMI site:

1) An unconfined water table zone within the glacial till unit which lies above the escarpment and occurs only on the southern half of the site

2) A partially confined water bearing zone within the low to moderate conductive materials represented by the till/bedrock interface

3) A confined water bearing zone within the low hydraulic conductivity shale

Figure 3-6 shows the typical water table surface within the glacial till unit. Figure 3-7 shows the typical piezometric contours for the till/bedrock interface. Slug tests have been performed on 18 monitoring wells. Data summaries from these tests are found in the *Supplemental Hydrologic Assessment* (Eckenfelder 1989a). Hydraulic conductivity values calculated from these tests are presented in Table 3-4. Typical water level data for all monitoring wells is in Table 3-5.

3.6.1 Glacial Till Zone

An unconfined water table zone occurs in the glacial till, which is present only in the topographically higher areas of the site, south of the escarpment. This unconfined zone receives recharge predominantly through direct infiltration of precipitation. The surface of the glacial till water table zone occurs at a shallow depth, ranging from approximately 2.5 feet at MW 101 to 15 feet at MW 312, and immediately below the ground surface along the north facing escarpment where it crops out. Flow within the unit is generally toward Fields Brook. Flow in the glacial till water bearing zone is cut off at the escarpment north of the plant (Eckenfelder 1989b).

The geometric mean hydraulic conductivity is estimated to be 1.9×10^{-6} centimeters per second (cm/sec) from slug tests conducted in applicable wells (Table 3-4). The average hydraulic gradient is 0.01 south of the former evaporation pond and 0.10 north of the impoundment to the escarpment. With an assumed effective porosity of 0.3, horizonal flow rates are estimated at 0.07 feet per year south of the evaporation pond and 0.7 feet per year north of the pond to the escarpment (Eckenfelder 1989b).

Table 3-3 - Monitoring Well Construction Data at the RMI Extrusion Plant, Ashtabula, Ohio

Well Number	Ground Elevation (ft msl)	Total Well Depth (ft)	Screened Interval (ft)	Geologic Unit of Screened Interval
100	636.3	14.5	4.5-14.5	Till
101	636.9	15.0	5-15	Till
103	635.8	14.0	4-14	Till
104	634.0	14.8	4.8-14.8	Till
105	631.9	16.0	6-16	Till
106	635.2	15.0	5-15	Till
200	634.1	43.0	33-43	Shale
201	611.5	15.0	5-15	Till/Shale
202	611.3	15.0	5-15	Till/Shale
203	611.8	15.0	5-15	Till/Shale
204	615.5	15.0	5-15	Till/Shale
205	611.8	15.0	5-15	Till/Shale
206	612.2	15.0	5-15	Till/Shale
207	633.3	26.0	4.3-26	Till
208[a]	631.8	25.0	3.9-25	Till
209[a]	631.0	25.0	3.3-25	Till
210[a]	630.4	26.0	3.6-26	Till
300	634.0	33.5	28.5-33.5	Till/Shale
301	612.2	15.0	5-15	Till/Shale
302	633.6	31.5	26.5-31.5	Till/Shale
303	631.0	31.5	26.5-31.5	Till/Shale
304	631.6	31.5	26.5-31.5	Till/Shale
305	630.3	29.5	24.5-29.5	Till/Shale
306	631.2	24.5	19.5-24.5	Till
307	631.2	17.0	12-17	Till
308	634.6	22.0	7-17	Till
309	634.3	32.0	27-32	Till/Shale
310	635.6	33.5	28.5-33.5	Till/Shale
311	636.4	34.0	29-34	Till/Shale
312	631.9	16.5	11.5-16.5	Till
313	631.9	24.0	19-24	Till
314	630.2	22.0	17-22	Till
315	630.0	14.5	9.5-14.5	Till
401	636.5	32.0	27-32	Till/Shale
402	636.4	54.0	49-54	Shale
403	629.0	27.5	22.5-27.5	Till/Shale
404	611.4	35.0	30-35	Shale
405	611.2	35.0	30-35	Shale

[a] Wells have been abandoned.

All elevations expressed in feet above MSL.

Adapted from: ECKENFELDER INC., 1989. *Supplemental Hydrogeologic Assessment, RMI Extrusion Plant, Ashtabula, Ohio.*

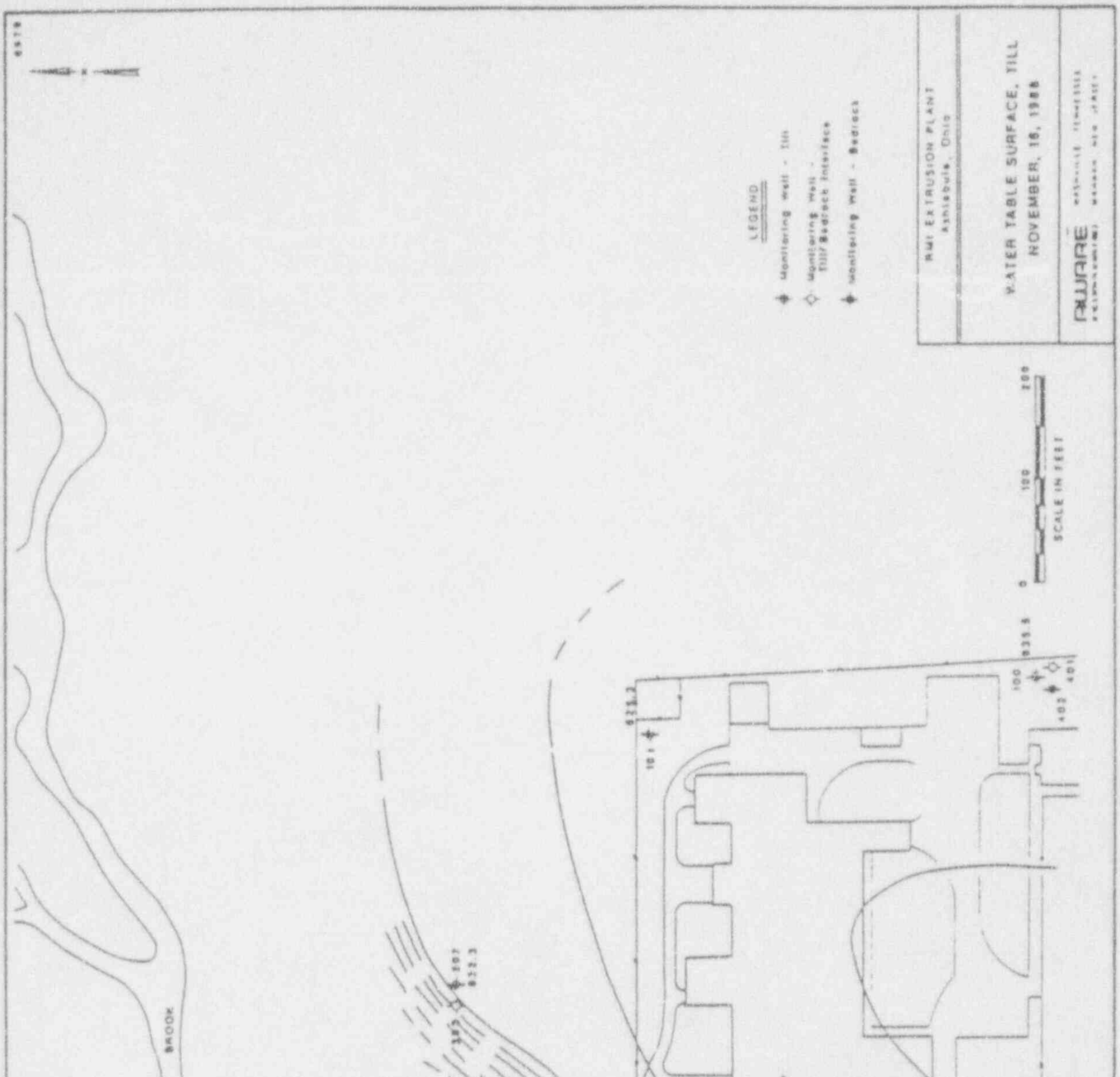


Figure 3-6 - Typical Water Table Surface

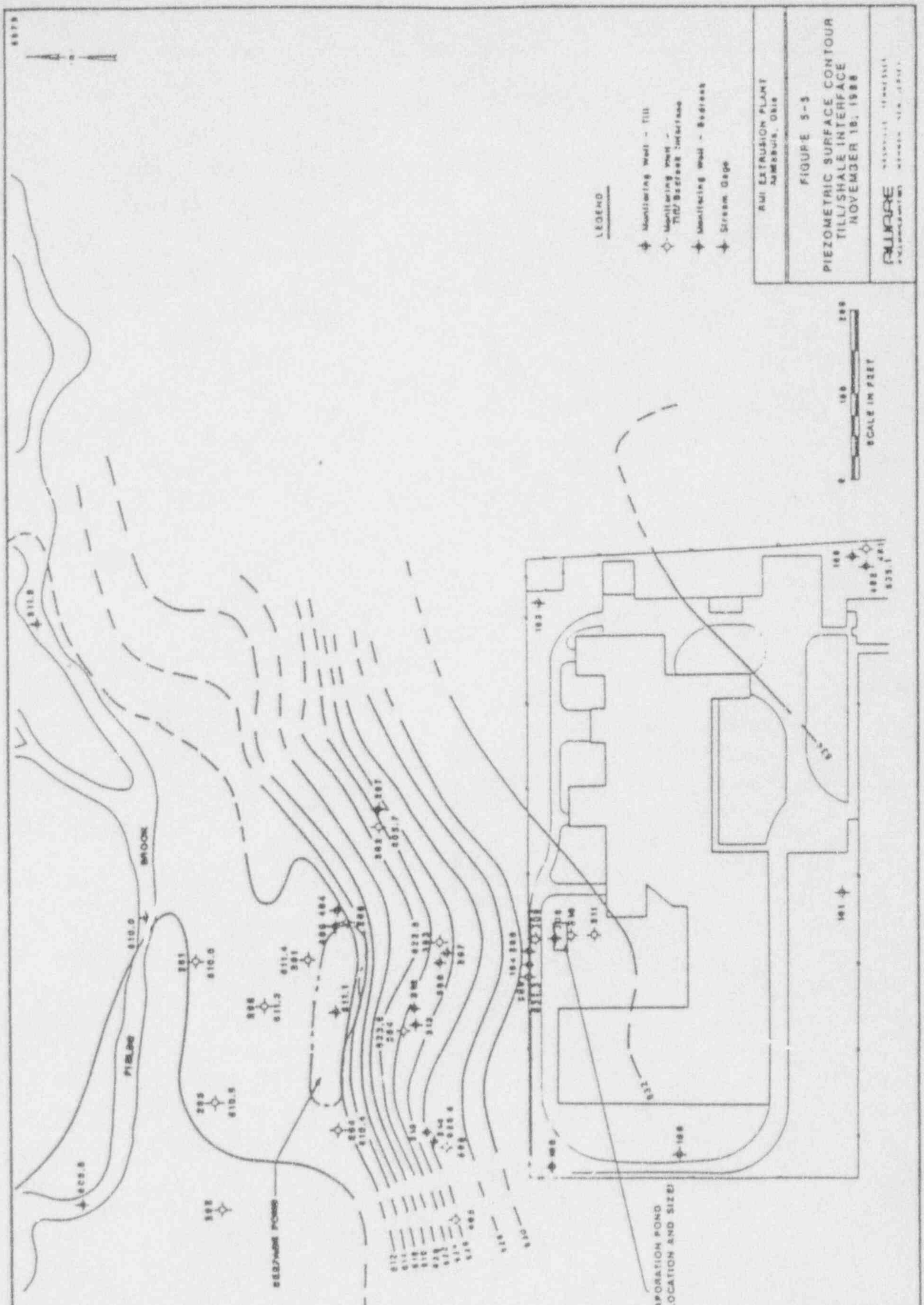


Figure 3-7 - Piezometric Contours

Table 3-4 - Slug Conductivity Test Results, RMI Extrusion Plant, Ashtabula, Ohio

Well Number	Geologic Unit	Hydraulic Conductivity (cm/sec)
100	Till	2.4×10^{-6}
101	Till	4.9×10^{-5}
103	Till	7.5×10^{-5}
104	Till	1.1×10^{-5}
105	Till	4.2×10^{-6}
106	Till	3.0×10^{-5}
306	Till	5.1×10^{-8}
307	Till	5.8×10^{-8}
314	Till	2.4×10^{-7}
315	Till	6.2×10^{-8}
	Till Geometric Mean	1.9×10^{-6}
205	Till/Shale	7.7×10^{-5}
301	Till/Shale	1.1×10^{-4}
303	Till/Shale	4.7×10^{-7}
304	Till/Shale	1.4×10^{-7}
305	Till/Shale	9.2×10^{-6}
401	Till/Shale	4.9×10^{-7}
403	Till/Shale	4.6×10^{-6}
	Till/Shale Geometric Mean	3.8×10^{-6}
402	Shale	2.4×10^{-7}

Reference: Eckenfelder Inc., 1989. *Supplemental Hydrogeologic Assessment, RMI Extrusion Plant, Ashtabula, Ohio*, May 1989.

Table 3-5 - Water Level Data 1986-1988 RMI Extrusion Plant, Ashtabula, Ohio (Page 1 of 2)

Well Number	Depth	Geologic Unit	Elevation		Groundwater Elevation				
			Reference	Ground	06-Jun-86	04-Aug-87	09-Nov-87	17-Nov-87	16-Nov-88
100	43.0	Till	639.06	--	635.98	635.0	635.5	634.5	635.5
101	15.0	Till	639.24	--	636.78	636.1	636.6	635.5	636.6
103	14.0	Till	639.18	--	635.43	635.2	NA	634.7	635.3
104	14.8	Till	636.49	--	633.86	630.8	634.0	633.5	633.5
105	16.0	Till	635.97	631.9	631.64	630.9	NA	631.5	631.6
106	15.0	Till	637.69	--	632.69	631.4	NA	631.1	632.6
200	43.0	Shale	635.77	634.1	616.77	624.4	628.3	NA	626.1
201	15.0	Till/Shale	613.53	611.5	609.82	609.5	NA	610.3	610.0
202	15.0	Till/Shale	613.37	611.3	609.29	610.2	NA	609.8	NA
203	15.0	Till/Shale	613.40	611.8	610.98	610.6	NA	610.8	610.9
204	15.0	Till/Shale	617.73	615.5	611.98	609.8	NA	612.0	610.4
205	15.0	Till/Shale	614.08	611.8	611.33	610.7	NA	611.3	611.3
206	15.0	Till/Shale	614.13	612.2	611.88	611.1	611.6	611.5	NA
207	26.0	Till	634.94	633.3	632.86	625.8	NA	632.3	632.3
208	25.0	Till	634.05	631.8	630.72	624.9	NA	NA	NA
209	25.5	Till	633.14	631.0	628.89	627.5	NA	NA	NA
210	26.0	Till	633.30	630.4	628.09	626.8	NA	633.0	NA
300	33.5	Till/Shale	636.33	634.0	NA	628.2	632.7	631.5	631.3
301	15.0	Till/Shale	615.15	612.2	NA	610.7	611.5	611.3	611.4
302	32.0	Till/Shale	636.68	633.6	NA	607.5	NA	622.9	605.7
303	31.5	Till/Shale	633.93	631.0	NA	623.2	624.5	NA	622.8
304	31.5	Till/Shale	634.66	631.6	NA	625.3	627.3	626.7	623.8
305	29.5	Till/Shale	633.16	630.3	NA	626.0	627.9	627.9	626.6
306	24.5	Till	634.09	631.2	NA	NA	624.1	NA	625.6

Table 3-5 - Water Level Data 1986-1988 RMI Extrusion Plant, Ashtabula, Ohio (Page 2 of 2)

Well Number	Depth	Geologic Unit	Elevation		Groundwater Elevation				
			Reference	Ground	06-Jun-86	04-Aug-87	09-Nov-87	17-Nov-87	16-Nov-88
307	17.0	Till	634.07	631.2	NA	NA	630.6	NA	625.3
308	22.0	Till	633.95	634.6	NA	NA	634.0	633.4	NA
309	32.0	Till/Shale	634.02	634.3	NA	NA	634.0	NA	NA
310	33.5	Till/Shale	635.94	635.6	NA	NA	NA	631.9	NA
311	32.5	Till/Shale	636.10	636.4	NA	NA	NA	633.6	NA
312	16.5	Till	634.78	631.9	NA	NA	628.6	NA	616.8
313	24.5	Till	635.01	631.9	NA	NA	621.7	NA	618.4
314	22.0	Till	633.21	630.2	NA	NA	627.6	NA	625.2
315	14.5	Till	633.31	630.0	NA	NA	626.9	NA	625.1
401	32.0	Till/Shale	638.89	636.5	NA	NA	NA	NA	635.1
402	54.0	Shale	638.19	636.4	NA	NA	NA	NA	583.12
403	27.5	Till/Shale	631.18	629.0	NA	NA	NA	NA	NA
404	35.0	Shale	613.60	611.4	NA	NA	NA	NA	<578 (Dry)
405	35.0	Shale	613.63	611.2	NA	NA	NA	NA	<578 (Dry)

NA = Not Applicable

All elevations expressed in feet above MSL.

Source: *Supplemental Hydrogeologic Assessment, RMI Extrusion Plant, Ashtabula, Ohio*

3.6.2 Till/Bedrock Interface Zone

Groundwater occurs under partially confined conditions in the laterally continuous zone represented by the till/bedrock interface. The potentiometric surface within this zone has been defined from monitoring wells screened at the till/bedrock interface. Horizontal flow within this zone moves from topographically high areas in the south toward Fields Brook to the north.

The till/bedrock interface zone is confined by the glacial till in the area south of the escarpment. However, this zone occurs under unconfined water table conditions from the escarpment northward to Fields Brook. The configuration of the piezometric surface reflects the vertical head differences between the glacial till and till/bedrock zones, particularly in the area of the escarpment. This relatively high head condition may be attributable to direct recharge to this zone in an area south of the plant (Eckenfelder 1989b).

The geometric mean hydraulic conductivity is estimated to be 3.8×10^{-6} cm/sec (Table 3-4). The average hydraulic gradient is 0.007 south of the former evaporation pond, 0.1 north of the impoundment to the escarpment, and 0.01 in the Fields Brook floodplain. With an assumed effective porosity of 0.1, horizontal flow rates are estimated to be 0.3 feet per year south of the evaporation pond, 3.9 feet per year north of the pond to the escarpment and 0.4 feet per year in the Fields Brook floodplain (Eckenfelder 1989b).

3.6.3 Bedrock Zone

Groundwater occurs under fully confined conditions in the deeper shale bedrock water bearing zone. The potentiometric surface within this zone has been partially defined by using water level measurements from monitoring wells screened within the shale. Using a hydraulic conductivity value of 2.4×10^{-7} cm/sec (MW 402), an average hydraulic gradient of 0.01 and a porosity of 0.1 yields a horizontal flow rate of 0.025 feet per year. Horizontal flow of groundwater in the shale is northward toward Lake Erie (Eckenfelder 1989b).

SECTION 4

PRELIMINARY EVALUATION OF CONTAMINATION

The *Site Scoping Report* (SR) (PARSONS 1993a) was prepared to support development the RMI site characterization plans. The SR provides a summary of existing RMI site physical and contamination data and contains results of direct measurements and samples obtained from various site locations. The SR was prepared to meet the requirements for a site scoping report described in draft *Manual for Conducting Radiological Surveys in Support of License Termination*, NUREG/CR-5849 (NRC 1992b) and provided the technical basis for the SCP.

The SR summarized both radiological and RCRA hazardous contaminant data. Preliminary radiation surveys of site buildings conducted in 1991 and a site scoping radiation of grounds Areas A through F conducted during the period June to December 1992 provided the basis for dividing the site buildings and grounds into affected and unaffected areas per NUREG/CR-5849 guidance. Data collected during the studies of the CAMU, analytical testing of site soil pile samples, and process knowledge provided the basis for identifying site media and areas known or suspected to contain RCRA hazardous contamination.

The following subsections summarize information contained in the SR. The information is intended to provide a link between the SR and the technical basis for groundwater, soils, and buildings characterization approaches described in Sections 7 through 9.

4.1 Identification of Contaminants

The SR identifies radiological and RCRA hazardous contaminants known or suspected to be present in the various media at the RMI site. Table 4-1 lists known and potential contaminants at the RMI site.

Table 4-1 - RMI Site Known and Potential Contaminants of Interest

Known	Potential[1]
RADIONUCLIDES	
Uranium-234 Uranium-235 Uranium-238 Technetium-99 Thorium-231 Thorium-234 Plutonium[2] Neptunium-237[2]	Thorium-232
INORGANICS	
Lead Barium	Arsenic
ORGANICS	
Trichloroethylene	Methylene chloride Perchloroethylene [3]

[1] Potential contaminant identified on the basis of limited information concerning operations

[2] Trace quantities were found in the drummed sediment/soil mixtures excavated during cleanup of the former evaporation pond. These elements were introduced at the facility as a contaminant in reprocessed uranium.

[3] Other organic compounds may potentially be present as a result of historical application of hydraulic press waste oils to the main plant fenceline as a weed suppressant and to the gravel fire road as a dust suppressant.

Table 4-2 provides summary of these contaminants by media (groundwater, soils, buildings/equipment). Locations and concentrations of the known contaminated media are described in Subsection 4.3.

Table 4-2 - RMI Site Contaminated Media

Media	Known or Potential Contaminant	
	Radiological	RCRA Hazardous
Groundwater	Uranium-234 Uranium-235 Uranium-238 Technetium-99 Thorium-231 Thorium-232 Thorium-234	Trichloroethylene
Soils	Uranium-234 Uranium-235 Uranium-238 Technetium-99 Thorium-232 Plutonium	Trichloroethylene Barium Lead Arsenic
Buildings/Equipment	Uranium-234 Uranium-235 Uranium-238 Thorium Technetium-99 Plutonium	Trichloroethylene Barium Lead Methylene Chloride Perchloroethylene

4.2 Proposed Clean-Up Levels

Table 4-3 contains a summary of the proposed clean-up levels for the relevant site media and primary radiological contaminants of interest. These levels have been demonstrated to be protective of human health and the environment are consistent with current NRC guidance. The US EPA has granted approval of the proposed clean-up levels for the CAMU (Subsection 2.1.2.3) (DOE 1993).

Table 4-3 - Summary of Proposed RMI Clean-Up Levels

Media	Radiological	
	Uranium	Technetium-99
Soil	30 pCi/g[a]	N/A[b]
Groundwater	20 $\mu g/\ell$[c]	900 pCi/ℓ[d]
Buildings	1,000 dpm/100 cm^2[(e)]	1,000 dpm/100 cm^2[(e)]
	5,000 dpm100 cm^2[(f)]	5,000 dpm100 cm^2[(f)]
	15,000 dpm/cm^2[(g)]	15,000 dpm/cm^2[(g)]

Notes:

[a]The current NRC guidelines (46 FR 52601, October 23, 1981) for clean-up levels of uranium in soils are 35 pCi/g for depleted levels of uranium, 30 pCi/g for enriched levels of uranium, and 10 pCi/g for natural abundance when all daughters are present and in equilibrium levels of uranium. A clean-up level for enriched uranium (i.e., 30 pCi/g) is proposed for the RMI Plant site, and is considered conservative since the majority of the uranium processed at the RMI Plant was depleted uranium.

[b]Eckenfelder 1991 and 1992 have previously demonstrated that the maximum existing Tc-99 concentrations is soil do not represent an unacceptable health risk to the public and a clean-up level is, therefore, not applicable for this radioisotope. Additional risk-based pathway studies would, however, be performed to verify that following release of the site for unrestricted use, the Tc-99 concentrations in soil would result in an acceptable long-term public health risk.

[c]Proposed maximum contaminant levels (MCLs) for uranium (56 FR 33050, July 18, 1991). The MCLs established in 40 CFR 141 for radionuclides in drinking water represent a concentration that shall not produce an annual dose equivalent greater than 4 mrem/yr.

[d]Regulatory guideline/criteria for free release as per NRC 1982; NRC Regulatory Guide 1.86; 46 FR 52601, October 23, 1981; and DOE Order 5400.5.

[e]1,000 dpm/100 cm^2 is the unrestricted release level for removable alpha (natural uranium, U-235 and U-238, and associated decay products). The unrestricted release level for beta/gamma radiation (e.g., Tc-99) is also 1,000 dpm/100 cm^2.

[f]5,000 dpm/100 cm^2 is the unrestricted release level (average value) for the sum of removable and fixed alpha (i.e., uranium). The unrestricted release level (average) for the sum or removable and fixed beta/gamma radiation (e.g., Tc-99) is also 5,000 dpm/100 cm^2.

[g]15,000 gpm/100 cm^2 is the unrestricted release level (maximum value) for the sum of removable and fixed alpha (i.e., uranium). The unrestricted release level (maximum) for the sum of the removable and fixed beta/gamma radiation (e.g., Tc-99) is also 15,000 dpm/100 cm^2.

4.3 Contaminant Nature and Extent

This subsection summarizes a preliminary estimation of the level, nature, and extent of radiological and RCRA hazardous contamination in groundwater, soils and buildings at the RMI site.

4.3.1 Groundwater

Radiological

Previous sampling and analysis efforts at the RMI site have identified the following radioactive constituents of interest in groundwater at the site: uranium and Tc-99. Based on process knowledge for the extrusion operations as described in Subsection 2.1.2.2, thorium-232 isotopes could potentially be a contaminant of groundwater at the site.

Groundwater investigations have been conducted and are documented in several reports. RMI has completed environmental reports for investigations conducted under RCRA. Initial investigations were conducted by Dames and Moore (1985, 1986, and 1987). More detailed studies were performed by AWARE, Inc. (1988) and Eckenfelder (1989a and b). Since 1985, radiological groundwater contamination areas which have exceeded radiological clean-up standards specified for the CAMU (Subsection 2.1.2.3) have been identified in three locations at the RMI site. These locations include:

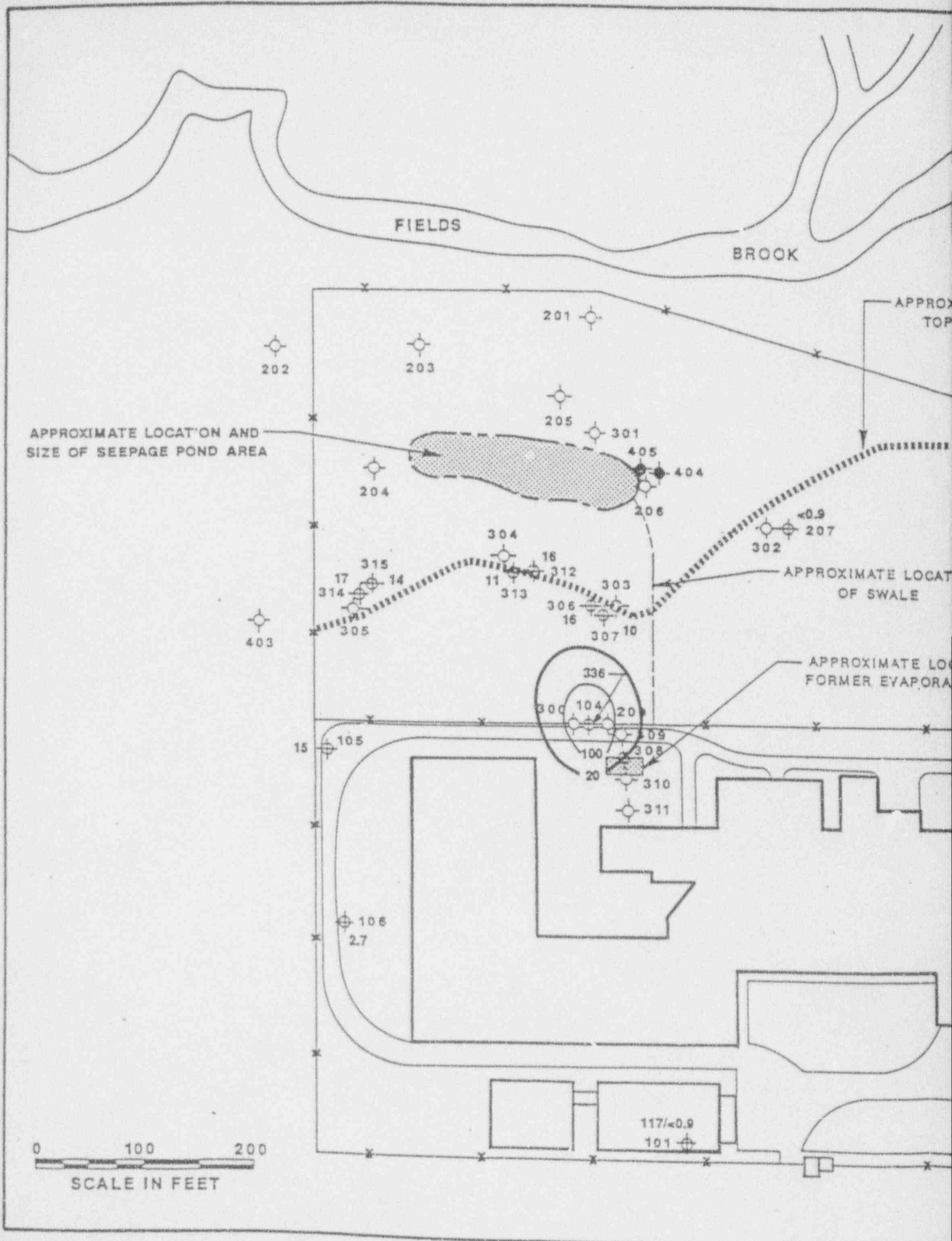
1) The CAMU area which includes the former evaporation pond, the associated groundwater plume, and the seepage pond (Areas B and C)

2) The northeast corner of the plant property (near monitoring well 103) (Area B)

3) The new office complex area (near monitoring well 101) (Area B).

These three locales are indicated as radiologically contaminated from isoconcentration maps (Figures 4-1 through 4-4) and groundwater monitoring data (Eckenfelder 1992). The majority of groundwater contamination has been found in the vicinity of the seepage pond and the former evaporation pond.

Groundwater contamination has been detected only in the glacial till and the till shale interface zones.



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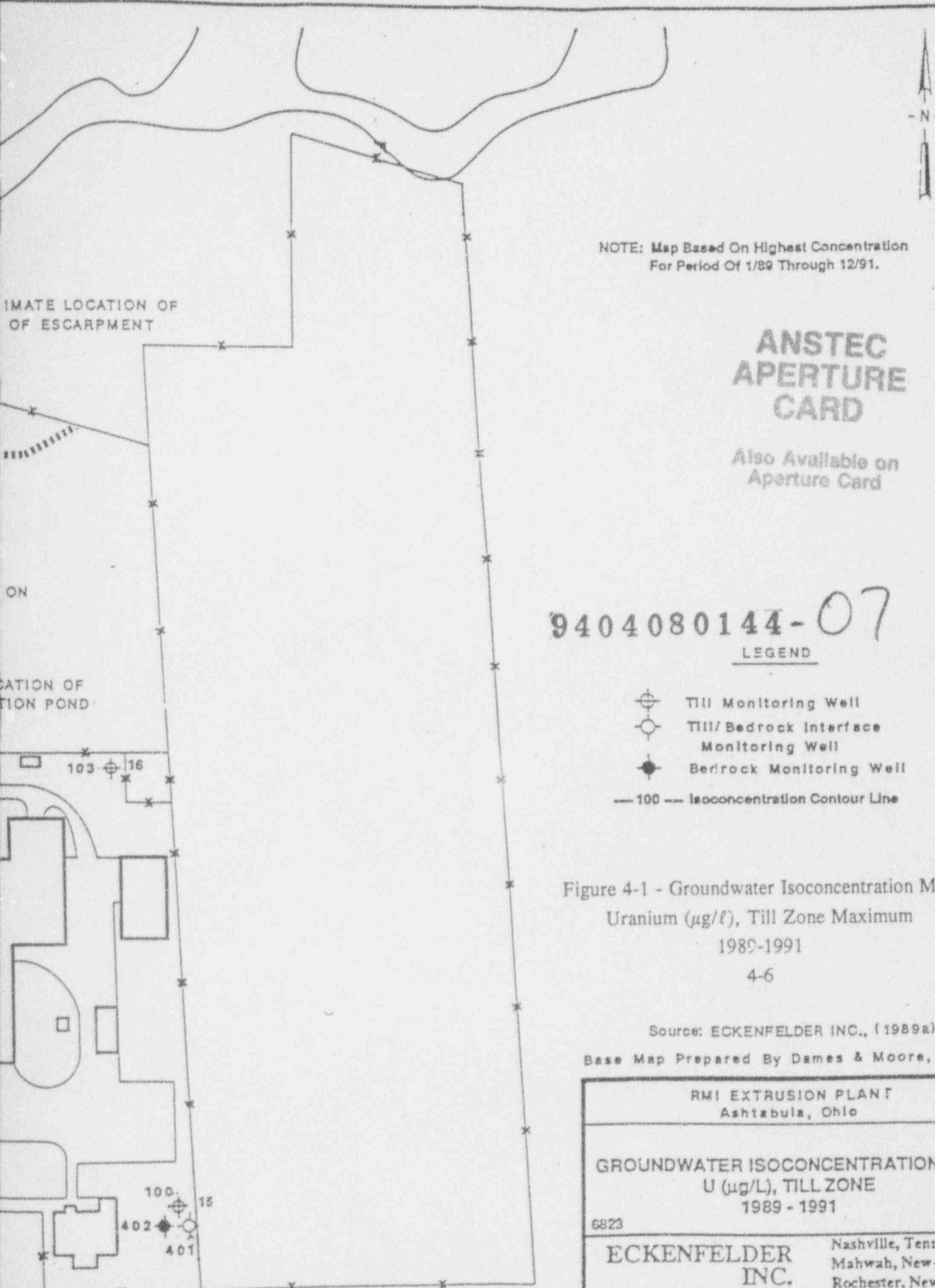


NOTE: Map Based On Highest Concentration For Period Of 1/89 Through 12/91.

LEGEND

- Till Monitoring Well
- Till/Bedrock Interface Monitoring Well
- Bedrock Monitoring Well
- — 100 — Isoconcentration Contour Line

Figure 4-1 - Groundwater Isoconcentration Map
Uranium ($\mu g/\ell$), Till Zone Maximum
1989-1991
4-6

Source: ECKENFELDER INC., (1989a)

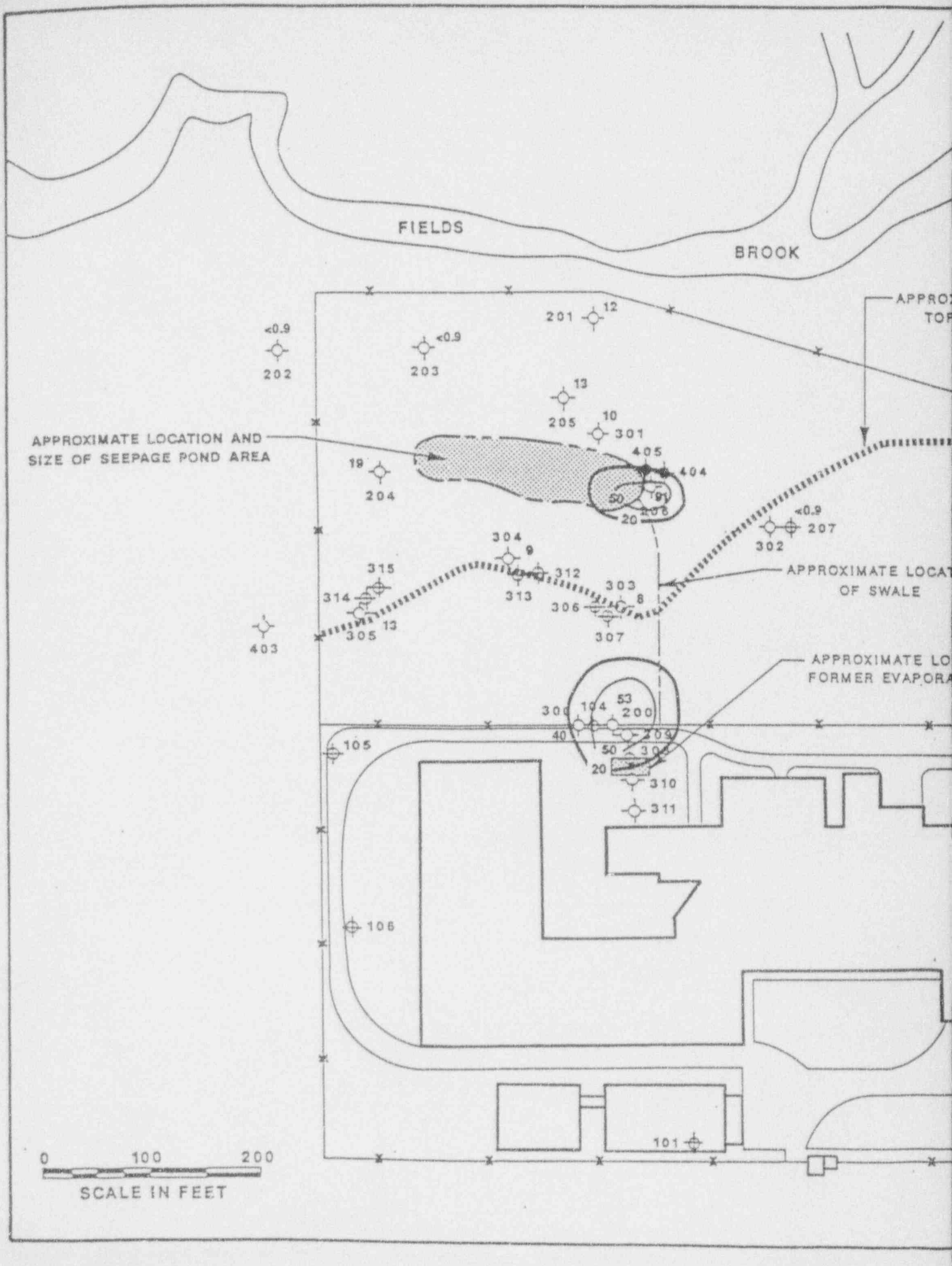
Base Map Prepared By Dames & Moore, 1986

RMI EXTRUSION PLANT
Ashtabula, Ohio

GROUNDWATER ISOCONCENTRATION MAP
U (µg/L), TILL ZONE
1989 - 1991

6823 8/92

ECKENFELDER INC.
Nashville, Tennessee
Mahwah, New Jersey
Rochester, New York



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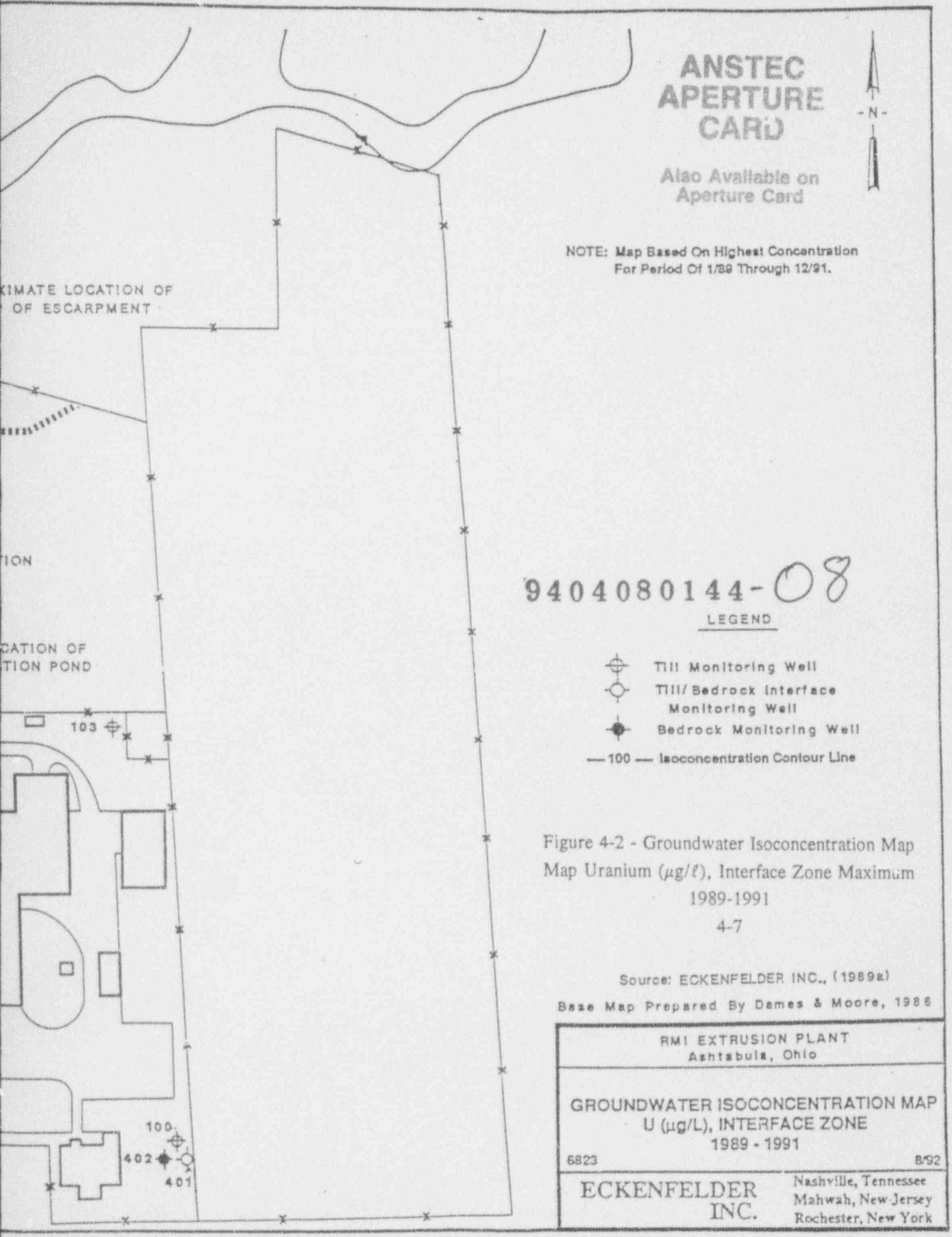
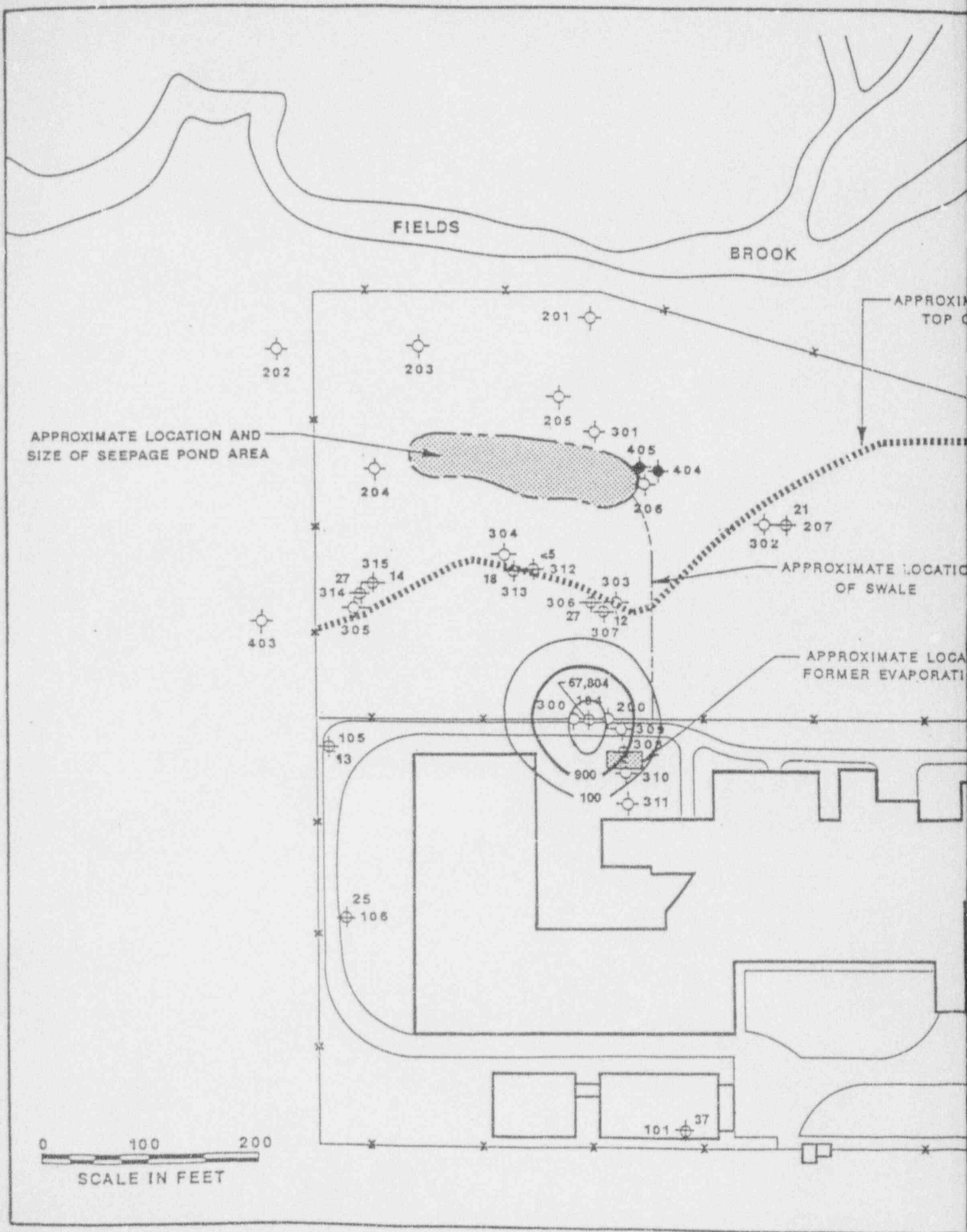


Figure 4-2 - Groundwater Isoconcentration Map
Map Uranium ($\mu g/\ell$), Interface Zone Maximum
1989-1991



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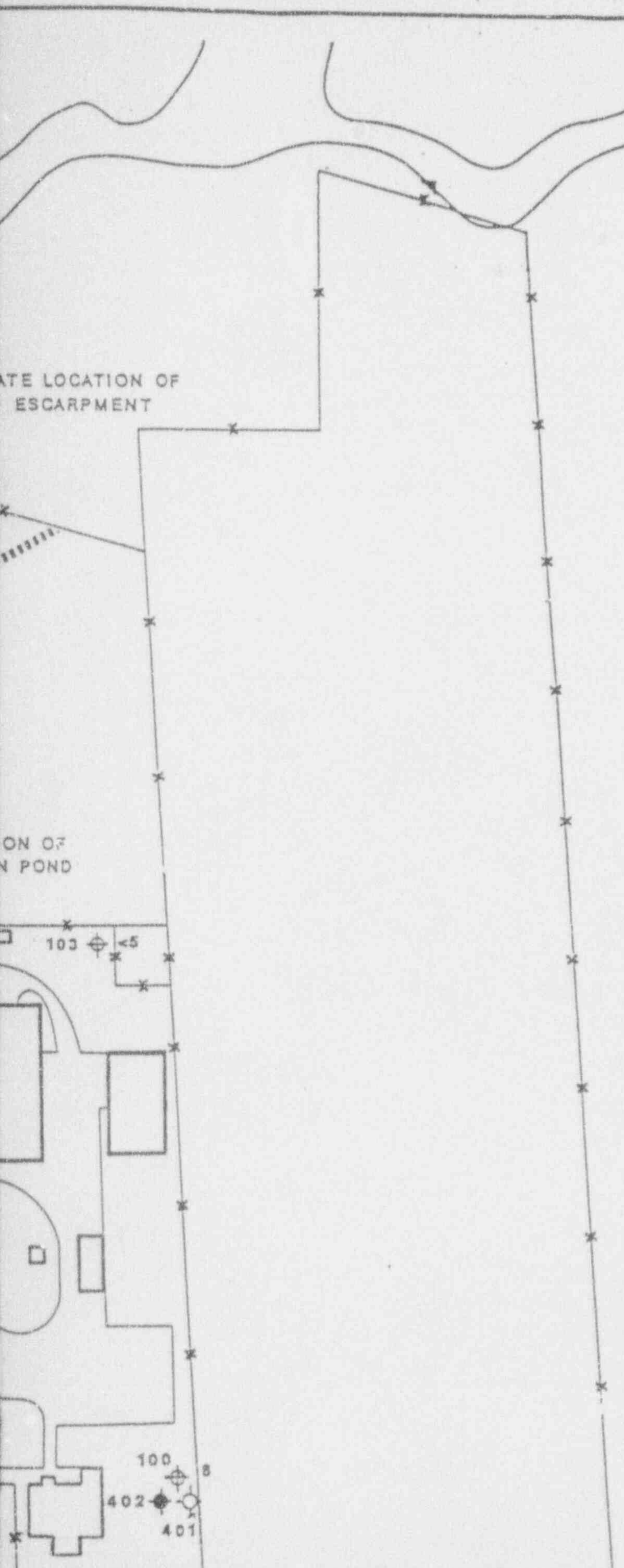


NOTE: Map Based On Highest Concentration For Period Of 1/89 Through 12/91.

LEGEND

- Till Monitoring Well
- Till/ Bedrock Interface Monitoring Well
- Bedrock Monitoring Well
- — 100 — Isoconcentration Contour Line

Figure 4-3 - Groundwater Isoconcentration Map
Tc-99 (pCi/ℓ), Till Zone 1989-1991

4-8

9404080144 -09

Source: ECKENFELDER INC., (1989a)

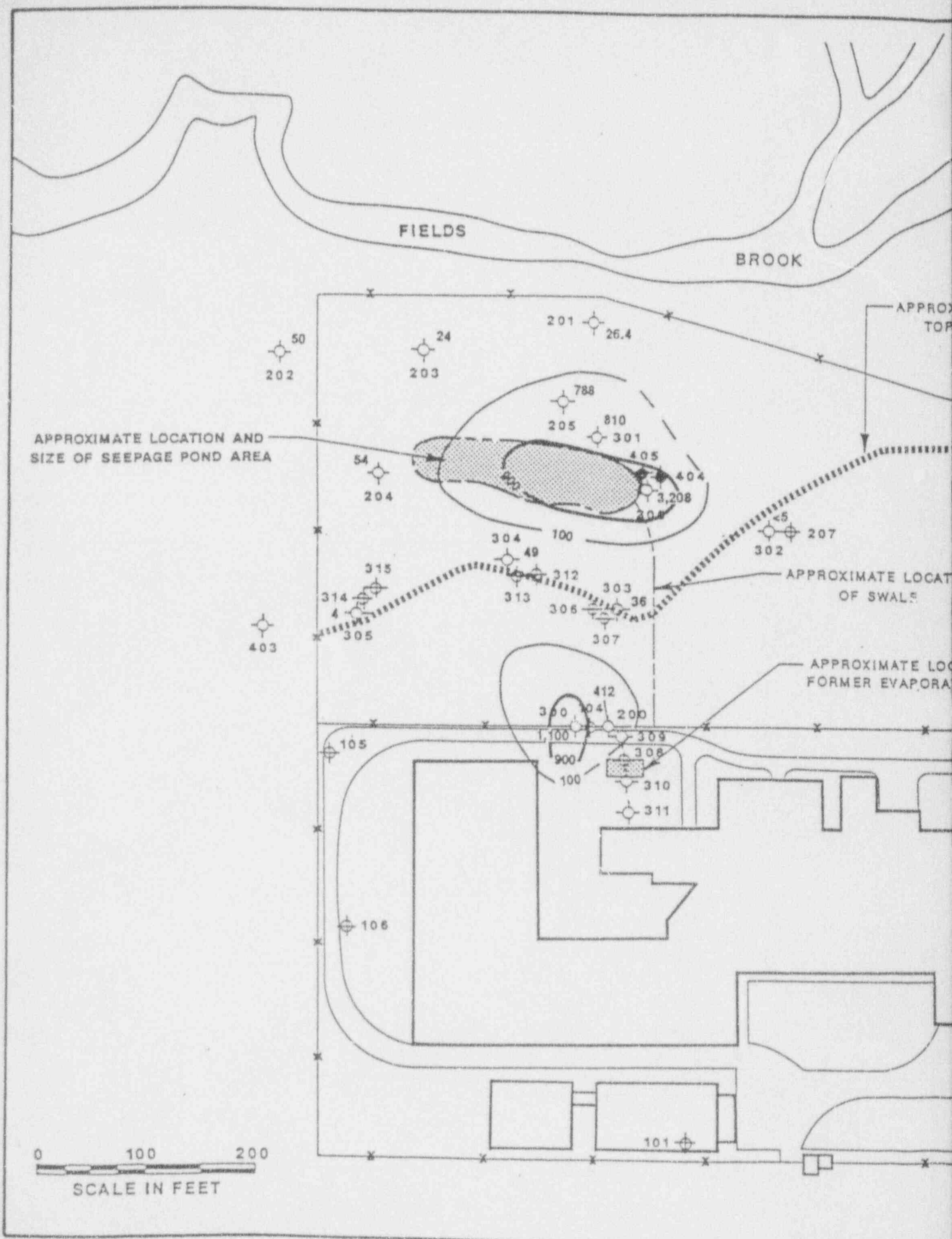
Base Map Prepared By Dames & Moore, 1986

RMI EXTRUSION PLANT
Ashtabula, Ohio

GROUNDWATER ISOCONCENTRATION MAP
^{99}Tc (pCi/L), TILL ZONE
1989 - 1991

6823 7/92

ECKENFELDER INC.
Nashville, Tennessee
Mahwah, New Jersey
Rochester, New York



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ANSTEC APERTURE CARD

Also Available on Aperture Card

NOTE: Map Based On Highest Concentration For Period Of 1/89 Through 12/91.

LEGEND

Till Monitoring Well

Till/ Bedrock Interface Monitoring Well

Bedrock Monitoring Well

— 100 — Isoconcentration Contour Line

Figure 4-4 - Groundwater Isoconcentration Map
Tc-99 (pCi/ℓ), Interface Zone Maximum
1989-1991
4-9

9404080144 - 10

Source: ECKENFELDER INC., (1989a)

Base Map Prepared By Dames & Moore, 1986

RMI EXTRUSION PLANT
Ashtabula, Ohio

GROUNDWATER ISOCONCENTRATION MAP
99 Tc (pCi/L), INTERFACE ZONE
1989 - 1991

6823 7/92

ECKENFELDER INC.
Nashville, Tennessee
Mahwah, New Jersey
Rochester, New York

RCRA Hazardous

Previous sampling and analysis efforts at the RMI site have identified TCE as a RCRA hazardous constituent of concern in groundwater at the site.

As a result of their studies of analytical groundwater data from the monitoring well network established for the CAMU, Eckenfelder, Inc., established TCE as the only RCRA hazardous contaminant of concern for groundwater (and seep water) in the CAMU. Cleanup of the TCE contaminated groundwater in the CAMU is being managed by the CMS (Eckenfelder 1992).

Groundwater contamination has been detected only in the glacial till and the till shale interface zones. During the groundwater investigation activities associated with the CAMU the wells were selectively sampled. The periodicity of sampling was dictated primarily by the requirements of the CAMU groundwater investigation. Following the CAMU groundwater investigation, wells were selectively sampled quarterly, then semi-annually for the following nonradiological parameters: VOCs, pH, specific conductance, TOC, TOX. Tabular summaries of non radiological groundwater analytical data for the CAMU investigation period of July 1985 through January 1989 are found in the *Supplemental Hydrologic Assessment* (Eckenfelder 1989a). The investigation activities were performed for six parameters and are listed below:

1) Trichloroethylene: The period reported is from July 1985 through January 1989.

2) Major Ions: The period reported is from July 1985 through January 1989. The analytes include calcium, magnesium, sodium, potassium, bicarbonate, carbonate, sulfate, and chloride.

3) Metals: The period reported is August and September 1988. The metals include silver, aluminum, arsenic, barium, beryllium, cadmium, cobalt, chromium, copper, mercury, manganese, nickel, lead, antimony, selenium, thallium, vanadium, and zinc. Cyanide was tested for in addition to the metals. From July 1985 through January 1989 samples were analyzed for both total and soluble iron. Samples from only 3 wells (MWs 104, 206, and 300) were analyzed for metals. MW 300 was sampled and analyzed for nickel and selenium only.

4) Organic Parameters: The period reported is March 1988 to January 1989.

5) Miscellaneous Parameters: The period reported is July 1985 through January 1989. The parameters are pH, specific conductance, total dissolved solids, nitrate, fluoride, and ammonia.

6) TOX\TOC: The period reported is covered July 1985 through January 1989.

The CMS (Eckenfelder 1992) summarizes additional VOC data through December 1991.

Figures 4-5 and 4-6 show isoconcentration contours for the TCE (Eckenfelder 1992).

TCE Contamination of the Glacial Till Zone exists only on the south side of the escarpment in the CAMU located in Areas B and C. Persistently elevated levels of TCE have been found beneath and downgradient of the former evaporation pond (Appendix C). Contamination of the Till/Shale Interface Zone occurs in the CAMU area. TCE contamination of this zone has been found in the vicinity of the former evaporation pond, beneath the seepage pond, and adjacent to Fields Brook. The TCE contamination seen in MWs 201, 202, and 203 is attributed to sources other than the RMI Extrusion Plant (Eckenfelder 1989b). The specified clean-up level for TCE is exceeded only in the former evaporation pond area. TCE has not been detected above background levels in the Bedrock Zone.

4.3.2 Soils

Radiological

Scoping information regarding the nature and extent of radiological contamination in RMI site soils came primarily from the following sources:

1) Radiological laboratory analysis of shallow surface soil samples collected annually

2) Radiological laboratory analysis of soil samples collected from a previously remediated 1-acre parcel of land in Area B (referred to as the "Front Yard")

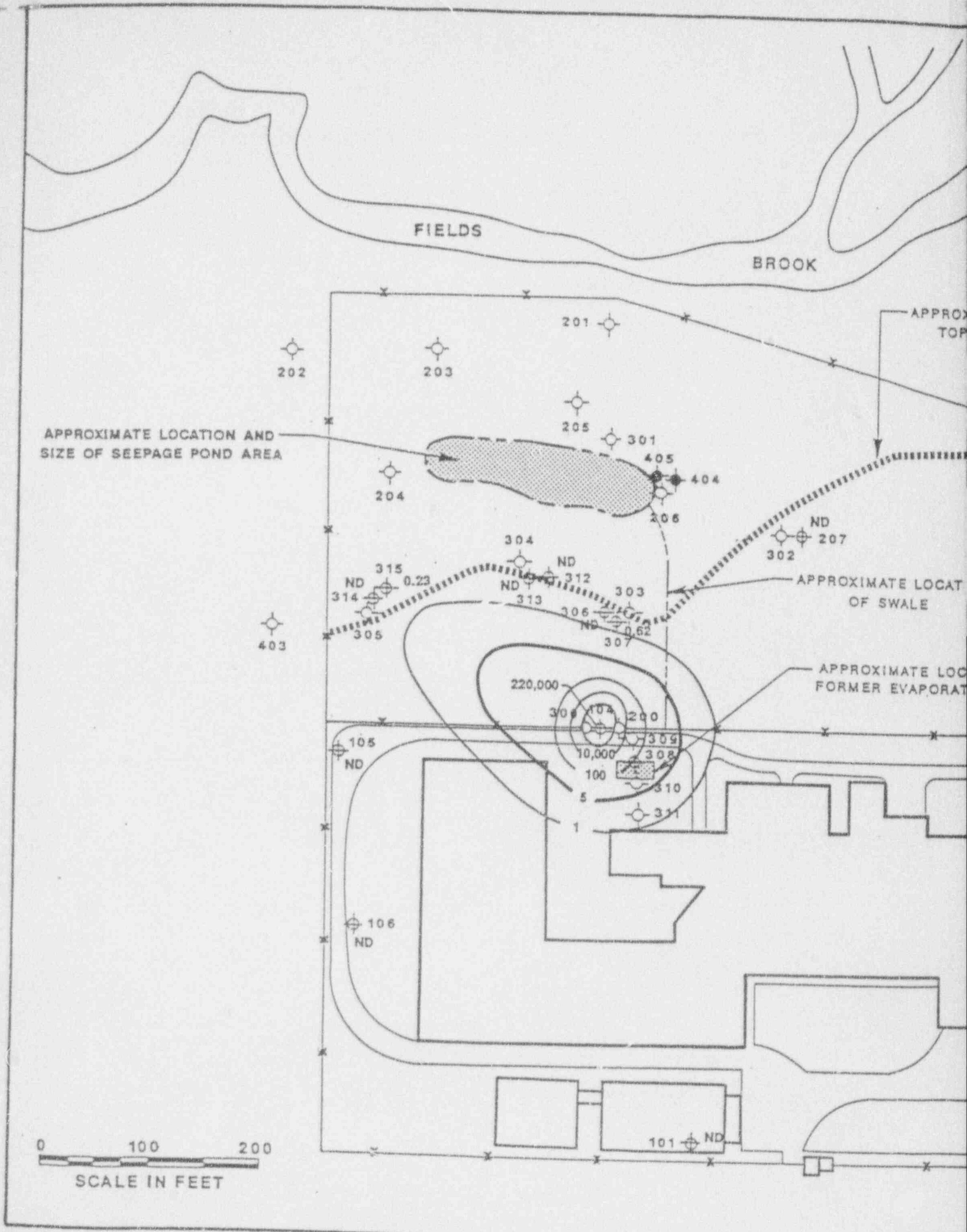
3) Radiological laboratory analysis of soil samples collected during soil boring at the former evaporation pond site

4) A scoping radiation survey of grounds Areas A though F

Information and data from these sources are presented in the SR and summarized below.

1) Annual Surface Soil Samples

As part of the data collection effort needed to prepare the RMI Annual Site Environmental Report, "on-site" (plant area and RMI property located immediately east of the plant area) and "off-site" (SCM Chemicals, Inc. property to the north of the plant area and areas adjacent to the plant area) surface soil samples are collected once each year and analyzed for uranium. Figure 4-7 shows the eleven "on-site" (X-1 through X-11) and 10 "adjacent, off-site" (S-45 through S-54) annual surface soil sample locations. Table 4-4 summarizes the total uranium concentration of the soil samples collected at these locations from 1986 to 1991. The soil samples were collected from the upper 6 inches of the soil horizon.



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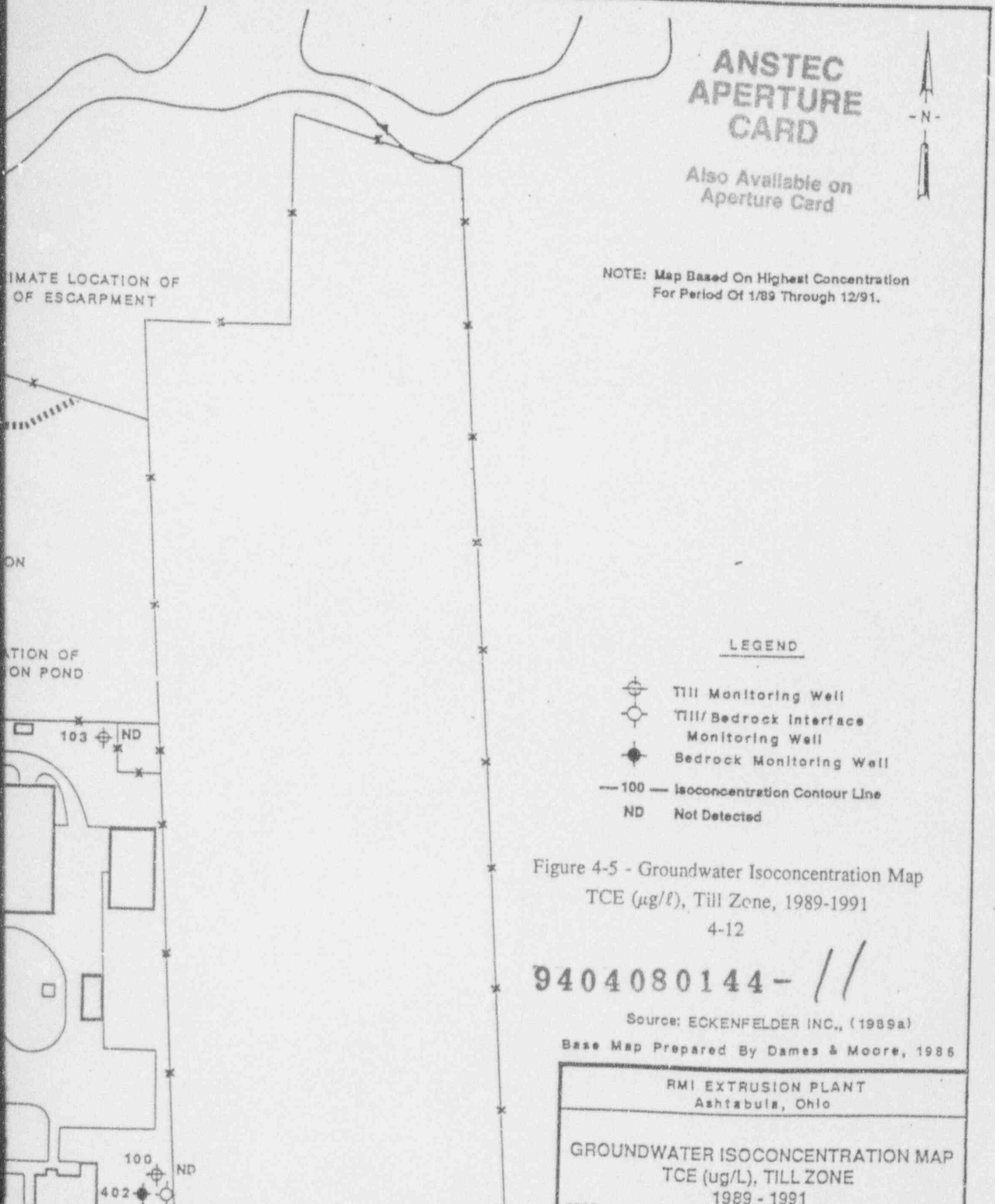

Figure 4-5 - Groundwater Isoconcentration Map
TCE ($\mu g/\ell$), Till Zone, 1989-1991

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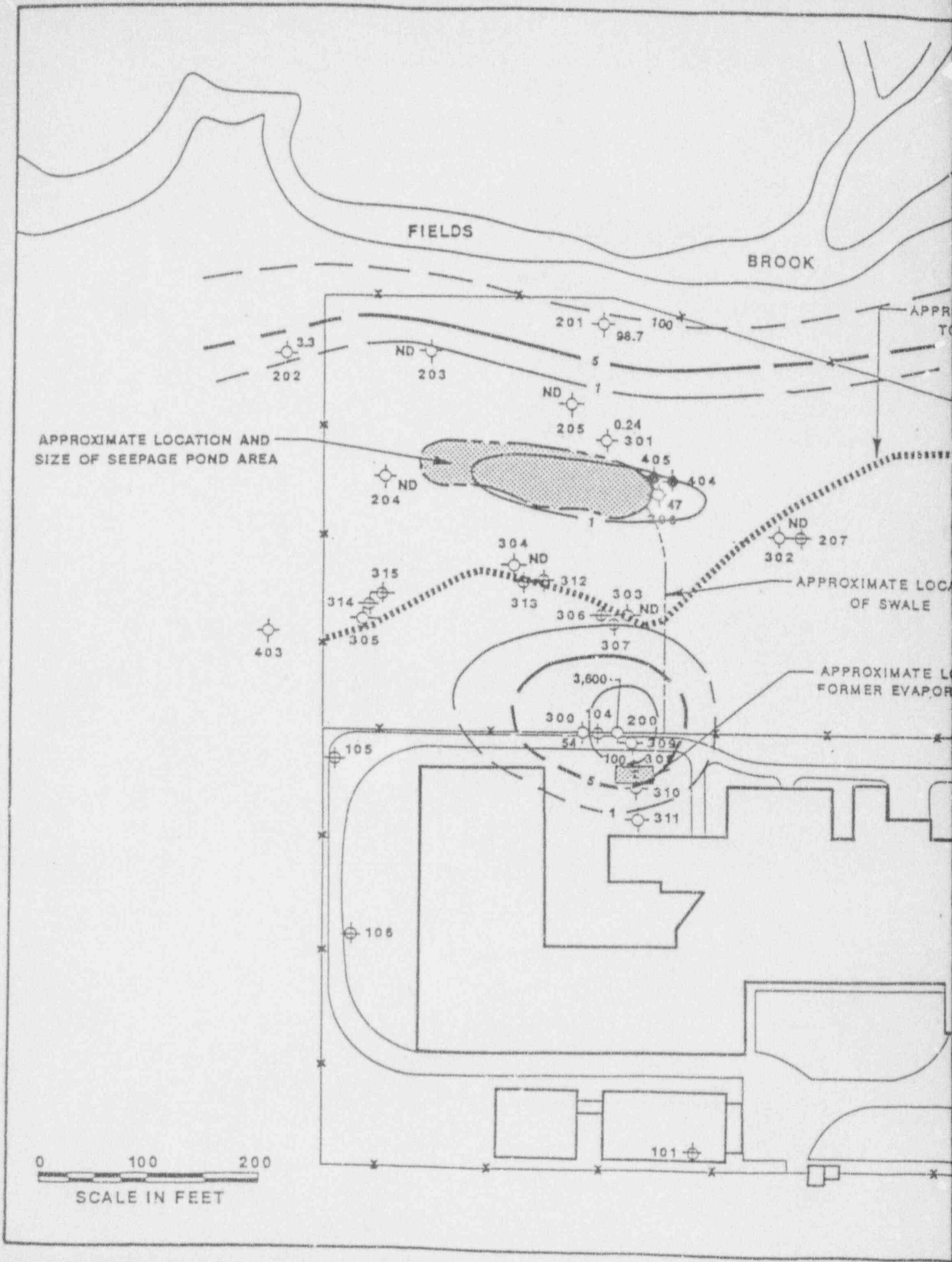
FIELDS
BROOK
APPROXIMATE LOCATION AND SIZE OF SEEPAGE POND AREA
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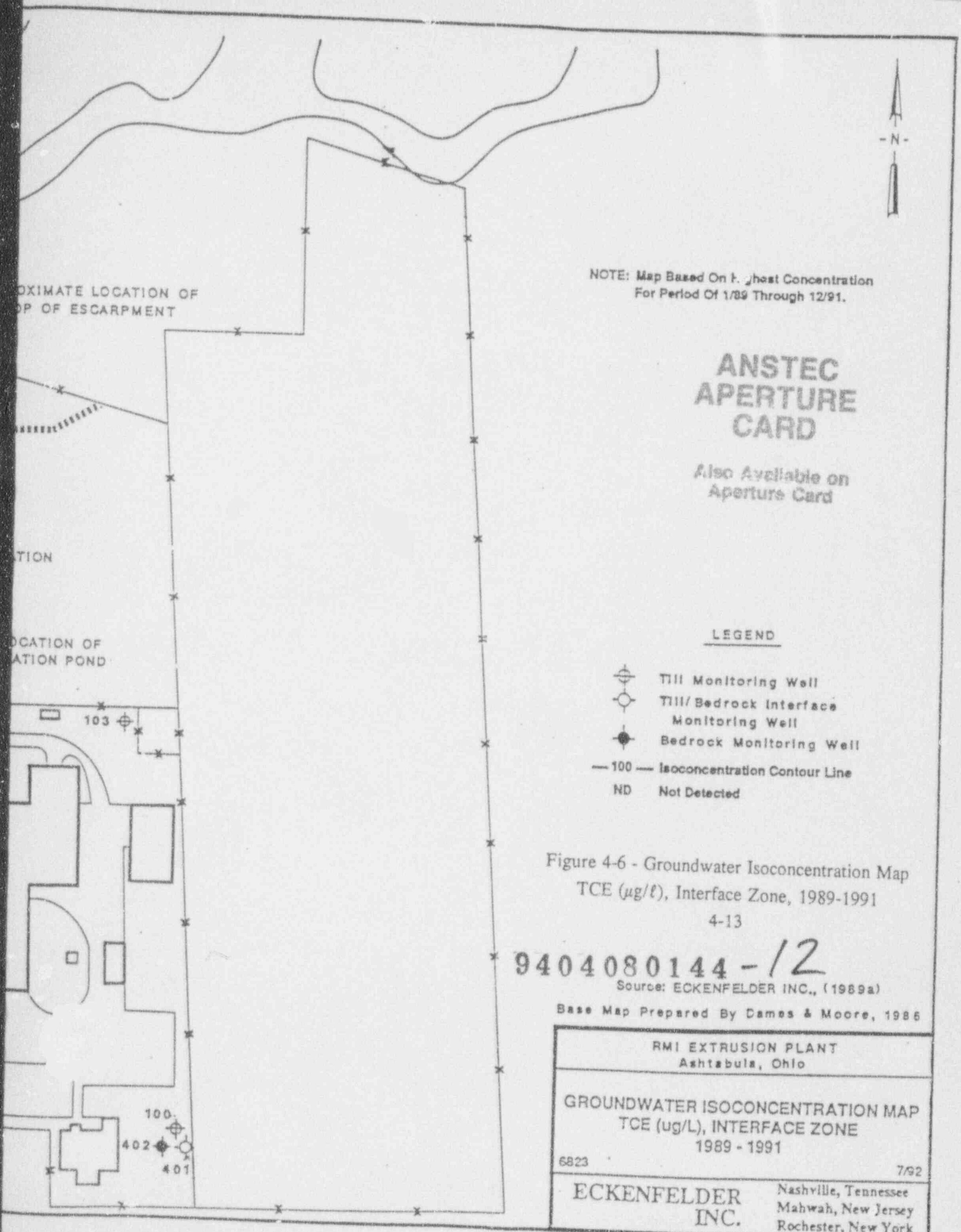
SCALE IN FEET



ANSTEC APERTURE CARD

Also Available on Aperture Card

Figure 4-6 - Groundwater Isoconcentration Map TCE ($\mu g/\ell$), Interface Zone, 1989-1991

4-13

9404080144 -12

Source: ECKENFELDER INC., (1989a)

Base Map Prepared By Dames & Moore, 1986

RMI EXTRUSION PLANT
Ashtabula, Ohio

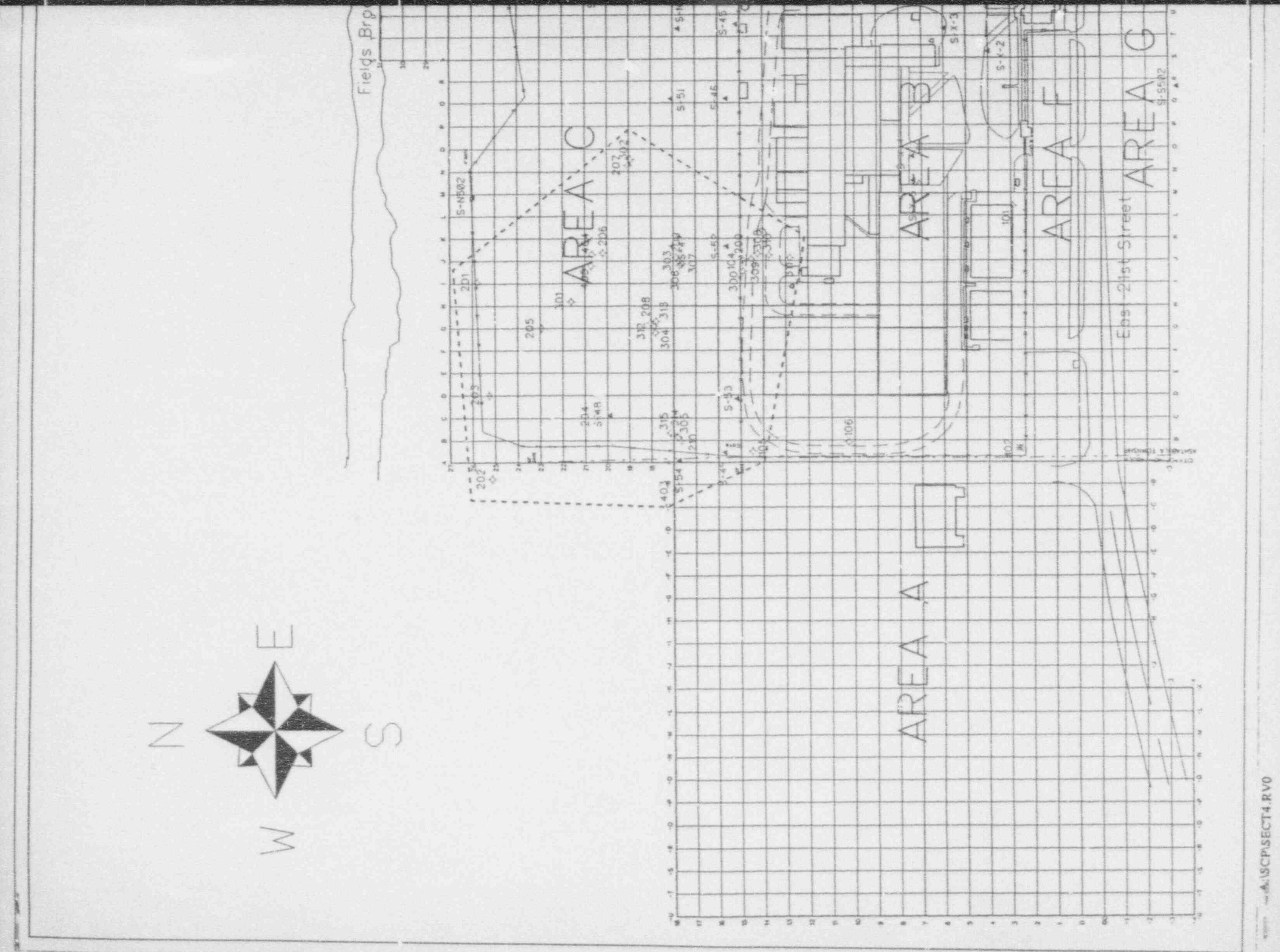
GROUNDWATER ISOCONCENTRATION MAP
TCE (ug/L), INTERFACE ZONE
1989 - 1991

6823 7/92

ECKENFELDER INC.

Nashville, Tennessee
Mahwah, New Jersey
Rochester, New York

Rev. No.: 0



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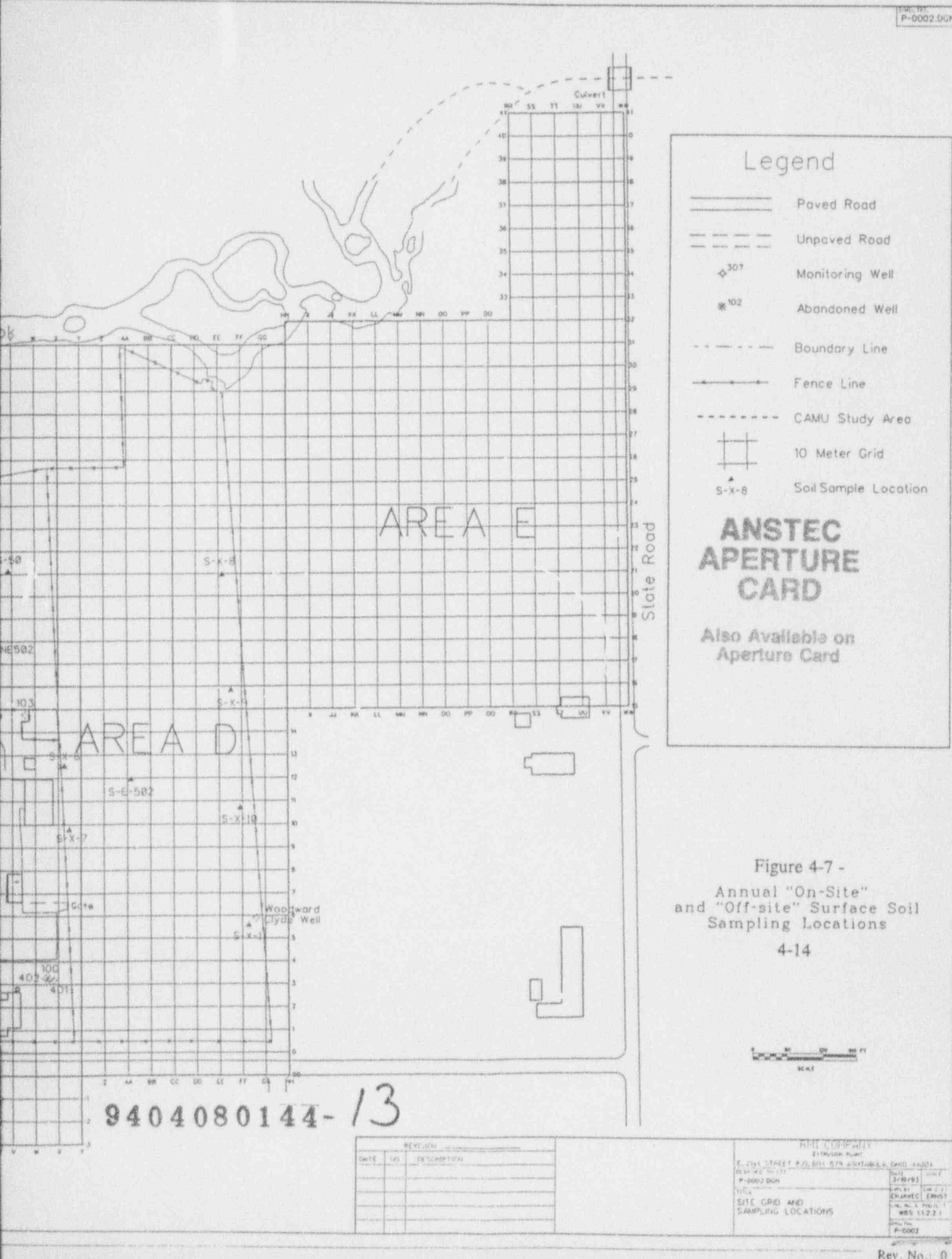

Figure 4-7 -
Annual "On-Site" and "Off-site" Surface Soil Sampling Locations

4-14

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Table 4-4 - RMI Annual Soil Sample Data Summary, 1986-1991

	Total Uranium (pCi/g)								
Sample Location	Year: 1986	1987	1988	1989	1990	1991	Maximum	Average	Standard Deviation
S-45	656	167	514	372	152	668	668	422	230
S-46	23.6	10.6	18.2	46.8	10.6	38.6	46.8	24.7	15.0
S-47	7.31	12.8	24.8	27.3	11.9	74.6	74.6	26.5	24.8
S-48	16.0	1.97	3.56	4.50	1.67	2.16	16.0	4.98	5.51
S-49	7.35	7.35	2.22	1.89	0.84	2.69	7.35	3.72	2.87
S-50	11.8	6.25	15.4	17.5	6.15	13.9	17.5	11.8	4.75
S-51	13.3	16.4	24.5	17.4	10.7	321	321	67.2	124
S-52	343	1.40	325	233	71.8	144	343	186	138
S-53	4.76	46.1	107	100	10.9	17.0	107	47.6	45.6
S-54	4.00	4.08	11.6	9.38	3.15	6.83	11.6	6.51	3.40
X-1	NST	NST	209	128	NST	NST	209	168.5	57.3
X-2	NST	NST	12.5	14.9	10.2	14.3	14.9	13.0	2.11
X-3	NST	NST	84.0	186	37.1	71.3	186	94.6	64.1
X-4	NST	NST	96.0	1580	46.4	59.6	1580	445.5	757
X-5	NST	NST	191	192	42.6	141.9	192	141.9	70.2
X-6	NST	NST	938	2600	272	713	2600	1131	1018
X-7	NST	NST	1.21	523	22.7	121	523	167	243
X-8	NST	NST	NST	NST	NST	1.71	1.71	1.71	NA
X-9	NST	NST	NST	NST	NST	3.97	3.97	3.97	NA
X-10	NST	NST	NST	NST	NST	5.65	5.65	5.65	NA
X-11	NST	NST	NST	NST	NST	6.76	6.76	6.76	NA

Summary - Total Uranium

All Samples, 1986-1991				
	No. of Data	Maximum	Average	Standard Deviation
Units:		pCi/g	pCi/g	pCi/g
S-series	60	668	80.1	154
X-series	30	2600	278	554

1991 Samples				
	No. of Data	Maximum	Average	Standard Deviation
Units:		pCi/g	pCi/g	pCi/g
S-series	10	668	129	214
X-series	10	713	114	217

Notes:

1. Soil samples collected from the upper 6 inches of the soil horizon.

2. Data Sources:

   1986-1989 data was obtained from 10/19/90 letter from RMI (E.P. Marsh) (D. Herman). The total uranium concentrations (ug/g) listed in the letter were converted to pCi/g (1ug/g approx. equals 0.75 pCi/g). This conversion assumes that isotopic uranium is 0.89 w/o U-235.

   1990 data was obtained from the RMI Decomissioning Plan (Draft).

   1991 Data was obtained from CEP Laboratory results (RMI-ESH:92-165, Dec. 11, 1992)

3. Concentrations listed as "less than" (<) in the RMI Decommisssioning Plan (Draft) and CEP results are shown as "equal to" values in this table. (1990 samples S-49 and S-54; 1991 samples X-8, X-9 and X-10.)

4. Concentrations of 1990 samples S-52 and X-2 are the average of two duplicate samples.

5. Concentrations of 1991 samples S-46, S-54, and X-4 are the average of two duplicate samples.

6. NST: No Sample Taken NA: Not Applicaple

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Additional annual off-site surface samples were collected in concentric rings originating from the center of the plant and extending outward 1.5 miles. The samples are collected from the upper 6 inches of the soil horizon and analyzed for uranium. Due to the south-southwest prevailing wind direction, samples are collected on four different compass points on a north-northeast line along the ring intersections. Background soil samples are taken at points 3.25 miles south and 3.5 miles west of the site (RMI 1991a).

Table 4-5 summarizes the total uranium concentration of the soil samples collected at these locations from 1986 to 1991.

2) Front Yard Soil Samples

Extensive characterization of uranium in RMI soil occurred in 1990 for a 1-acre portion of the site located immediately south of the RF-6 Butler Building referred to as the "Front Yard" (see Figure 4-8). This characterization was conducted in order to support excavation of contaminated soil prior to the construction of a modular office and laboratory complex on the site. The analytical data indicated that uranium contamination in surface soil generally decreased as distance from the facility buildings increased. Contamination levels also generally decreased with increasing soil depth.

Contamination levels in surface soil (1-6 inches in depth) ranged from 3 to 184 pCi/g total uranium. The highest subsurface (greater than 24 inch depth) soil contamination levels were observed adjacent to the RF-6 Butler Building foundation. A total uranium concentration level of 106 pCi/g was observed at a depth of 24 to 36 inches in this location (RMI 1991a). A summary of these results is presented in a graphical form in Figure 4-9.

3) CAMU Soil Boring

In August 1988, during investigation of the former evaporation pond at RMI, several soil samples were collected from the bore holes at depths ranging from 2 to 28 feet below ground surface. A total of 13 soil samples were collected and analyzed for total uranium and Tc-99 (Eckenfelder 1989b). Figure 4-10 shows the locations of these borings. Table 4-6 summarizes the results. The maximum total uranium concentration in soil samples from 0-2 feet in depth was 20.2 pCi/g and 8.1 pCi/g for samples below 2 feet in depth. The maximum technetium concentration in soil samples from 0-2 feet in depth was 6.6 pCi/g and 8.3 pCi/g for samples below 2 feet in depth. Additional deep soil sampling for radiological contamination in areas outside of the CAMU has not been performed.

Table 4-5 - RMI Annual Concentric Ring Soil Sample Data, 1986-1991

Year:	Maximum 1986 to 1991								
Distance From Plant Center(mi.)	0.1	0.15	0.2	0.5	1	1.25	1.5	3.25	3.5
Compass Direction	Total Uranium (pCi/g)								
N	74.0	3.28	2.28			0.69			
NNE	44.2	14.1	3.09	1.57	1.15		1.13		
ENE				0.91	1.58		1.35		
E	307		10.1						
S	3.13	1.80		1.05	1.06		1.14	1.58	
WSW				1.42	0.90		1.12		
W		1.44	1.35						0.83
Maximum All Directions	307	14.1	10.1	1.57	1.58	0.69	1.35	1.58	0.83
Average All Directions	107	5.16	4.21	1.24	1.17	0.69	1.19	1.58	0.83

Year:	Average 1986 to 1991								
Distance From Plant Center(mi.)	0.1	0.15	0.2	0.5	1	1.25	1.5	3.25	3.5
Compass Direction	Total Uranium (pCi/g)								
N	35.9	2.13	1.38			0.36			
NNE	15.5	7.98	1.97	0.66	0.50		0.53		
ENE				0.59	0.75		0.81		
E	69.7		2.67						
S	2.13	1.08		0.56	0.54		0.45	0.58	
WSW				0.62	0.55		0.77		
W		0.66	0.78						0.42
Maximum All Directions	69.7	7.98	2.67	0.66	0.75	0.36	0.81	0.58	0.42
Average All Directions	30.8	2.96	1.70	0.61	0.59	0.36	0.64	0.58	0.42

Notes:

1. Soil samples collected from the upper 6 inches of the soil horizon.

2. Data Sources:

1986 – 1989 data was obtained from 10/19/90 letter from RMI (E.P. Marsh) to WEMCO (D. Herman). The total uranium concentrations (ug/g) listed in the letter were converted to pCi/g (1ug/g approx. equals 0.75 pCi/g).

1990 data was obtained from the Draft Decommissioning Plan for the RMI Extrusion Plant, December 1991.

1991 data was obtained from from Controls for Environmental Pollution (CEP), Inc., laboratory results provided by letter RMI-ESH:92-165, December 11, 1992.

3. Concentrations listed as "less than" (<) for the 1990 and 1991 source data are shown as "equal to" values in this table.

4. Distance approximations used in this table:

RMI Annual Environmental Monitoring Report Distance (feet)	Approximate Distance Used in This Table (miles)
502	0.1
802	0.15
1106	0.2

5. Concentrations of 1990 samples N-0.2 mi. and N-1.25 miles are the average of a sample and its duplicate sample.

6. Concentrations of 1991 samples NNE-0.1 mi., N-0.2 mi., NNE-0.5 mi., and WSW-1.5 mi are the average of a sample and its duplicate sample.

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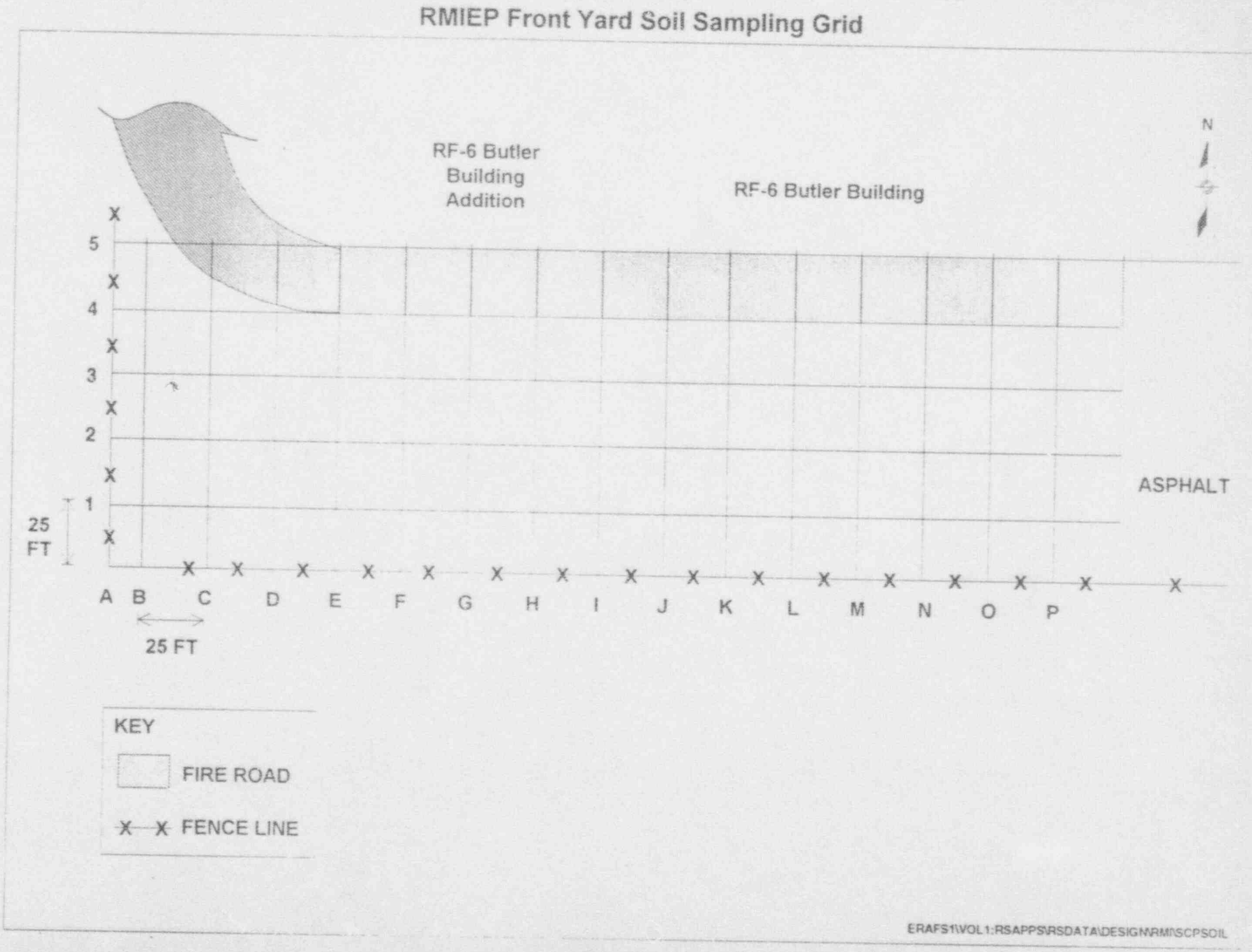
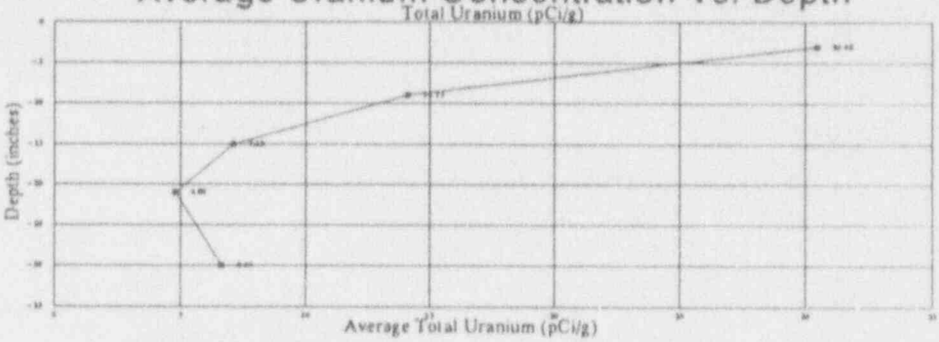
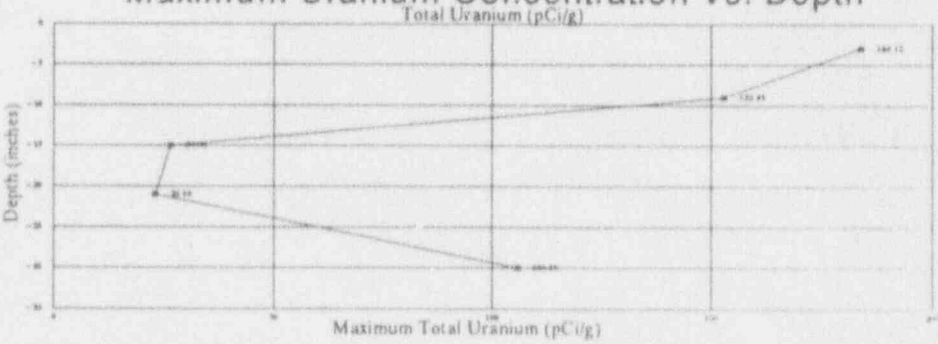


Figure 4-8 - RMI Front Yard Soil Samp'ing Grid

Figure 4-9 - Summary of RMI Front Yard Soil Samples

		Total Uranium (pCi/g)		
Depth (inches)	No. of Locations	Maximum	Average	Standard Deviation
1--6	71	184.13	30.48	28.44
6-12	36	152.93	14.12	29.33
12-18	20	26.48	7.12	8.02
18-24	29	23.08	4.80	6.23
24-36	22	105.90	6.64	22.24





Notes:

1. Data Sources:

(A) Figure entitled RMI Company Extrusion Plant --Front Yard Soil Results (RMI-ESH:91-165). The figure showed pre-excavation total uranium concentrations in ug/g. The uranium concentrtions were converted to to pCi/g (1ug/g approx. equals 0.75 pCi/g).

(B) Letters from RMI (C.A. Marchal) to Oak Ridge Associated Universities (P. Cotton) dated 1/28/91 and 2/5/91. These letters described after excavation uranium sampling results and excavation depths respectively. Isotopic U-234, U-235, and U-238 were summed to obtain a total uranium value. Sample results for 5 decontaminated hot spots (1/28/91 letter) and localized areas requiring further excavation (identified as areas A, B, and C in the 2/5/91 letter) were not included in this table.

2. Any source data duplicate samples or pre and post excavation samples at the same sample loction were averaged.

3. Any isotopic U-235 concentrations listed as "less than" (<) in the 1/28/91 letter were conside: as "equal to" values when they were summed to obtain total uranium values.

9/28/93 File: TO2FY.WK3

Table 4-6 - RMI Radionuclide Data from Soil Borings near the Former Evaporation Pond - August 1988

Soil Boring Sample No.	Sample Depth (feet)	Geiger Counter (cpm)	Uranium (μg/g)	Uranium (pCi/g)	Gross Alpha (pCi/g)	Tc-99 (pCi/g)	Gross Beta (pCi/g)
SB1-1	0-2	240-360	20.0	13.5	17.1	6.11	25.8
SB1-5	8-10	160-180	4.1	2.8	3.2	1.32	6.1
SB2-1	0-2	200	6.3	4.2	5.4	6.62	43.0
SB2-14	26-28	140-160	3.2	2.2	3.7	0.3	4.1
SB3-1	0-2	100-120	8.9	6.0	7.6	1.52	18.6
SB3-7	12-14	100-120	12.0	8.1	7.6	0.59	6.2
SB4-1	0-2	160-180	13.7	9.2	11.7	3.24	14.3
SB4-7	12-14	140-160	2.07	1.4	2.6	8.3	4.9
SB5-1	0-2	180-200	0.9	0.6	4.1	0.74	23.4
SB5-5	8-10	180-200	5.7	3.8	3.1	<0.3	3.6
SB5-12	22-24	140-160	1.13	0.8	3.3	<0.3	4.3
SB6-1	0-2		30.0	20.2	25.7	1.88	39.1
SB6-12	22-24		0.71	0.5	2.9	<0.3	3.8
Maximum of samples from 0-2 feet depth			30.0	20.2		6.62	
Maximum of samples below 2 foot depth			12.0	8.1		8.3	
Average of samples from 0-2 feet depth			13.3	9.0		3.4	
Average of samples below 2 foot depth			4.1	2.8		1.6	

Notes:

1. Data Source: *RFI Equivalency Document for the RMI Extrusion Plant*
2. When Tc-99 result was reported as <0.3 pCi/g, 0.3 was used in averaging.

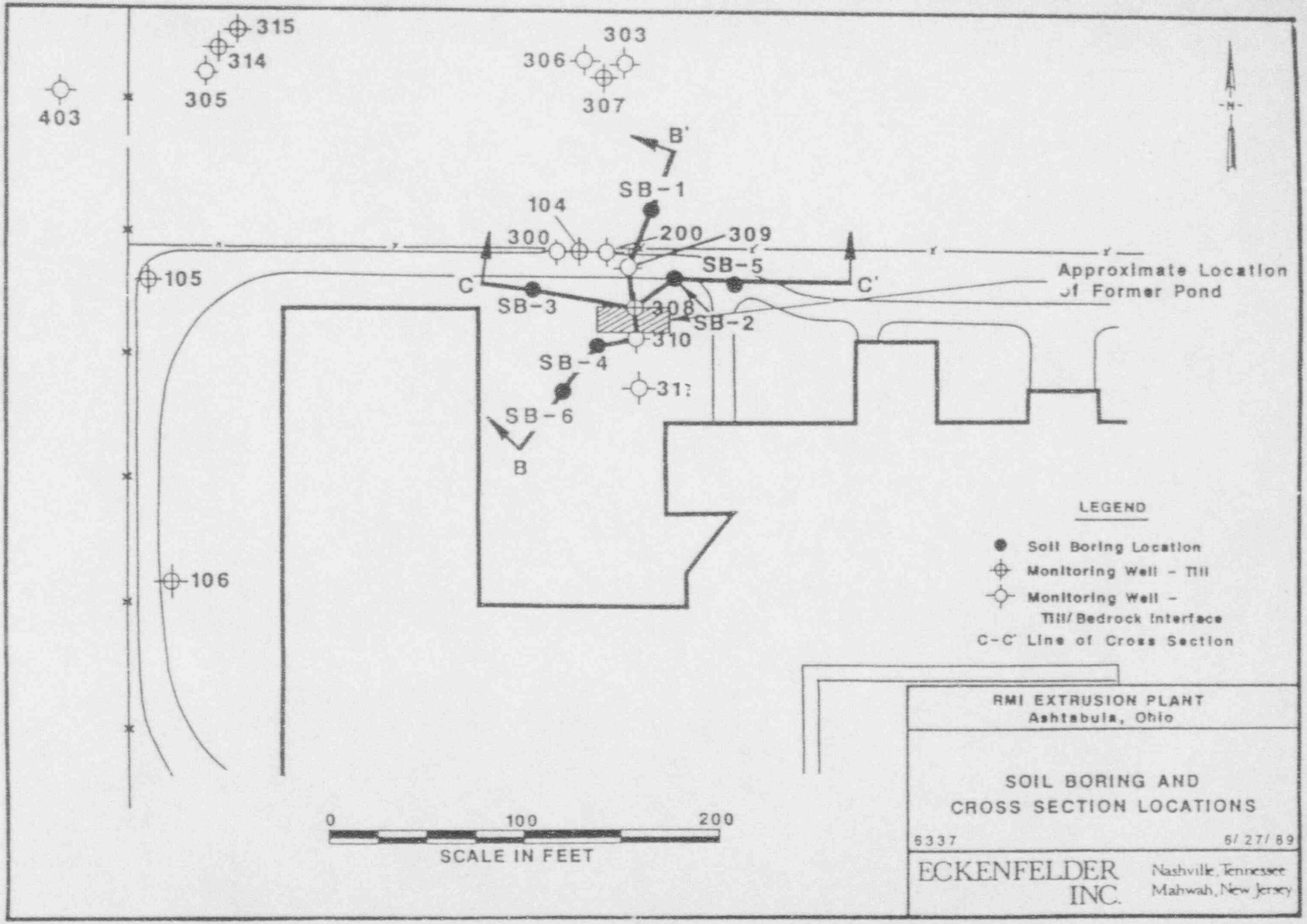


Figure 4-10 - Former Evaporation Pond Soil Boring and Cross Section Locations

4) Site Scoping Radiation Survey

RMI conducted a scoping radiation survey of site grounds during the period June to December 1992. The areas surveyed were the grounds of Areas A through F. Radiation detection instruments equipped with Geiger-Mueller (G-M) detectors were used to perform a walkover survey of the site grounds. The purpose of the survey was to provide data to evaluate the extent and stratification of radiological contamination in support of the design of sampling and analysis plans for the radiological characterization of site surface soils. The sections below provide a description of the survey and a summary of the results.

<u>Radiation Survey Procedure</u>

The procedure used to conduct the radiation survey was RMI-L-149.2 *Scoping Procedure for Surface Soils Characterization Project* (RMI 1992c). The procedure was prepared by RMI and considered the general guidance for performing preliminary (scoping) radiation surveys contained in NUREG/CR-2082, *Monitoring for Compliance with Decommissioning Termination Survey Criteria* (NRC 1981) and NUREG/CR-5849, *Manual for Conducting Radiological Surveys In Support of License Termination* (NRC 1992).

The survey was performed over the 10 meter by 10 meter site grid. A laser transit was used to establish the grid. Stakes were placed at each grid intersection. Grid point coordinates were identified on each stake. Prior to conducting surveys of the gridded areas, an RMI supervisor inspected the grid markers for correct identification.

Daily, prior to conducting surveys, the technician performing the survey conducted an instrument performance evaluation, and determined background and uranium and Tc-99 check source values for the survey instrument. The readings for the background and source checks were taken in sets of 20 one-minute readings with the instrument set at scaler/integration mode. If all of the readings fell within ±2 standard deviations from the mean values which were established for each instrument, the check was considered satisfactory. Tc-99 check source value were also determined periodically during the performance of the survey.

To perform the survey, the technician stood at a grid intersection and slowly swept the G-M detector as close as possible to the soil surface, but not greater than 5 cm above the surface. The maximum obtainable reading (counts per minute [cpm], uncorrected for background) from the detector at the corresponding grid intersection point was recorded on a field data sheet. The technician then walked a straight line towards the next grid intersection point while sweeping the detector perpendicular to the direction of travel. The maximum reading detected between the data points was recorded on the field data sheet. This process was repeated at each grid intersection and along each grid line (north-south and east-west).

Following review of the field data sheets by the supervisors, the counts per minute readings were placed on maps. The maps showed the cpm, uncorrected for background (RMI drawings DD 1758, DD 1761 through DD 1765). The maps were then checked by an RMI supervisor.

Background Area Survey

RMI performed radiation measurements at Lake Shore Park, Ashtabula, County (see Figure 2-1) between June and October 1992. The measurements were performed with eight of the G-M instruments and associated detectors used during the walkover survey of the site. The reading were taken in sets of 20 one minute readings with the instruments set at scaler/integration mode. If all of the readings fell within ± 2 standard deviations of the mean of 20 readings), the background set was considered satisfactory. There were 300 measurements taken over 15 separate sets (20 each time) involving eight instruments.

Table 4-7 summarizes the results of the background surveys performed at Lake Shore Park, Ashtabula County, Ohio.

The interval within which the true radiation cpm population mean lies with a 99 percent degree of confidence was calculated using the interval estimation techniques found in *Probability and Statistics for Engineers* (Miller and Freund 1973). These calculations assume a normal distribution of the populations, and that the sample population's variance is approximately equal to the true population's variance. From the calculations for the 300 readings taken at Lake Shore Park, it is estimated (with 99 percent confidence) that the true population mean of the cpm radiation readings lies between 55.9 and 58.9 cpm.

The 300 individual radiation readings taken at Lake Shore Park ranged from a minimum of 33 cpm to a maximum of 92 cpm. For a normal distribution approximately 95 percent of the events fall within 2 standard deviations from the mean. This characteristic of a normal distribution was used to estimate the range of individual cpm reading that would be representative of the radiation (background) levels in soils at Lake Shore Park. This estimation assumes a normal distribution of the populations, and that the sample population's variance is approximately equal to the true populations variance. Two sample standard deviations (± 19.8 cpm) were applied to sample population mean (57.4 cpm) to arrive at a 95 percent confidence interval of 37.6 to 77.2 cpm. Therefore, for practical purposes, scoping radiation survey readings between 35 and 80 cpm are representative of the soil radiation (background) levels taken at Lake Shore Park. Levels found on the site that are above 80 cpm are representative of radiation levels above the (background) levels of soil at Lake Shore Park.

Table 4-7 - Site Scoping Radiation Survey Background Data Analysis

Location: Lake Shore Park, Ashtabula County, Ohio

Period: June 1992 - October 1992

Detector type: G-M

Units measured: cpm beta-gamma

Instruments:	Dates:		
A723D	6/17/92	08/3/92	
B438D	6/18/93	09/17/92	10/30/92
B437D	6/18/92		
A527P	8/03/92	09/11/92	10/30/92
B435D	8/03/92	09/11/92	
A530P	9/17/92	10/30/92	
B387D	9/17/92		
A722D	10/13/92		

Number of readings taken per instrument per date: 20

Total number of readings (n)	Sample Population Mean (x)	Sample Population Standard Deviation (s)	99 percent Confidence Interval for the True Population Mean (μ)
300	57.4	9.9	$55.9 < \mu < 58.9$

Reference: (1) *Probability and Statistics for Engineers, 2nd Edition*, pp.186-187.
(2) PARSONS RMI Project Calculations, TO2-16-001, and TO2-16-002.

Survey Maps for Site Areas A through F

Figure 4-11 shows a contour map of the residual radiation levels in cpm above background (net cpm) for Areas A through F. For clarity, only the 100 and 1000 cpm above background contours are shown. An uncorrected background value of 80 cpm estimated from the Lake Shore Park data was subtracted from the radiation survey data shown on RMI drawings DD-1758, DD-1761 through 1765 used to prepare the maps. The 1 cpm contour (just above background) is shown on the maps as the dashed line.

Site Scoping Radiat
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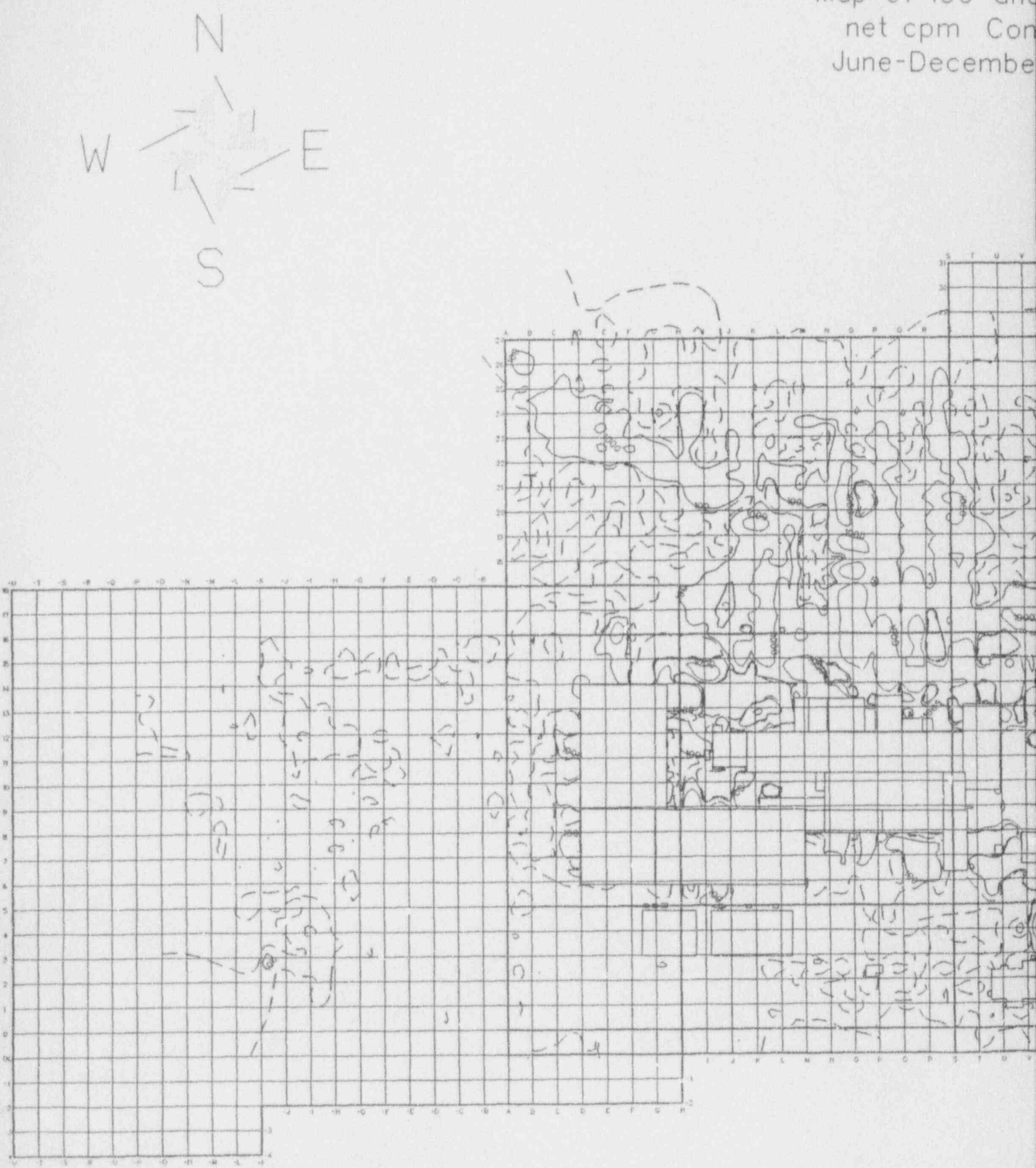

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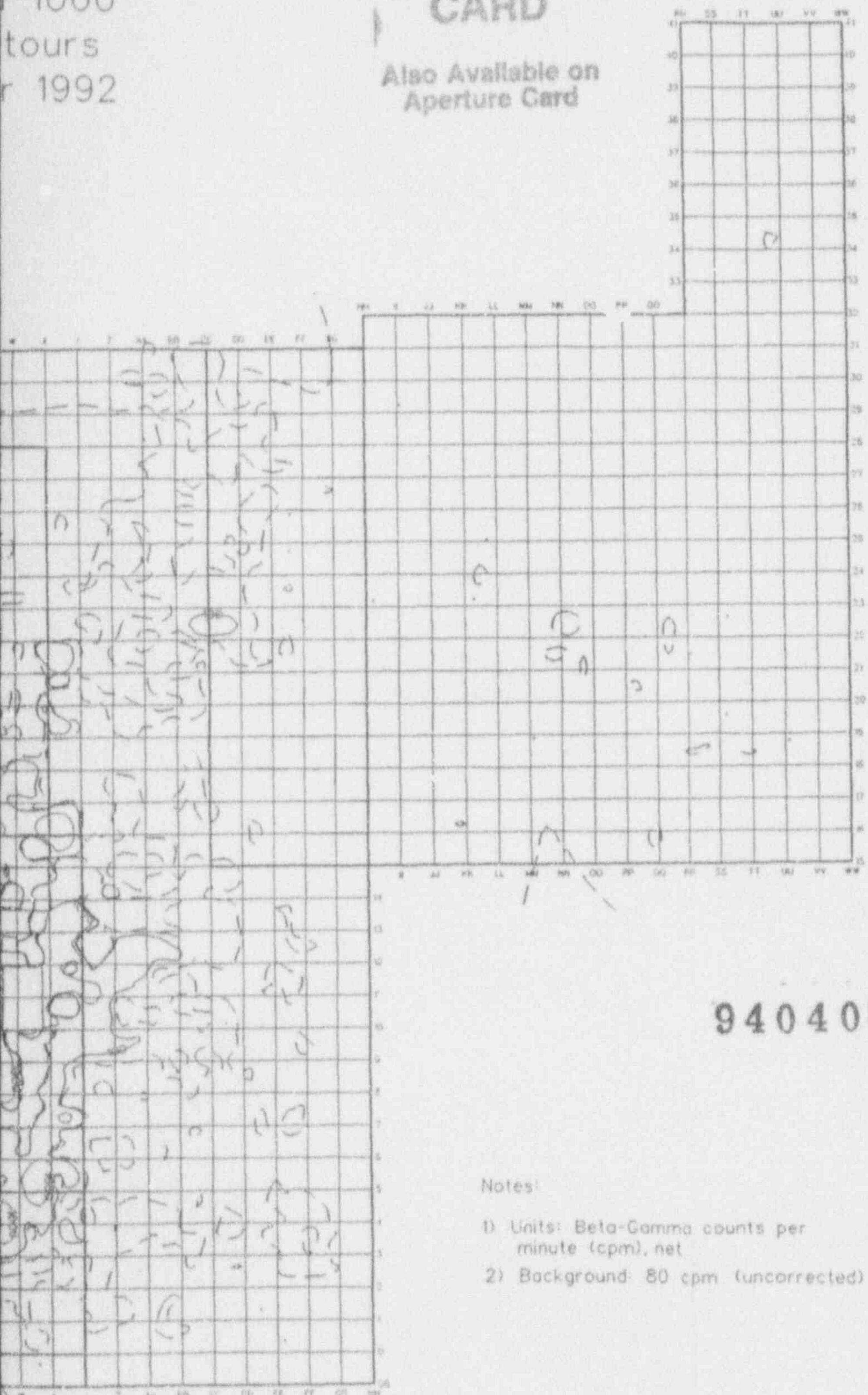

Legend

10 Meter Grid

1 cpm

100 cpm

1000 cpm

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Figure 4-11 - Site Scoping Radiation Survey Map of 100 and 1,000 net cpm Contours

4-25

Notes:

1) Units: Beta-Gamma counts per minute (cpm), net
2) Background: 80 cpm (uncorrected)

SCALE

Rev. No.: 0

REVISION		
DATE	NO	DESCRIPTION

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DESIGNED IN FIT: P-0004.DGN
DATE: 3/19/93
TITLE: SITE SCOPING RADIATION SURVEY MAP OF 100 AND 1000 NET CPM CONTOURS
DWG. NO.: P-0004

Figure 4-12 shows the 1000, 10,000 and 50,000 cpm above background contours. The highest reading found during the survey was 76,120 cpm above background, located near the fence line east of the Cleveland Electric and Illuminating substation.

Figure 4-13 shows the 100 and 1000 cpm above background contours with respect to the 1991 annual soil sampling results. Soil sampling was not conducted in conjunction with the site scoping radiation survey. The 1991 annual soil sampling data was reviewed to evaluate whether a correlation could be made with respect to the data of the site scoping radiation survey. A direct correlation between the concentration (pCi/g) of uranium in the shallow surface soil samples and the radiation readings could not be established, however, the majority of soil samples with greater than 30 pCi/g are located in an area with greater than 100 cpm net. The NRC guideline value of 30 pCi/g for uranium in soil should be considered when reviewing Figure 4-13.

<u>Survey Results</u>

(1) The highest surface radiation levels are located primarily in areas B and C. These areas contain sections with radiation levels in excess of 1000 cpm above background.

(2) The majority of Area E has radiation surface levels similar to those measured at Lake Shore Park (i.e., background).

(3) The majority of Areas A and F are at background levels, however, areas of slightly elevated surface radiation levels exist. The maximum reading encountered in Area A was 150 cpm above background near grid location -K3. The maximum reading encountered in Area F was 60 cpm above background near grid locations R00, S00, and U00.

(4) The majority of Area D has radiation at background levels, however, areas of elevated surface radiation levels are more prevalent than encountered in Area A and F. The maximum reading encountered in Area D was 76,120 cpm near grid location X13

(5) Areas of surface radiation levels in excess of 1,000 cpm above background are located in areas immediately north of the Main Plant Building.

(6) The pattern of higher radiation readings is generally consistent with the drainage features of the site.

<u>RCPA Hazardous</u>

Scoping information regarding the nature and extent of hazardous contamination in RMI site soils came primarily from the following sources:

1) Laboratory analysis of sediment samples collected during studies of the CAMU

2) Laboratory analysis of soil samples collected during soil boring at the former evaporation pond site

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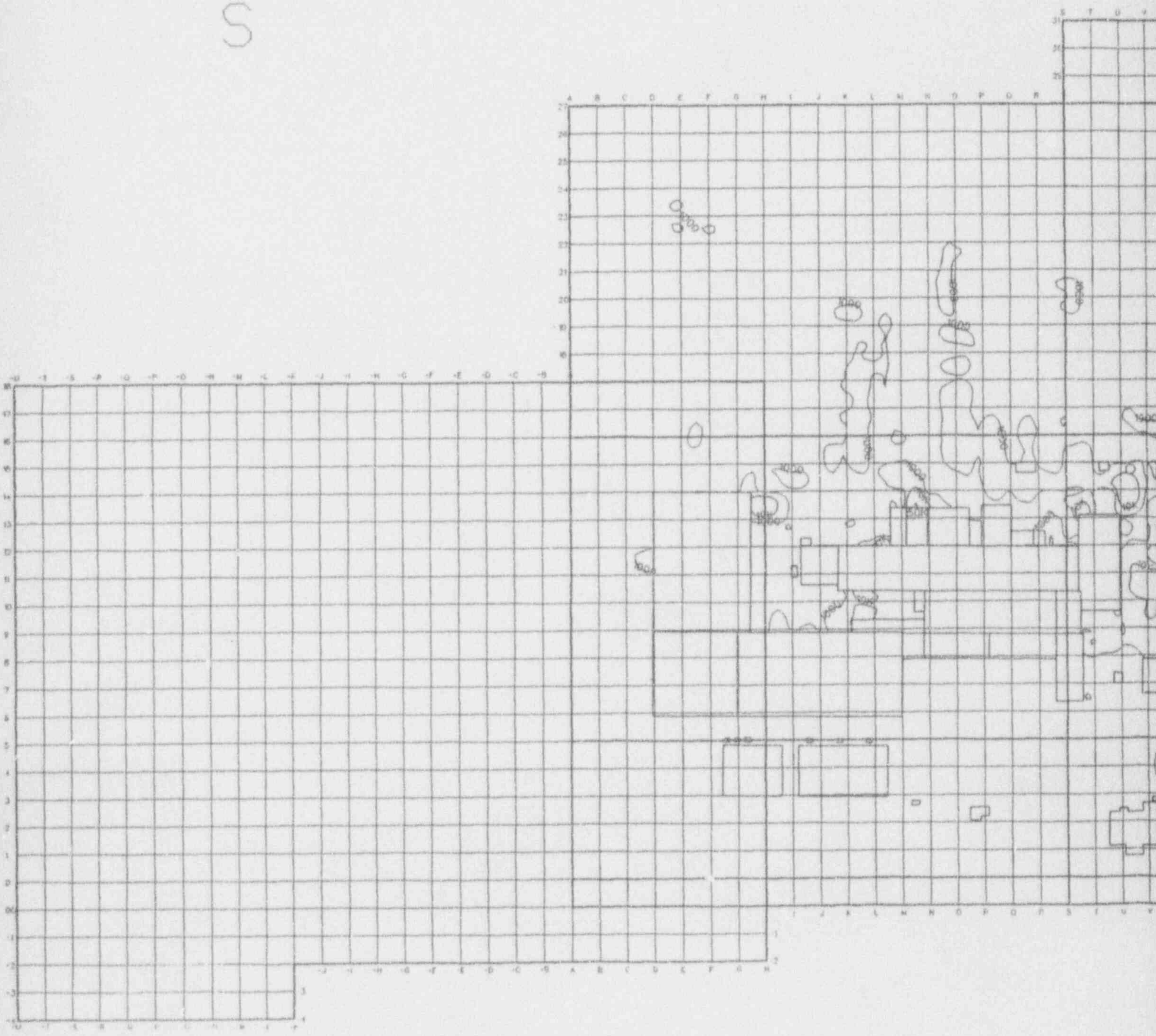

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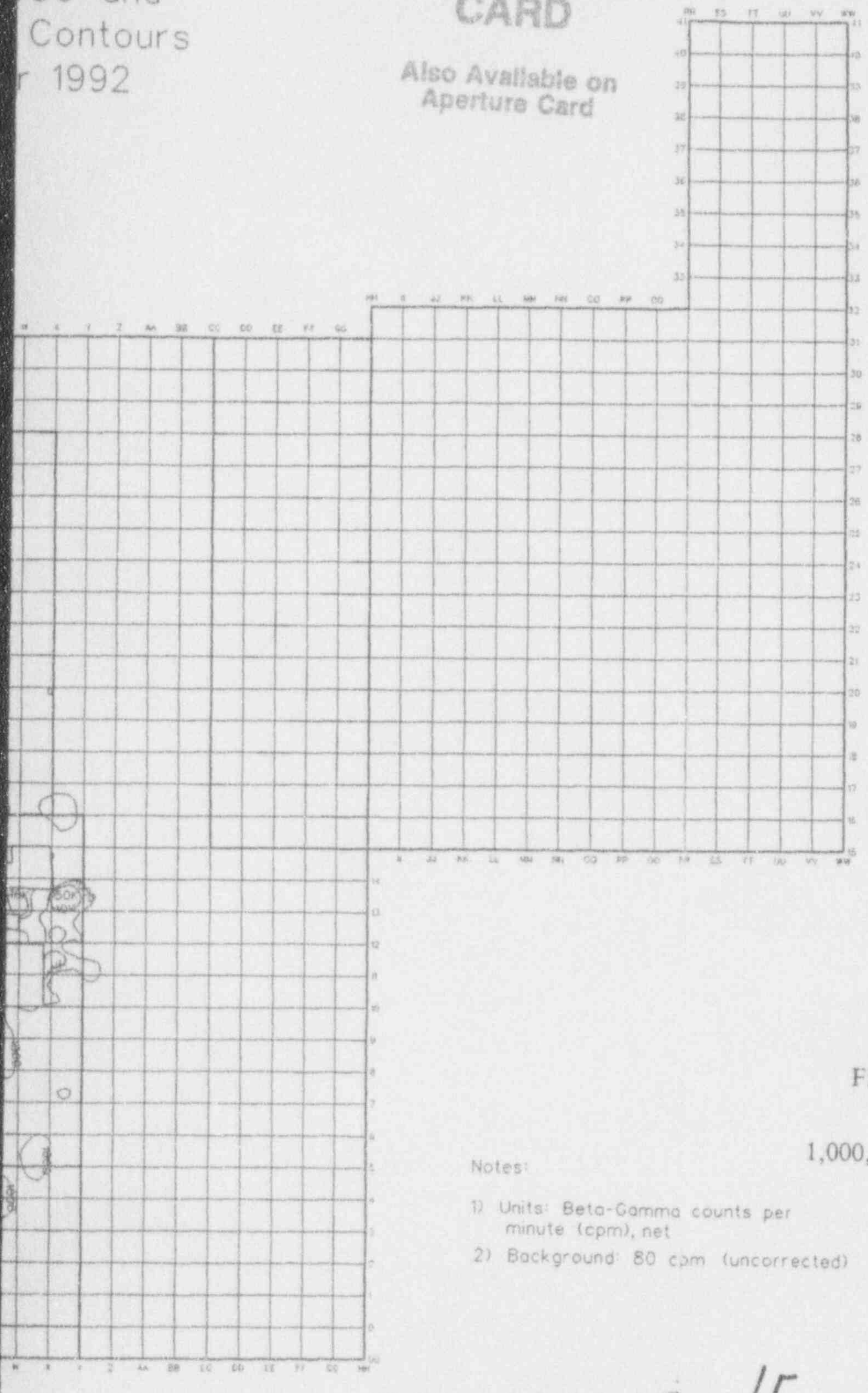


Legend

10 Meter Grid

1000 cpm

10,000 cpm

50,000 cpm

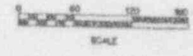
Notes:

1) Units: Beta-Gamma counts per minute (cpm), net

2) Background: 80 cpm (uncorrected)

Figure 4-12 - Site Scoping Radiation Survey Map of 1,000, 10,000, and 50,000 net cpm Contours

4-27



REVISION		
DATE	NO	DESCRIPTION

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DESIGNED TO FIT: P-0005.DGN
DATE: 3/19/93
SCALE
TITLE: SITE SCOPING RADIATION SURVEY MAP OF 1000, 10,000 AND 50,000 NET CPM CONTOURS
DWN BY: E.RJAVEC
CHK'D BY: ERNST
ENG. No. & WBS: 1.1.2.2.1
PROJECT
DWG. No.: P-0005

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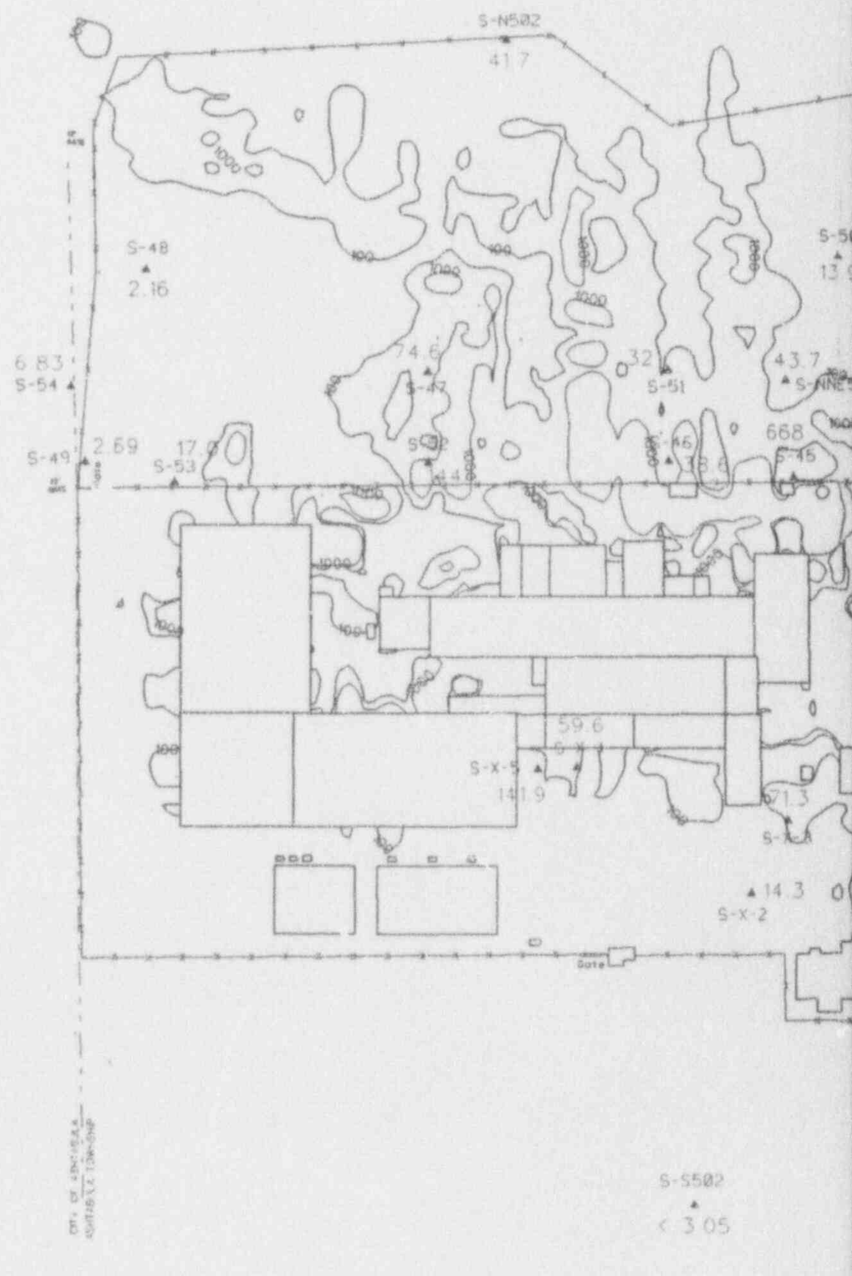

P-0007.DGN

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Legend

- - — - - —	Boundary Line
—•—•—	Fence Line
▲ S-X-8	Soil Sample Location
22.5	Total Uranium (pCi/g)
———	100 cpm
———	1000 cpm

Figure 4-13 - Site Scoping Radiation Survey Map of 100 and 1,000 net cpm Contours and 1991 Shallow Soil Sample Total Uranium Concentrations

Notes:

1) Units: Beta-Gamma counts per minute (cpm), net
2) Background: 80 cpm (uncorrected)

SCALE

Rev. No.: 0

9404080144-16

REVISION		
DATE	NO	DESCRIPTION

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DESIGNED TO FIT P-0007.DGN	DATE 3/22/93	SCALE
TITLE	DRN BY KRJAVEC	CHK'D BY ERNST
SITE SCOPING RADIATION SURVEY MAP OF 100 AND 1000 NET CPM CONTOURS & 1991 SHALLOW SOIL SAMPLE TOTAL URANIUM CONC.	DWG No. & WBS 1.1.2.2.1	PROJECT
	DWG No. P-0007	

3) Laboratory analysis of samples collected from site soil piles

4) Historical information concerning operational practices, occurrences, and spills (see Subsection 2.1.2.2)

Information and data from these sources are presented in the SR and summarized below.

1) CAMU Surface Water and Sediment Samples

TCE data for water and sediment samples collected from the swale and seepage pond are summarized in Table 4-8. TCE in swale water samples has been measured at concentrations of 2,600, 6,400 and 1,250 μg/liter. This was not unexpected, as the swale was believed to have carried overflow from the evaporation pond to the escarpment area in the past. TCE concentrations in seepage pond samples have all been below or near detection limits.

It was concluded that volatilization of TCE occurred before the runoff from the swale had reached the seepage pond area, resulting in very low concentrations measured in the seepage pond samples which are well below the regulatory threshold of 100 μg/l. (Eckenfelder 1989b).

TCE was measured at a concentration of 6,200 μg/kg in swale sediment collected in December 1987, but was not detected in the January 1989 samples. TCE was either not detected due to concentrations below detection limits or it was not present in sediment samples collected in the seepage pond. The higher levels in the swale sediment samples compared to seepage pond sediment samples were not unexpected because the majority of TCE would likely have volatilized before reaching the seepage pond area, and therefore not be available to partition to the sediments of the seepage pond area. The fact that TCE was not detected in the January 1989 sediment samples for the swale was thought to reflect the inherent variability of sediment samples, or to indicate that TCE was being flushed from the swale (Eckenfelder 1989b).

Table 4-8 - TCE Concentration in Water and Sediment Seepage Pond and Swale Samples

	Date						
	08/27/87	12/21/87	09/16/88	10/13/88	01/16/89	Average[a]	Maximum
Water Samples (μg/l)							
Seepage Pond	3[b]	< 5[c]	3.9[c]	1.1[c]	NA[d]	< 3.2	< 5
Swale	2,600	6,400	NA	1,250	NA	3,400	6,400
Sediment Samples (μg/l)							
Seepage Pond	NA	< 5[c]	NA	NA	ND[e]	< 2	< 5
Swale	NA	6,200	NA	NA	ND	3,100	6,200

[a] If result is less than the detection limit, the detection limit was used in averaging. If the result was ND, zero was used in averaging.

[b] Average of two duplicate analyses.

[c] Average of analyses for three samples collected from seepage pond.

[d] NA = Not Analyzed.

[e] None Detected.

Source: Eckenfelder, Inc., *RFI Equivalency Document for the RMI Extrusion Plant*

2) Deep Soil Sampling

In August and September 1987, soil samples were obtained during the installation of 300-series wells. The sampling included HNu data obtained during drilling, HNu head space analysis, and laboratory testing for TCE. Soil samples were obtained from 10 well borings (MWs 300-305 and 308-311). The samples were obtained from borings to a depth of approximately 31 feet (Eckenfelder 1989b).

In August 1988, six soil borings were drilled in the vicinity of the former evaporation pond in order to define the vertical and lateral extent of the former pond contaminants (see Figure 4-10). Based on field screening with a PID, soil samples from the borings were analyzed for priority pollutant volatile organic compounds. Only TCE was detected in the soil borings. Based on this data and data from soil samples collected during the installation of the 300-series in 1987, the TCE contaminated soil appears to be confined to the area adjacent to and extending down gradient, or north, from the former evaporation pond. Maximum TCE concentrations in the soil were observed at the 7- to 8-foot depths in the immediate vicinity of the former evaporation pond (Eckenfelder 1989b). Figures 4-14 through 4-17 show the zone of TCE containing soil based on the 1987 and 1988 soil sampling data (Eckenfelder 1989b).

3) Soil Pile Sampling

In 1988 samples were taken from piles of soil and stone that had been collected from various construction locations at the RMI site. The samples were analyzed for hazardous waste characteristics (metals only) using the Extraction Procedure (EP) Toxicity test method and volatile organic compounds (SW-846 method 8240 for VOA Hazardous Substance List [HSL] target compounds). The metals were analyzed for: silver, arsenic, barium, cadmium, chromium, mercury, lead, and selenium. The analysis indicated that only barium was present above analytical detection limits. The highest EP Toxicity concentration for barium was 2.04 mg/ℓ.

The soil toxicity concentration was below the existing regulatory limit at the time the EP was used as the required test method by the US EPA. The soil and stone piles associated with these analytical data were removed from the site in 1988 (RMI 1991a).

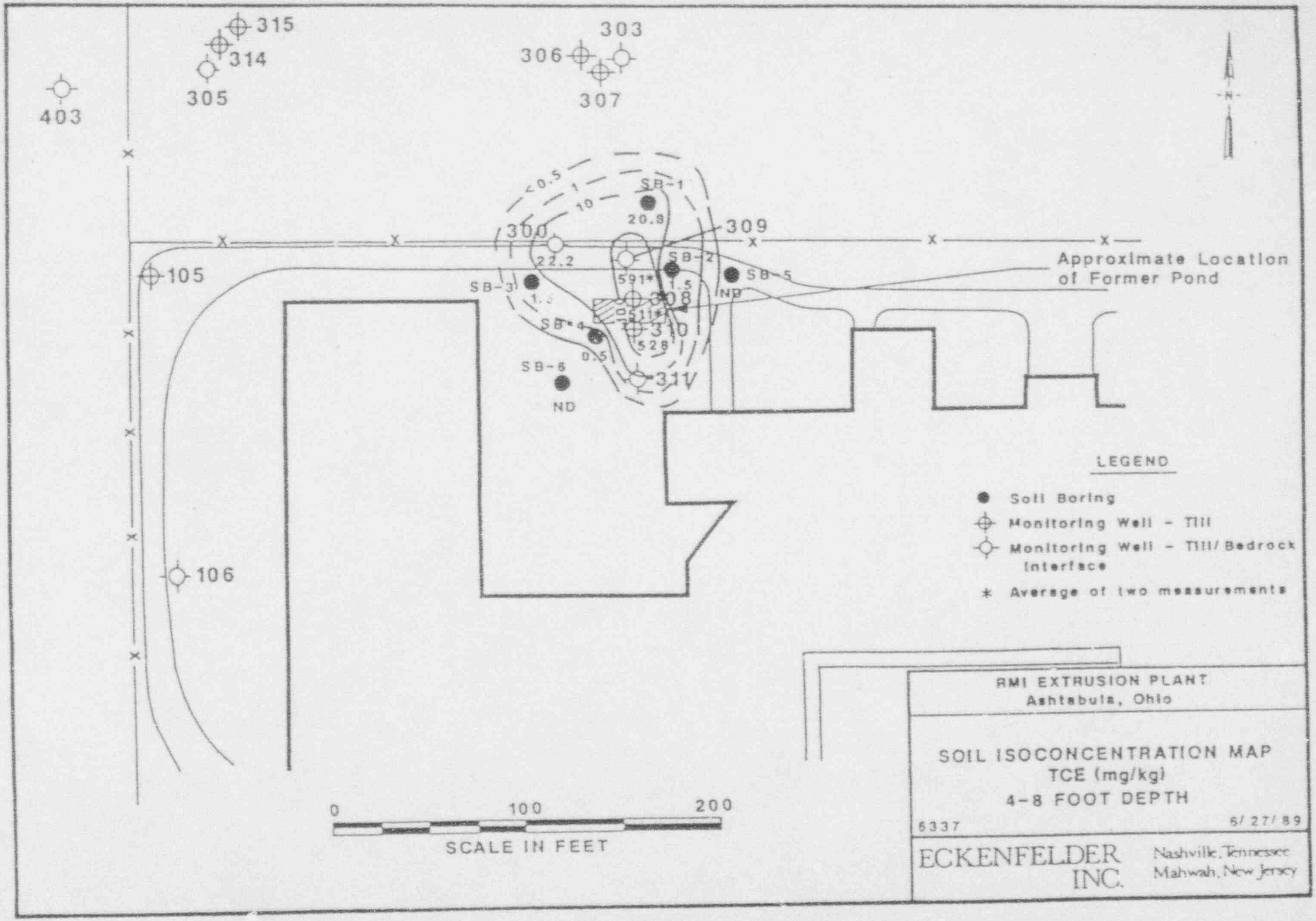


Figure 4-14 - Soil Isoconcentration Map (TCE [mg/kg] 4-8 ft depth)

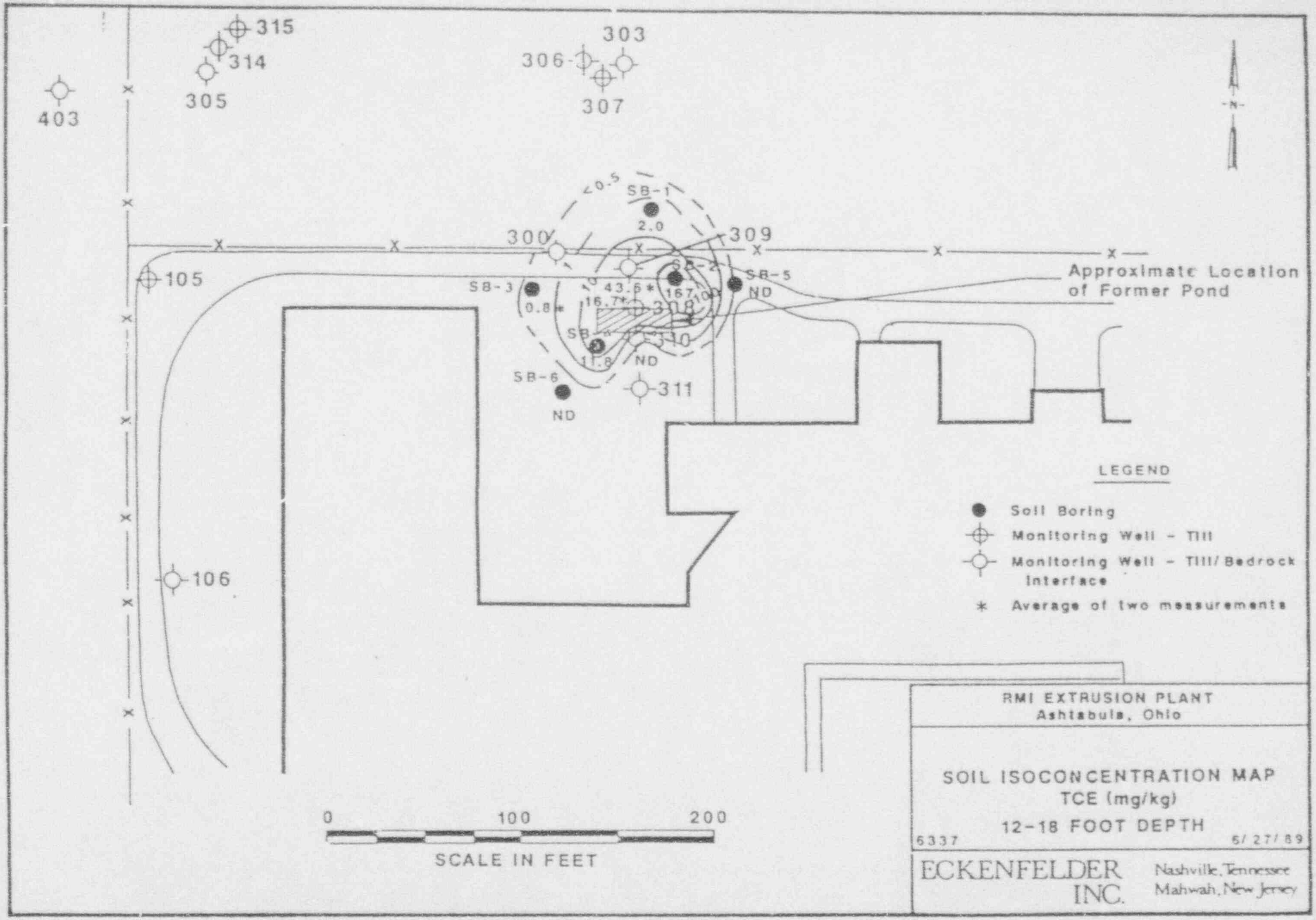


Figure 4-15 - Soil Isoconcentration Map (TCE [mg/kg] 12-18 ft depth)

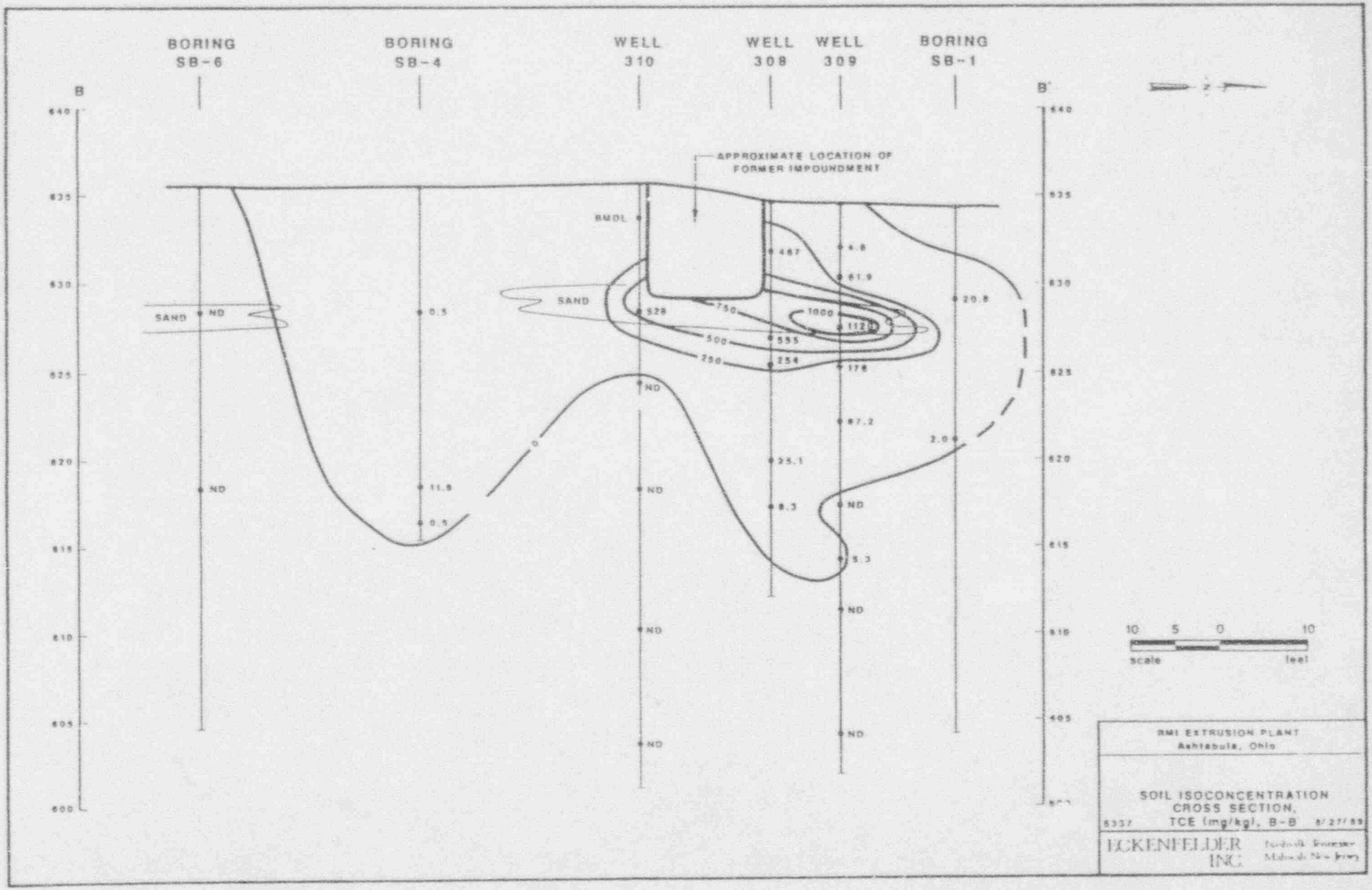


Figure 4-16 · Soil Isoconcentration Map Cross Section (TCE [mg/kg] B-B')

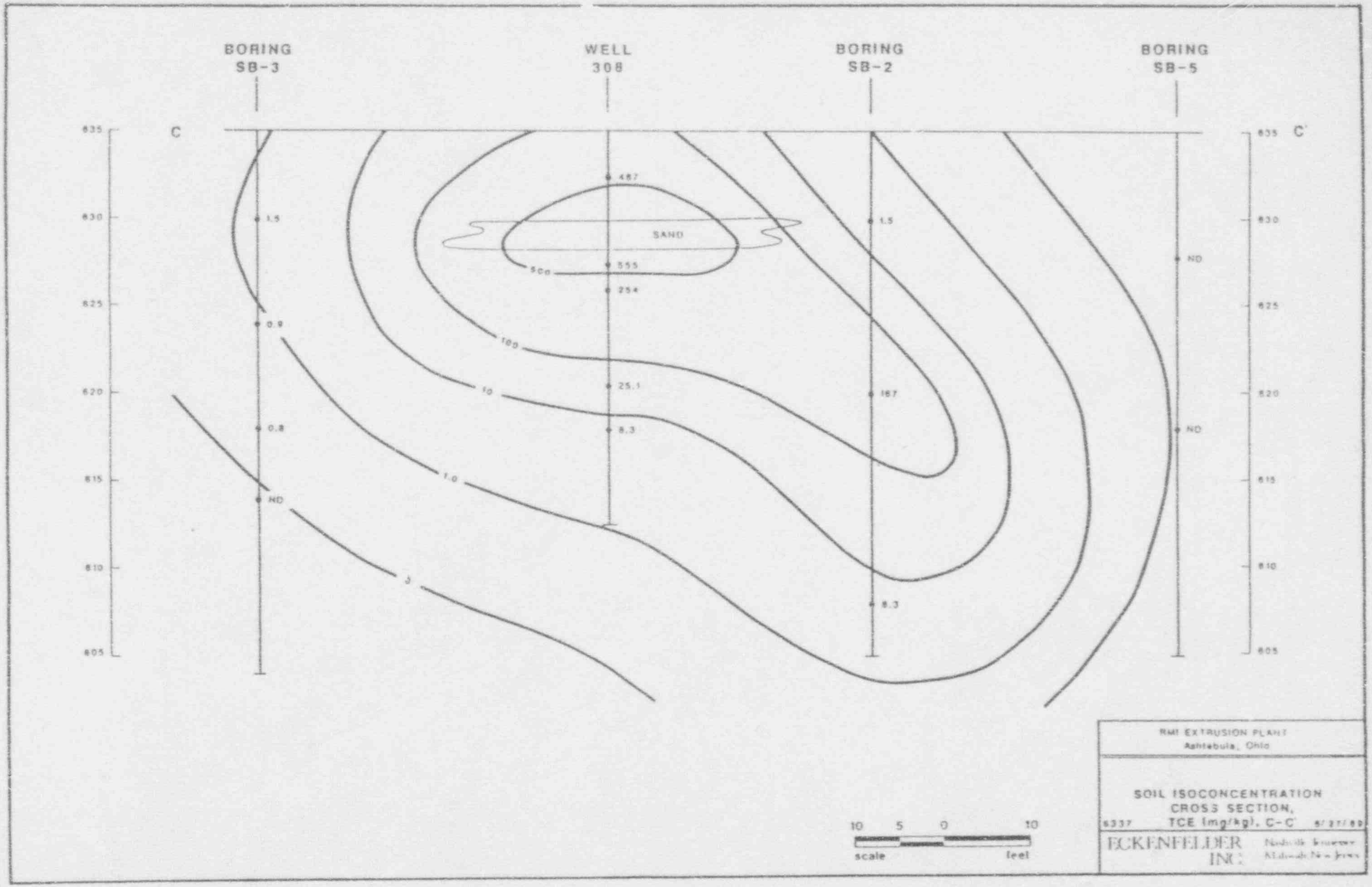


Figure 4-17 - Soil Isoconcentration Map Cross Section (TCE [mg/kg] C-C')

The same types of analyses were conducted on soil samples taken from other RMI soil piles in 1989. Analytical results summarized present the concentrations of the various EP toxicity tests as measured concentration in the extract. EP Toxicity concentrations for barium in the soil were similarly low (<3.3 mg/ℓ) compared to hazardous waste regulatory limits in all samples. Lead was also detected in most samples; however, the EP Toxicity concentrations were lower than regulatory limits (<0.4 mg/ℓ). Arsenic was detected in only one sample at a concentration of 0.3 mg/ℓ. The hazardous waste regulatory limit for both lead and arsenic is 5.0 mg/ℓ. The soil pile associated with these sampling and analysis data remains on site (RMI 1991a).

4) Past Operations

The SR identified operational practices that could potentially have resulted in RCRA hazardous contamination of soils located in Area B (excluding former evaporation pond and other areas of CAMU):

These practices included:

(1) Previously uncovered scrap along the north fence of Area B (metals, organics)
(2) Spreading of contamination from intraplant traffic (metals, organics)
(3) Used oils applied along fence and building lines for weed control and on fire roads (organics)
(4) Soil and construction debris piles (metals, organics)
(5) Backfill material placed south of the RF-6 building and Main Plant (metals, organics)
(6) Abandoned outdoor trash burn pad (metals, organics)
(7) Outdoor welding and cutting locations (metals)

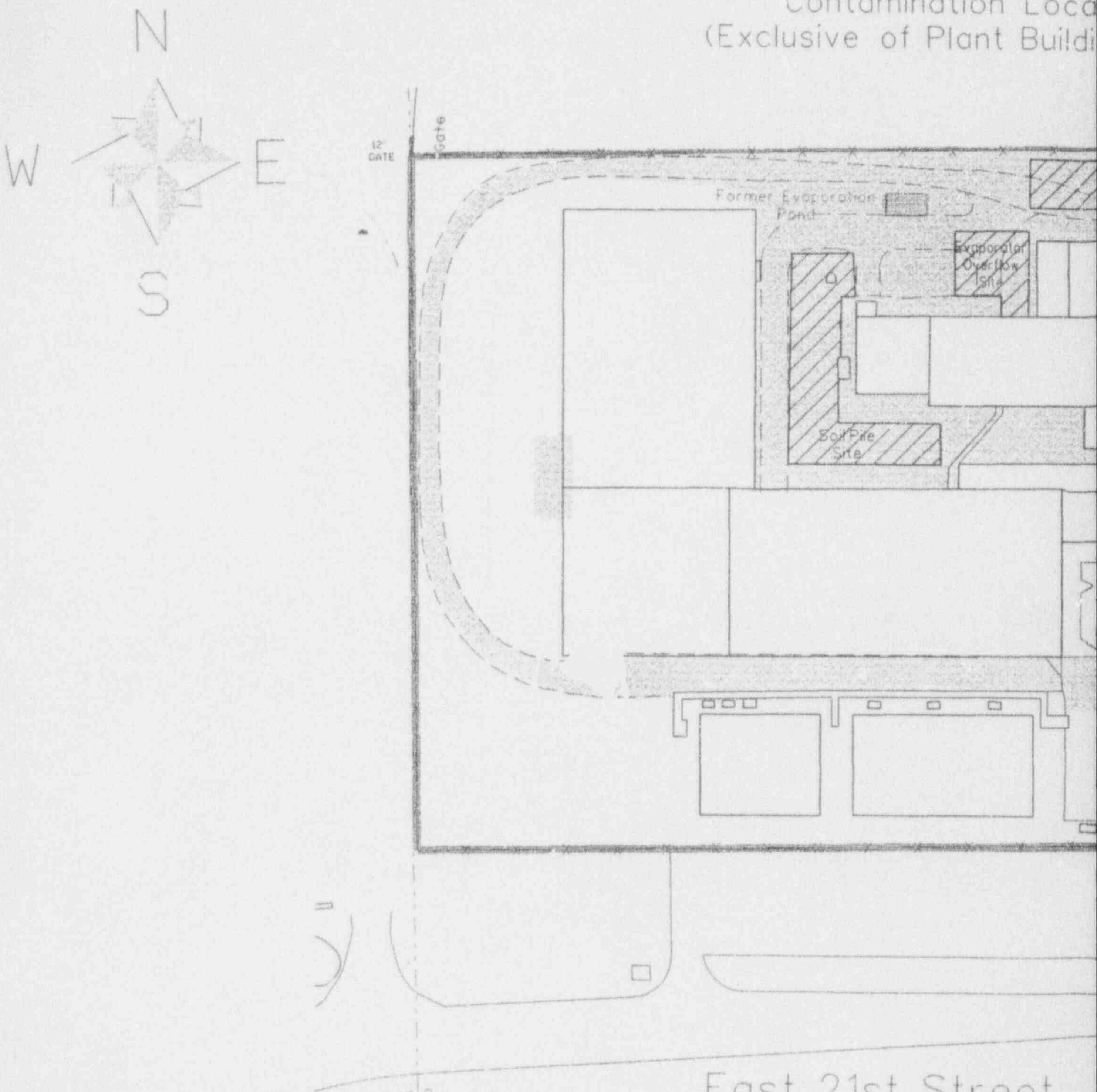
Additionally, the SR identified spills and operational occurrences that could potentially result in RCRA hazardous contamination of Area B soils (excluding former evaporation pond and other areas of the CAMU):

(1) Surface spills on the north side of the plant from evaporation tank overflow (inorganics)
(2) Sumps and drains beneath the plant buildings (metals, inorganics, organics)
(3) Trenches leading to the wastewater treatment building (metals, inorganics, organics)
(4) Pumping out of main sump onto ground along north side of main plant following water leaks from the hydraulic press (metals, organics)

RCRA hazardous contamination resulting from past operation is suspected to be located primarily in Area B.

Figure 4-18 shows an initial estimate of the locations within Area B which could be potentially contaminated with RCRA constituents.

RMI Site Area E
Potential RCRA Haza
Contamination Loca
(Exclusive of Plant Buildi



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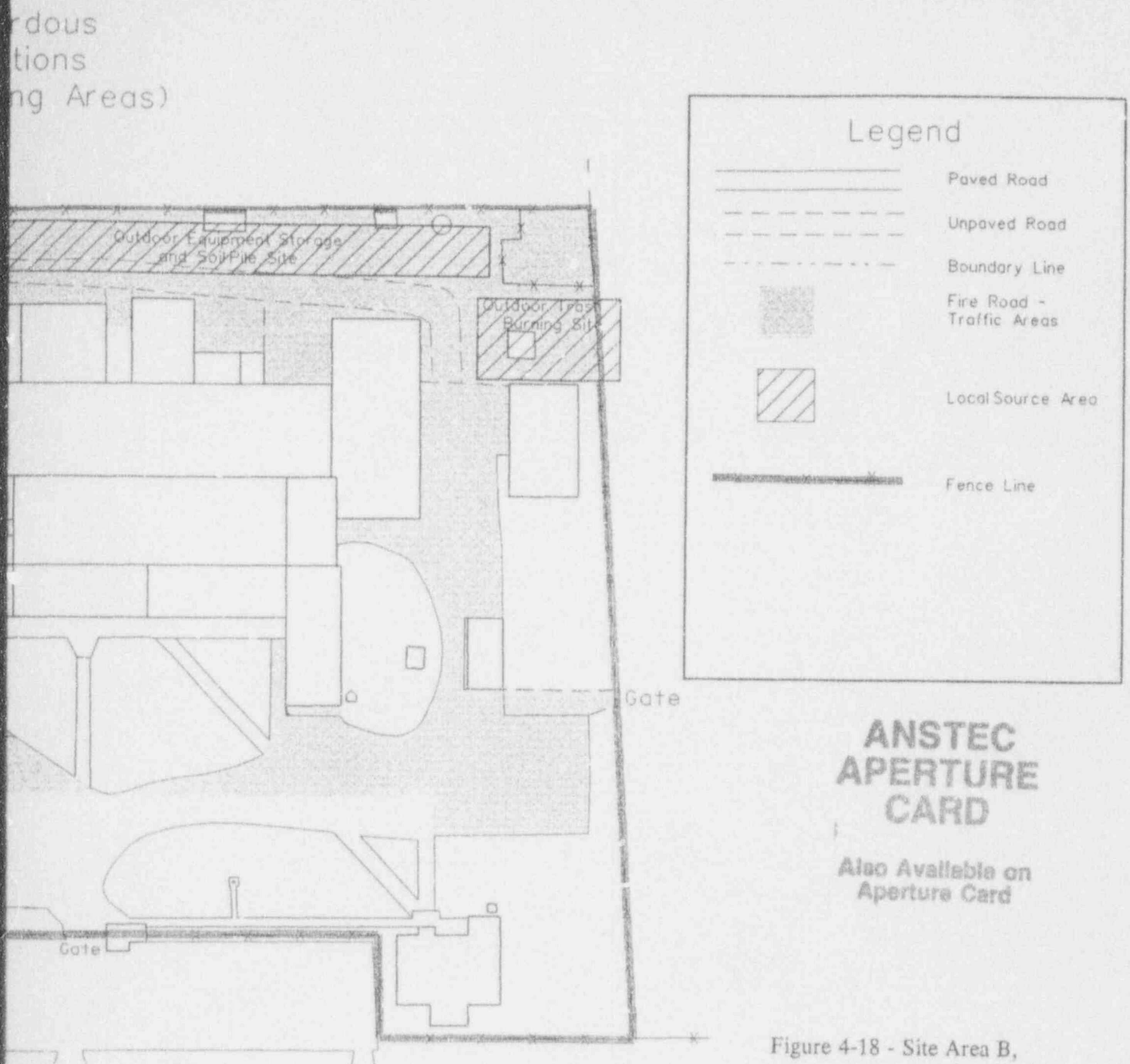


Figure 4-18 - Site Area B,
Potential RCRA Hazardous
Contamination Locations
4-37

0 60 120 180 FT
SCALE

Rev. No.: 0

REVISION		
DATE	NO.	DESCRIPTION
9/23/93	1	Revised Local Source Areas

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004
DESIGNED TO FIT: P-0009.DGN
DATE: 5/23/93
TITLE: RMI SITE AREA B POTENTIAL RCRA HAZARDOUS CONTAMINATION LOCATIONS
WBS 1.1.2.3.1
DWG. No. P-0009

4.3.3 Buildings

The RMI site is comprised of 25 buildings which are located in Area B. Preliminary radiological surveys indicate radioactive contamination is present on many building surfaces and equipment. In addition, past operations generated RCRA hazardous wastes. Residual contamination from these wastes may remain on building surfaces and equipment. The potential radiological and RCRA contaminants are discussed below.

Radiological Contamination

Potential radiological contaminants are identified in Table 4-9. Previous surveys and process history indicate uranium is the primary radiological contaminant. However, because experimental quantities of thorium-232 were processed at the site and technetium-99 has been reported in soil and groundwater samples, a percentage of the total samples will be analyzed to determine if these contaminants are present. In addition, because transuranic material (plutonium and neptunium) has been detected in trace quantities in some process residues, a percentage of samples will be analyzed for isotopic plutonium to confirm significant quantities of transuranic material are not present.

In 1991, a preliminary survey of the building walls was conducted. The results of this survey are summarized in Tables 4-10 and 4-11. No surveys were taken above 6 feet from the floor. The floor contamination data in the tables are derived from floor survey measurements taken during January and February, 1992 as part of RMI's radiological contamination control program.

Table 4-9 - Potential Radiological Contaminants

Potential Contaminant	Source	Remarks
Uranium	Depleted, natural and enriched uranium billets used to produce extrusions and closed die forgings.	Approximately 117,000 metric tons of uranium processed from 1962 - 1988.
Thorium 232	Thorium billets used to produce extrusions	16 metric tons extruded from 1961 - 1971. Approximately 11 metric tons of this total extruded in a single campaign in 1963.
Technetium 99	Depleted, natural and enriched uranium billets, containing recycled material, used to produce extrusions and closed die forgings.	Detected in soil and groundwater samples.
Plutonium	Depleted, natural and enriched uranium billets, containing recycled material, used to produce extrusions and closed die forgings.	Detected in trace quantities in some process residues.

Table 4-10 - Buildings Preliminary Alpha Radiological Survey Data

Building[3]	Wall Surfaces[1]						Floor Surfaces[2]					
	Direct Alpha (dpm/100 cm²)			Removable Alpha (dpm/100 cm²)			Direct Alpha (dpm/100 cm²)			Removable Alpha (dpm/100 cm²)		
	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum
Unrestricted Release Levels for U-nat, U-235, U-238 and beta-gamma emitters	5000	---[4]	15000	---	---	1000	5000	---	15000	---	---	1000
Main Plant[5]	351	454	2541	419	619	6836	951	1246	14012	86	105	1149
RF6 Building	729	980	2592	1093	1702	9225	---	---	---	---	---	---
Northwest Storage Warehouse	81	100	325	757	1483	12191	287	359	679	36	51	119
RF6 Building Addition	100	128	413	76	95	178	509	959	3431	19	29	76
Billet Storage Warehouse	123	149	188	78	102	169	235	314	592	14	20	50
Locker Rooms/ Foreman's Offices	29	30	177	11	12	347	140	206	2257	10	14	193
ES&H Building	29	32	74	7	12	221	62	77	111	7	9	23
RF3 Building	470	784	9169	577	742	3495	---	---	---	---	---	---
Tool Crib	247	370	1755	83	114	490	121	146	264	25	34	69
Wastewater Treatment Plant	15	20	59	11	16	72	155	231	473	8	9	13
Die Head Filter Building	25	32	101	30	42	183	88	116	140	10	13	24
Dock Area[6]	293	372	1371	32	42	202	239	308	655	12	16	74

Table 4-10 - Buildings Preliminary Alpha Radiological Survey Data (Continued)

Building	Wall Surfaces						Floor Surfaces					
	Direct Alpha (dpm/100 cm²)			Removable Alpha (dpm/100 cm²)			Direct Alpha (dpm/100 cm²)			Removable Alpha (dpm/100 cm²)		
	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum
Unrestricted Release Levels for U-nat, U-235, U-238 and beta-gamma emitters	5000	---	15000	---	---	1000	5000	---	15000	---	---	1000
Enclosed Rampway	226	284	717	46	62	236	284	603	1244	21	26	40
Saw Filter Building	151	206	842	118	160	472	281	511	702	16	21	34
Runout Table Filter Building	39	50	101	16	22	83	74	99	111	14	18	30
RCRA Storage Building	43	55	137	28	36	85	507	806	4222	33	46	228
Substation	31	41	148	26	35	100	---	---	---	---	---	---
Guard House	31	43	81	5	7	12	93	132	148	4	5	5
Compressor Room	78	97	230	28	35	107	130	154	211	17	22	31
Sewage Disposal Plant	52	80	96	12	19	24	---	---	---	---	---	---
Emergency Equipment Storage Building	14	18	43	10	14	72	---	---	---	---	---	---

[1] Data from preliminary survey taken during 1991

[2] Data from routine surveys taken as part of RMI Contamination Control program

[3] Modular laboratory and Modular Offices were installed after the preliminary survey was conduct and therefore are not included in this table

[4] Data not available

[5] Data from the High and Low Bay areas were combined

[6] Data from the Dock area and Enclosed Truck Ramp were combined

[7] Volumetric measurements may be required to free release concrete or other surfaces

Table 4-11 - Buildings Preliminary Beta Radiological Survey Data

Building[3]	Wall Surfaces[1]						Floor Surfaces[2]					
	Direct Beta (dpm/100 cm²)			Removable Beta (dpm/100 cm²)			Direct Beta (dpm/100 cm²)			Removable Beta (dpm/100 cm²)		
	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum
Unrestricted Release Levels for U-nat, U-235, U-238 and beta-gamma emitters	5000	---[4]	15000	---	---	1000	5000	---	15000	---	---	1000
Main Plant[5]	18803	25643	149631	3972	5215	34530	362943	378516	5299265	539	677	6708
RF6 Building	12584	21760	127546	12966	21923	134805	---	---	---	---	---	---
Northwest Storage Warehouse	1292	2075	12147	10168	21591	198721	121392	231454	651803	209	308	828
RF6 Building Addition	368	504	1456	871	1441	8830	80335	105893	180815	89	117	205
Billet Storage Warehouse	714	1083	2855	430	585	983	34604	48953	107840	73	104	254
Locker Rooms/ Foreman's Offices	273	327	10585	67	85	4320	18920	26360	237962	73	113	1602
ES&H Building	216	274	1430	11	14	65	894	1280	4300	37	50	166
RF3 Building	10144	16010	142270	2955	3905	19450	---	---	---	---	---	---
Tool Crib	3955	6919	44539	1021	1593	8774	10342	12751	18017	146	187	341
Wastewater Treatment Plant	663	1004	4059	92	135	620	5399	9222	35979	68	87	153
Die Head Filter Building	168	239	817	372	608	3631	---	---	---	50	71	132
Dock Area[5]	4996	6989	46517	464	616	3478	102011	168769	521504	71	107	491

Table 4-11 - Buildings Preliminary Beta Radiological Survey Data (Continued)

Building	Wall Surfaces						Floor Surfaces					
	Direct Beta (dpm/100 cm²)			Removable Beta (dpm/100 cm²)			Direct Beta (dpm/100 cm²)			Removable Beta (dpm/100 cm²)		
	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum	Average	90% UCL	Maximum
Unrestricted Release Levels for U-nat, U-235, U-238 and beta-gamma emitters	5000		15000			1000	5000		15000			1000
Enclosed Rampway	691	911	2305	354	509	2054	85115	126536	283616	95	135	289
Saw Filter Building	396	690	4223	1509	2202	7909	---	---	---	70	101	203
Runout Table Filter Building	604	803	2245	169	265	1466	8020	13875	30530	80	101	158
RCRA Storage Building	263	380	1342	187	253	998	95298	139284	714667	129	175	815
Substation	535	690	1749	212	295	1013	---	---	---	---	---	---
Guard House	349	452	577	30	44	65	433	949	962	28	41	62
Compressor Room	1415	1703	2788	408	562	2165	---	---	---	164	230	481
Sewage Disposal Plant	315	634	844	198	243	278	---	---	---	---	---	---
Emergency Equipment Storage Building	10	16	69	34	51	240	---	---	---	---	---	---

[1] Data from preliminary survey taken during 1991

[2] Data from routine surveys taken as part of RMI Contamination Control program

[3] Modular laboratory and Modular Offices were installed after the preliminary survey was conduct and therefore are not included in this table

[4] Data not available

[5] Data from the High and Low Bay areas were combined

[6] Data from the Dock area and Enclosed Truck Ramp were combined

[7] Volumetric measurements may be required to free release concrete or other surfaces

RCRA Hazardous Contamination

Six RCRA hazardous waste streams have been identified which can be divided into 15 waste types. The operations and maintenance activities which generated 14 of these hazardous waste types may have resulted in contamination of the buildings. The fifteenth waste type, TCE contaminated bail water, is associated with groundwater sampling activities. These waste types, along with their US EPA hazardous designations, are identified in Tables 4-12 through 4-14. A discussion of each waste is provided below.

Barium contaminated wastes were generated as the result of preheating the uranium metal ingots or billets prior to extrusion in a barium chloride saltbath. The fresh salt material charged to the tanks was a proprietary mixture (Houghton Liquid Heat 980) consisting of 55 percent of barium chloride ($BaCl_2$), 25 percent potassium chloride (KCl), and 20 percent sodium chloride (NaCl), based on weight. The white salt mixture is odorless and consists of solid crystals with an average density of 3.86 g/cc.

The molten saltbath tank contents were changed when sludge appeared to adhere to the billets (or about once a year) and constitute the spent saltbath salt and sludge waste streams. The spent saltbath wastes, which contains about 10 to 22 percent (weight) uranium oxide, were ladled out into a shallow steel tank and allowed to solidify. The solidified saltbath material was then broken up in the shallow tank and the pieces placed in 30 or 55 gallon, United States Department of Transportation (DOT) Specification 17H, steel drums for storage. The spent salt waste is a mixed hazardous waste (i.e., it contains uranium material), which is not ignitable, corrosive, or reactive. The waste is toxic because of its high barium content. Floor sweepings from the saltbath and extrusion press areas, insulation material (Koal Wool) and associated residues were also drummed and labeled in the same way.

Approximately every two years, the bricks lining the salt baths were replaced. As the old bricks are removed, they were placed in 55-gallon, DOT Specification 17H steel drums for storage. The used saltbath brick waste was a mixed hazardous waste (i.e., it contained uranium material) which is not ignitable, corrosive, or reactive. Based on EP toxicity analyses run on a composite sample of saltbath brick, the waste was found to be characteristic of EP toxicity because of its barium content.

Table 4-12 - Barium Contaminated (US EPA Waste Code D005)

Description	Existing Inventory	Project Inventory
Koal Wool	221 kg	54 kg
Salt Bath Brick	*	*
Salt Bath Floor Sweepings	353 kg	*
Salt Bath Pads & Gloves	*	*
Salt Bath Salt	*	*
Salt Bath Sludge	*	*
Die Head Residue	237 kg	*

* Waste volumes have not been estimated

The presence of barium in the molten saltbath requires the investigation of the plant process area for possible contamination. The barium chloride from spills or droppings from process materials would recrystallize once out of the heated bath and be deposited on the floor. The floor was either hosed clean or broomed clean. As a result, the floor and associated trenches and any expansion joints or other floor penetrations may require sampling. Another potential barium contamination source was the volatilization of barium chloride on heating. Horizontal surfaces or structural members may be inspected or sampled.

The pump station waste oil arose from the use of the oil in pumps that generate the hydraulic pressure for the extrusion process. Waste oil was skimmed from the surface of the oil-water mixture in the sump on a weekly basis and placed in a drum for storage. A complete change of oil for the unit was made about once a year. Lead contamination entered the lubricating oil from lead impregnated seals in the hydraulic pump. The pump station waste oil is not ignitable, corrosive, or reactive. It is considered hazardous because of its TCLP toxicity with regard to lead (DOO8). The petroleum anti-wear hydraulic and lubricating oil used at RMI was ENERGOL HLP 150 produced by British Petroleum (formerly Standard Oil Ohio Company [SOHIO], Ohio). This material was a solvent refined paraffinic based oil blend plus additive package containing zinc alkyl dithiophosphate anti-wear and antioxidant, anti-rust metal deactivator, anti-foam, and demulsibility agents. The blended oil contains not more than 0.1 percent zinc and 0.1 percent phosphorus. The oil flashpoint is 380 degrees F or greater.

The spent lathe oil-water coolant waste arose from the use of an oil-water liquid medium as a coolant in the machining of metal billets. The coolant medium used at RMI consisted of a combination of about 5 percent Staysol 77 (water miscible metalworking fluid) in 95 percent water by volume. The lathe coolant was changed about every year. The waste lathe oil-water coolant is not ignitable, corrosive, or reactive. It is hazardous because of its EP toxicity for lead (DOO8).

Table 4-13 - Lead Contaminated (US EPA Waste Code D008)

Description	Existing Inventory	Projected Inventory
Lathe Oil/Coolant (Liquid)	380 kg	185 kg
Lathe Oil/Coolant (Solids)	805 kg	193 kg
Pump Station Oil (Liquid)	380 kg	186 kg
Pump Station Oil (Solids)	192 kg	193 kg

The pump station and lathe oil-water mixture contained lead. In addition, some hydraulic seals on the lathes or extrusion press were made of or contained lead. Lead impregnated extrusion lubricants were used periodically. Sampling and analysis will confirm the presence of lead contamination in the pump station oil and lathe oil-water mixture. The floors, trenches, drains and sump systems associated with lathes and extrusion press will be investigated to determine if contamination from these wastes is present.

Chlorinated solvent wastes were generated in cleaning/degreasing operations carried out on electrical motors and other parts in the plant. Two different proprietary chlorinated solvent formulations and one proprietary aliphatic solvent are employed for cleaning/degreasing operations in the plant. As generated by maintenance, the chlorinated solvent waste drums contain variable amounts of each of the three spent solvent formulations. Solvents soaked rags are accumulated in other drums. Because of the methylene chloride and tetrachloroethylene (perchloroethylene) contents, this mixed solvent waste has an US EPA hazardous waste number of FOO1. A flash point of 103 degrees Fahrenheit (F) characterizes the waste as ignitable and has a US EPA hazardous waste number of DOO1.

The chlorinated solvent waste at RMI contains a mixture of three proprietary solvents, (i.e., F.O. 128 and F.O. 352 [both marketed by HEXCEL Specialty Chemicals, Lodi, New Jersey] and Solvent Stoddard R-66 [marketed by SOHIO]). Solvent F.O. 128 is a blend of aliphatic and chlorinated hydrocarbons. The approximate composition is as follows:

Aliphatic Petroleum Hydrocarbons > 60 - 80 percent
Methylene Chloride < 5 - 15 percent
Perchloroethylene > 10 - 30 percent

F.O. 128 is a watery white liquid with a mild petroleum odor, a specific gravity of about 0.98, and a flash point of about 235 degrees F. F.O. 352 is a nonflammable, noncorrosive, fast drying solvent designed to quickly dissolve contaminants in all types of cleaning and degreasing operations. The F.O 352 solvent contains 45 percent methylene chloride and 55 percent perchloroethylene by weight.

Solvent Stoddard R-66 is generally accepted for use especially where air pollution controls limit or prohibit the use of aromatic hydrocarbons. Solvent Stoddard R-66 contains approximately equal amounts of paraffinic and napthenic hydrocarbons. It contains no olefinic hydrocarbons and less than 2 percent aromatic hydrocarbons (typically 1.3 percent); also, it contains less than 0.1 percent benzene. The Solvent Stoddard R-66 flashpoint is 105°F.

The floor stripping chlorinated solvent waste resulted from the common practice in uranium processing facilities of coating concrete floors with a sealant coating. This coating minimized the infiltration of uranium into the concrete. For maintenance operations, the floors were stripped once each year of their coating and a new coating was applied. The floor stripper used in some areas was the listed chlorinated solvent methylene chloride. The floor stripper waste has an US EPA hazardous waste number of F002 (spent halogenated solvent).

Table 4-14 - Organic Contaminated (US EPA Waste Codes F001, F002, and/or D001)

Description	Existing Inventory	Projected Inventory
Chlorinated/Stoddard Solvents (Solids)	571 kg	681 kg
Chlorinated/Stoddard Solvents (Liquids)	400 kg	990 kg
Floor Stripping Solvents	4302 kg	860 kg

The chlorinated solvents and degreasing solvents are not expected as contaminants since they are volatiles. However, the volatiles may have leaked in floor cracks, expansion joints, etc. when sealing and floor coating was performed during the years of operation. A limited sampling or inspection of the vapor degreaser area and floor joints should be conducted to determine if these RCRA wastes are present.

4.4 Preliminary Dose Assessment

In support of the DOE Environmental Safety and Health (ES&H) requirements in DOE Order 5400.1, a pathway analysis was conducted for the existing conditions at RMI. For the RMI Pathway Analysis, the release estimates (and consequently the dose estimates) from the site were based on available environmental media samples (PARSONS 1993b). The types of releases that were considered were fugitive dust emissions and surface water releases. These release pathways were modeled using various equations and software packages. Release models used were the Cowherd Model and the Universal Soil Loss Equation. Dose estimates were calculated using the RESRAD and GENII-S models.

Three scenarios were conducted. The first scenario involved calculating the dose to the population around RMI, the second was performed to find the dose to the maximally exposed individual (MEI), and the third scenario was done to find the dose to a worker at the RMI site. In calculating the dose to the receptors, routes of exposure used were inhalation, ingestion, and external exposure.

Table 4-15 presents the final dose summary. This table includes the dose to each receptor and scenario. Included are the Reasonable Maximum Exposure (RME) and the 5 percent and 95 percent confidence levels. Please note that these exposures do not include any contribution from the groundwater pathway. The analysis showed that Tc-99 was the only radionuclide that would reach the groundwater within 10 years. This radionuclide, or any other in the groundwater, will not reach the general populous during the remediation time frame as there are no drinking water wells within 2 miles of the RMI site and the soil characteristics do not promote the spread of water-borne contaminants.

Table 4-15 - Summary of Reasonable Maximum Exposures

Scenario	**5 percent Confidence Interval**	**Reasonable Maximum Exposure (RME)**	**95 percent Confidence Interval**
Population Dose (person-rem)	3.5E-4	6.4E-3	1.0E-3
Maximally Exposed Individual Dose (rem)	9.2E-6	1.8E-5	2.3E-4
Worker Dose (rem)	6.0E-4	6.0E-3	6.0E-2

The population scenario models the annual effective dose equivalent to the population from the current releases at the RMI plant. The population considered exposed is within a radius of 80 km of the site. The release pathways are by fugitive dust emissions and through surface water transport. The exposure pathways to the population consist of inhalation of the airborne dusts, inadvertent soil ingestion, and external gamma exposure. For this scenario, the most significant pathway is that of dust inhalation; it contributes about 99 percent of the total dose.

The MEI scenario models the dose to the residents that are east of the site at a distance of 220 meters. The release pathways for this scenario consist of fugitive dust emissions and surface water transport. Exposure pathways for the MEI are the same as for the population case--inhalation of the airborne dusts, inadvertent soil ingestion, and external gamma exposure. The most significant pathway for the MEI case is the dust inhalation pathway; it contributes approximately 99 percent of the total dose.

The worker dose scenario modeled the radiation dose to a on-site worker. This worker was assumed to spend 2,000 hr/yr on site, with 75 percent of that time indoors where the airborne contamination levels were said to be 40 percent of the external values. The release pathways in this scenario are also inhalation of the airborne dusts, inadvertent soil ingestion, and external gamma exposure. The most significant pathway for the worker is the external gamma exposure which contributes approximately 65 percent of the total dose. This exposure pathway dominates the dose due to the presence of Th-228 and U-238.

4.5 Affected and Unaffected Areas

4.5.1 Affected and Unaffected Grounds

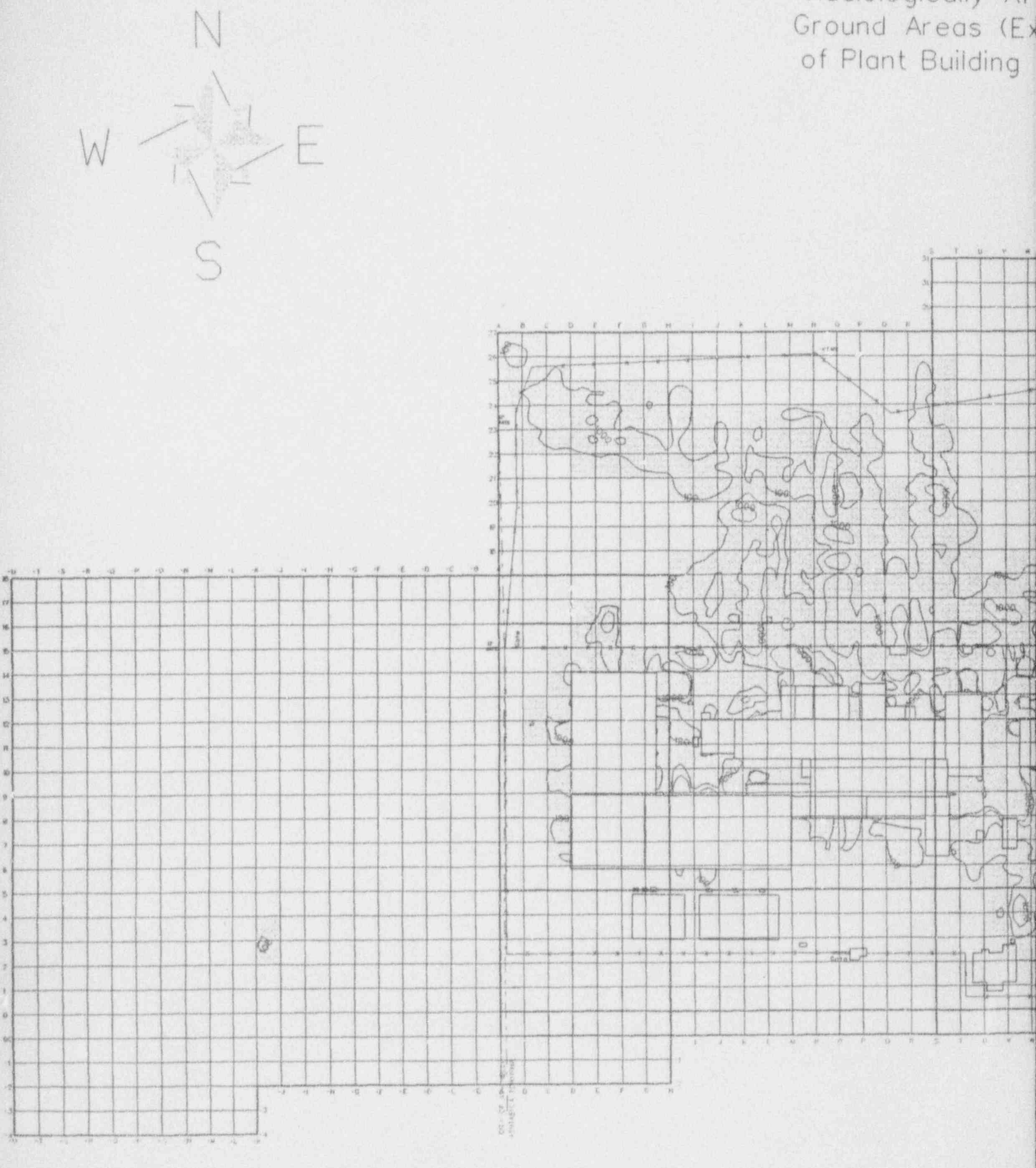
Figure 4-19 shows the radiologically affected grounds areas as determined by the site scoping radiation survey. Grounds areas refers to the surface soils and paved areas surveyed. NUREG/CR-5849 guidance suggests that the grounds be classified into affected and unaffected during site scoping.

The site areas with surface radiation readings levels above the net 100 cpm level were considered to be affected by plant operations. The 1991 soils sampling total uranium concentrations were compared to the radiation levels contours from the scoping radiation survey to determine affected areas. In general, it was observed that the shallow soil sample locations that had total uranium concentrations in excess of 30 pCi/g had corresponding radiation levels in excess of 100 cpm above background (see Figure 4-13). Thus the 100 cpm net contour lines were used to establish the affected 10 meter survey grids shown in Figure 4-19. This approach to classifying the affected areas was intended to be preliminary.

To allow for uncertainties in the above method of preliminary classification of affected areas, and to facilitate management of soil sample collection during the site characterization, Areas B, C, D, F, and G will be classified as Affected Areas for the initial characterization investigations. Areas A and E will be considered Unaffected, however discrete localized areas of elevated radioactivity in Areas A and D will require consideration.

Figure 4-20 shows the affected and unaffected areas for the site characterization. Figure 4-21 shows the discrete localized areas of elevated radioactivity in Areas A and D found during the site scoping radiation survey.

Site Scoping Radiati
Radiologically Af
Ground Areas (Ex
of Plant Building



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DWG. NO. P-0008.DGN

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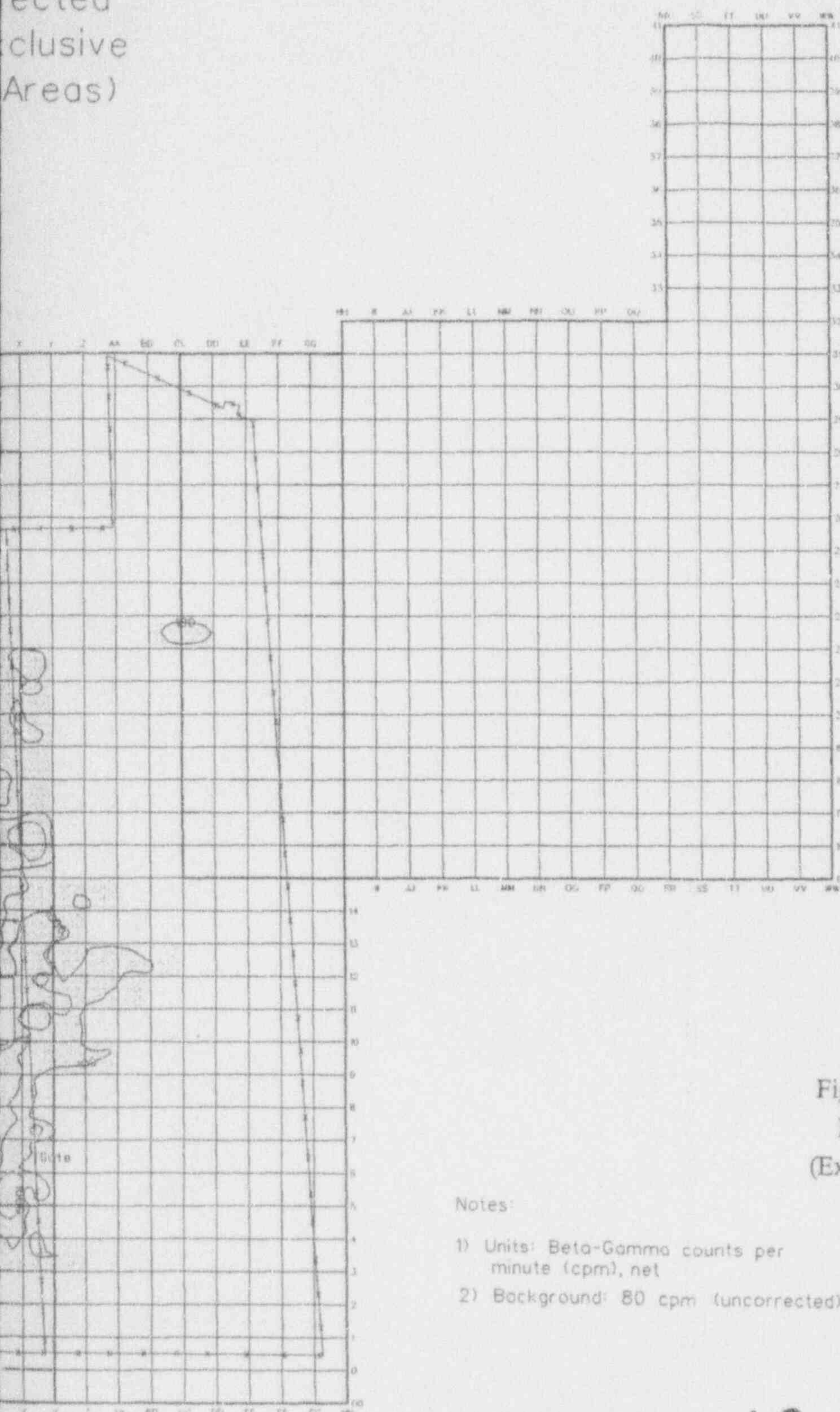


Legend

- Boundary Line
- Fence Line
- 10 Meter Grid
- 100 cpm
- 1000 cpm
- Assumed Radiologically Affected Ground Areas

Figure 4-19 - Site Scoping Survey Radiologically Affected Areas (Exclusive of Plant Building Areas)

4-50

Notes:

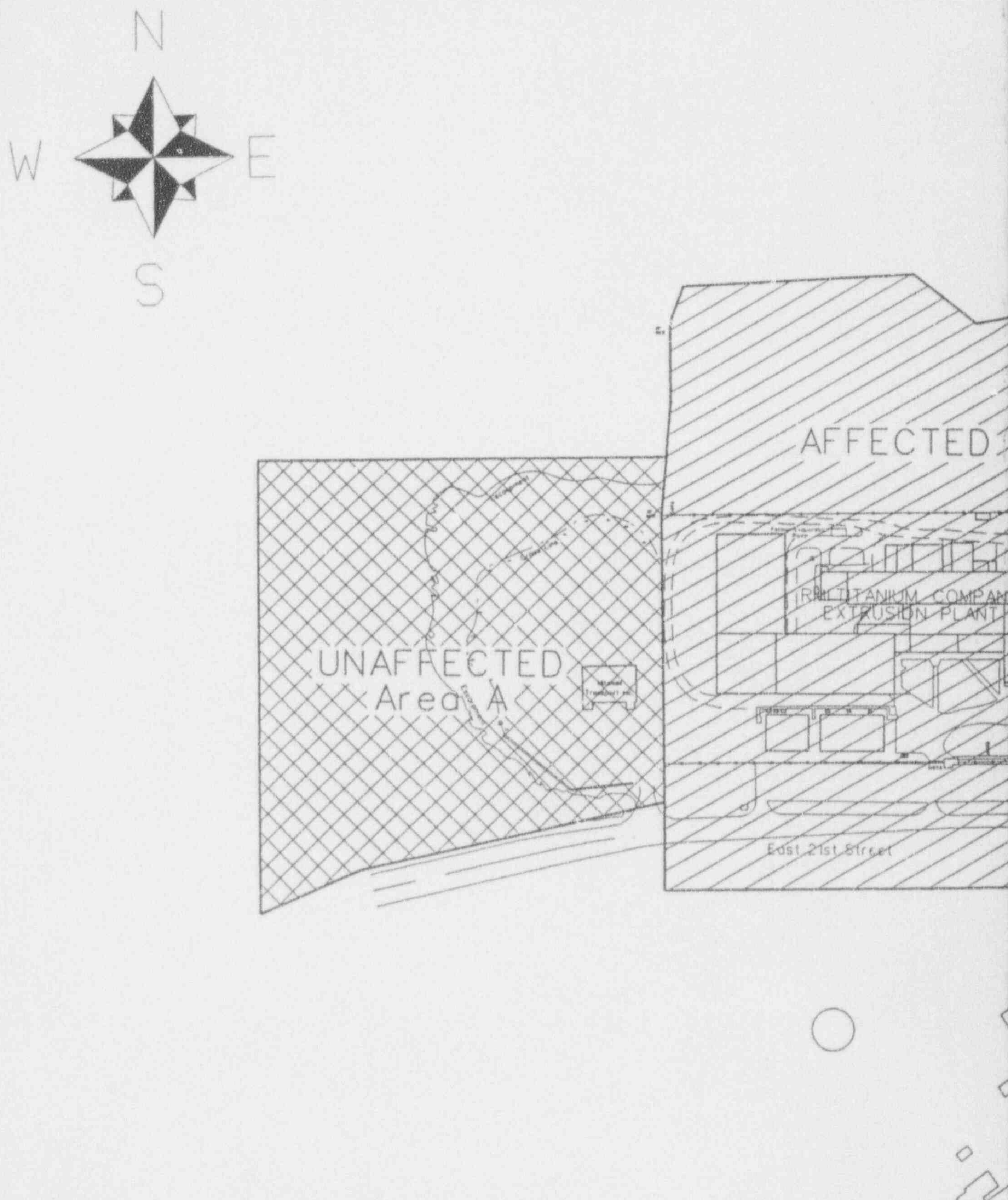
1) Units: Beta-Gamma counts per minute (cpm), net
2) Background: 80 cpm (uncorrected)

9404080144- 18

REVISION		
DATE	NO	DESCRIPTION

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DESIGNED TO FIT P-0008.DGN	DATE 3/22/93	SCALE
TITLE SITE SCOPING RADIATION SURVEY RADIOLOGICALLY AFFECTED GROUND AREAS (EXCLUSIVE OF PLANT BUILDING AREAS)	DWN. BY ERJAVEC	CHK'D BY ERNST
	ENG. No. & PROJECT WBS: 1.1.2.2.1	
	DWG. No. P-0008	



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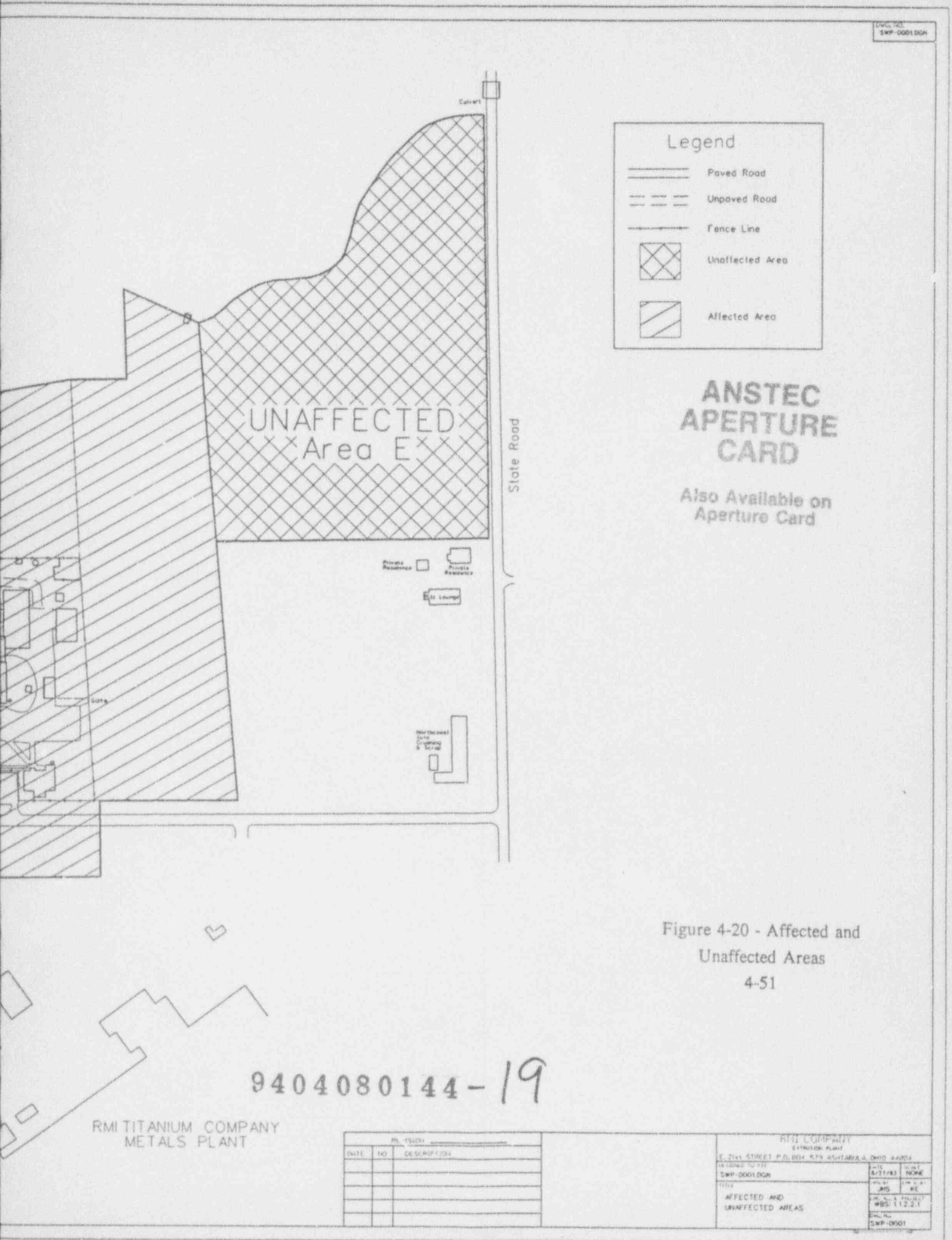
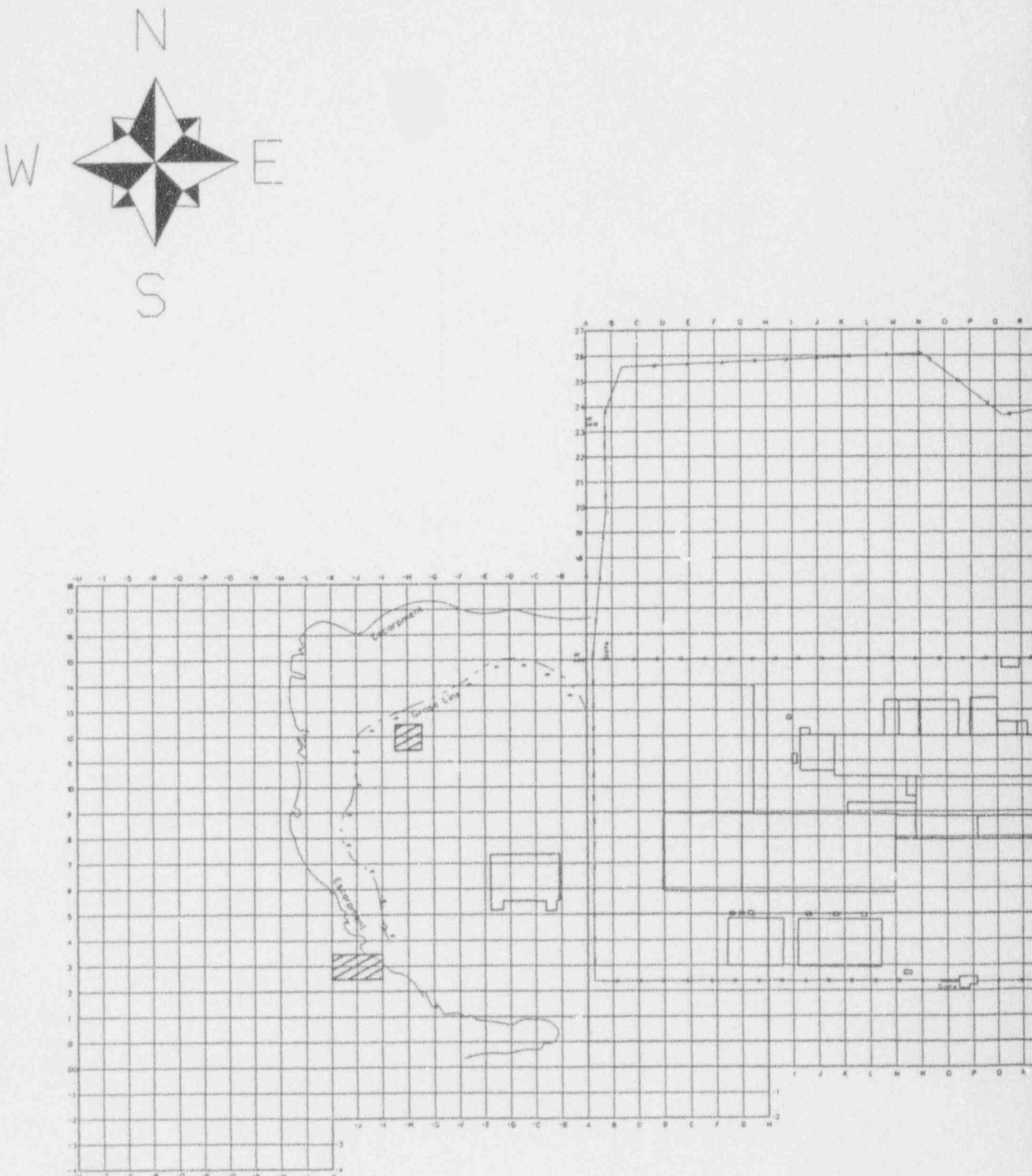


Figure 4-20 - Affected and Unaffected Areas



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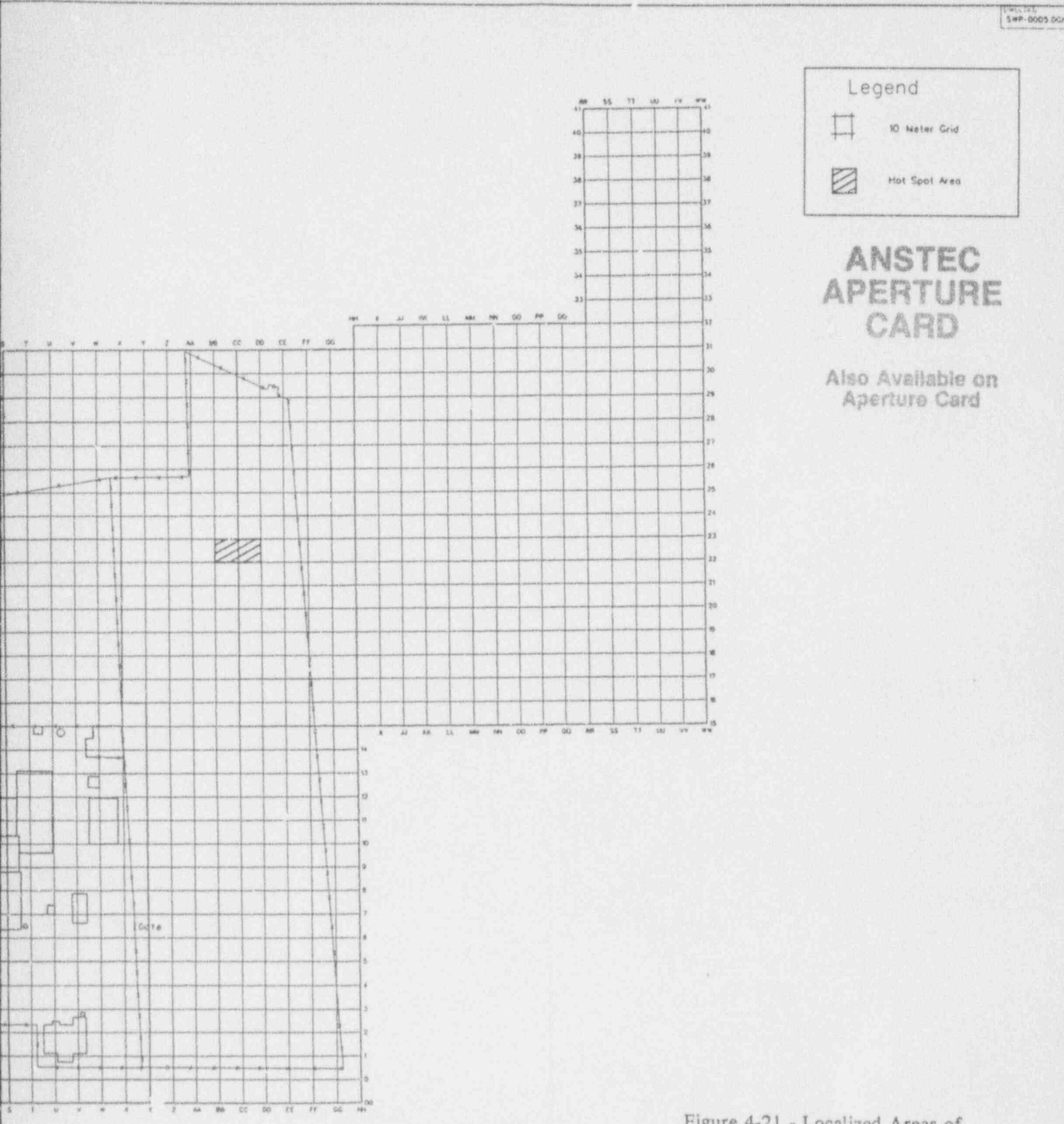

Figure 4-21 - Localized Areas of Elevated Radioactivity
(See Section 4.5.1)

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REVISION		
DATE	NO.	DESCRIPTION

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004
SWP-0005.DGN
8/17/93 NONE
LOCALIZED AREAS OF ELEVATED RADIOACTIVITY
WBS 1.1.2.2.1
SWP-0005

Table 4-16 Affected and Unaffected Grounds Areas (excluding buildings)

Area	Determination	Affected Media	Reason for Determination	Remarks
A	Unaffected		Site scoping survey results	Localized areas of elevated radioactivity established near survey grid locations -K, 3 and -H, 12 considered affected
B	Affected	Soils Groundwater	Site scoping survey results Annual soil samples exceeded limit Front Yard soil samples exceeded limit CAMU groundwater contaminant plume Groundwater monitoring results from wells 101 and 103	
C	Affected	Soils Groundwater	Site scoping survey results Annual soil samples exceeded limit CAMU groundwater contaminant plume	
D	Affected	Soils	Site scoping survey results Annual soil samples exceeded limit	Localized areas of elevated radioactivity established near grid location CC,21
E	Unaffected		Site scoping survey results	
F	Affected	Soils	Ditch provides potential s. .ace water runoff pathway	
G	Assumed Affected	Soils	Ditch provides potential surface water runoff pathway	Radiation walkover survey of established grid to be performed

The boundaries of the site scoping radiation survey did not include the area south of East 21st Street. Based on the SR conceptual model of airborne contamination transport, it may be assumed that radiological contamination settled on East 21st Street adjacent to the site. Rain would then wash the particulate contamination into the ditches north and south of East 21st Street. Thus Area G, a 30 meter by 250 meter area south of East 21st Street, was established for further investigation. Area G will be assumed affected pending further characterization.

Affected groundwater is known or suspected to exist in Areas B and C. Other areas are classified as unaffected with respect to groundwater.

Table 4-16 summarizes the Affected and Unaffected grounds areas.

4.5.2 Affected and Unaffected Buildings

The preliminary survey data presented in Table 4-18 indicated all buildings with the exception of the ES&H building, sewage disposal plant, guardhouse and emergency equipment storage building, are affected areas. Additional characterization will be performed at the Environmental, Safety, and Health (ES&H) building, sewage disposal plant, guardhouse and emergency equipment storage building to confirm that these buildings are unaffected. Until these additional characterization is complete, these buildings will be assumed to be affected. Two buildings, the modular laboratory and modular offices, are assumed to be unaffected. These buildings were installed after plant operations were shutdown and are maintained as non-radiological areas (i.e., removable contamination less than 700 dpm/100 cm^2). Verification that the laboratory and modular office areas are unaffected will be conducted during license termination surveys. Each building and the reason it is considered affected or unaffected is listed in Table 4-17.

Table 4-17 - Affected and Unaffected Buildings

Building	Determination	Reason for Determination
Main Plant	Affected	Removable alpha contamination on walls and floor exceeds limit Direct beta contamination on walls and floor exceeds average and maximum limits Removable beta contamination on wall and floor exceeds limit
RF6 Building	Affected	Removable alpha contamination on walls exceeds limit Direct beta contamination on walls exceeds average and maximum limits Removable beta contamination on walls exceeds limit
Northwest Storage Building	Affected	Removable alpha contamination on walls exceeds limit Direct beta contamination on floor exceeds average and maximum limits Removable beta contamination on walls exceeds limit
RF6 Building Addition	Affected	Removable beta contamination on walls exceeds limit Direct beta contamination on floor exceeds average and maximum limits
Billet Storage Warehouse	Affected	Direct beta contamination on floor exceeds average and maximum limits
Locker Rooms/ Foreman's Offices	Affected	Removable beta contamination on walls and floor exceeds limit Direct beta contamination on floor exceeds average and maximum limits
ES&H Building	Affected	Assumed affected
RF3 Building	Affected	Removable alpha contamination on walls exceeds limit Direct beta contamination on walls exceed average and maximum limits Removal beta contamination on walls exceed limit
Tool Crib	Affected	Direct beta contamination on walls exceeds maximum limit Direct beta contamination on floor exceeds average and maximum limits Removable beta contamination on walls exceeds limit
Wastewater Treatment Plant	Affected	Direct beta contamination on floor exceeds average and maximum limits
Die Head Filter Building	Affected	Direct beta contamination on floor exceeds average limit

Table 4-17 Affected and Unaffected Buildings (Continued)

Building	Determination	Reason for Determination
Dock Area	Affected	Direct beta contamination on walls and floor exceeds maximum limit Removable beta contamination on floor exceeds limit
Enclosed Rampway	Affected	Removable beta contamination on walls exceeds limit Direct beta contamination on floor exceeds average and maximum limits
Saw Filter Building	Affected	Removable beta contamination on walls exceeds limit
Runout Table Filter Building	Affected	Removable beta contamination on walls exceeds limit Direct beta contamination on floor exceeds average and maximum limits
RCRA Storage Building	Affected	Direct beta contamination on floor exceeds average and maximum limits
Substation	Affected	Removable beta contamination on walls exceeds limit
Guard House	Affected	Assumed affected
Compressor Room	Affected	Removable beta contamination on walls exceeds limit
Sewage Disposal Plant	Affected	Assumed affected
Emergency Equipment Storage Building	Affected	Assumed affected
Modular Laboratory	Unaffected	Laboratory installed after plant operations ceased and are maintained as non-radiological areas
Modular Offices	Unaffected	Offices installed after plant operations ceased and are maintained as non-radiological areas

SECTION 5

APPROACH TO SITE CHARACTERIZATION

The approach to characterization of the RMI site is based on identification of data needs and collection of the necessary data in a manner consistent with regulatory requirements, technical guidance, data quality objectives, and site-specific conditions. Data needs have been identified in the SR. A description of applicable requirements and guidance documents is presented in Subsection 5.1. The overall approach is designed to be implemented in three phases: preliminary, detailed, and supplemental. It is important to recognize that these three phases are to be applied to three distinct media: (1) groundwater, (2) soils, and (3) buildings/equipment. The entire area being characterized has been subdivided into areas A through G to facilitate discussions, and the is based on a combination of ownership and land use.

This approach, being phased, media-specific, and subdivided into areas A through G, allows for a wide range of flexibility in implementation, especially regarding characterization of soils and buildings/equipment. By subdividing the overall characterization into discrete areas, it becomes possible to continue through the phased processes as necessary, allowing various segments to be potentially in different phases or the various media to be in different phases of characterization concurrently.

Characterization of the groundwater regime is somewhat more difficult and does not lend itself to a "segmented" characterization. The approach to characterizing the groundwater begins by assessing areas of known surface contamination and drilling monitoring wells near the perimeters of the segments (e.g., Area B, containing the known contamination). If contamination is identified in the wells, then wells need to be drilled beyond the initial segment boundary into other areas to determine the extent of contamination. If contamination is not identified, then it will be assumed that the wells are beyond the extent of contamination and what will remain to be done will be to reduce or narrow the potentially contaminated area by moving closer to potential contamination sources until contamination is identified and, if present, its extent demonstrated.

Subsection 5.2 provides a discussion of the phased approach and its implementation. The work plan's content and format are presented in Subsection 5.3. Organizational structures and attendant responsibilities for various aspects of the characterization process are described in Subsection 5.4.

5.1 Overall Regulations and Guidance

This section identifies the applicable regulations and guidance documents which establish the requirements for the site characterization process. The documents presented encompass requirements for radiological and RCRA hazardous characterization. Site decommissioning is governed by NRC regulations and license conditions. To effectively conduct site remediation, adequate characterization is required for all affected media. RMI, as a SDMP site, is provided guidance per the draft BTP. In addition to that guidance, RMI is required to submit a Site Characterization Plan. The site-specific requirements are presented in Table 5-1. Primary guidance for characterization is provided by NRC, US EPA and DOE documents listed in Table 5-2. Table 5-3 lists related guidance for characterization.

5.2 Phased Characterization Approach

RMI will implement site characterization using a phased approach. The phased approach is implemented in a series of discrete steps, each providing a higher level of detail regarding the nature and extent of the site contamination. This phased approach is similar to that typically used for US EPA characterization investigations and is illustrated in Figure 5-1.

Table 5-1 - Regulatory Requirements and Notices for Site Characterization

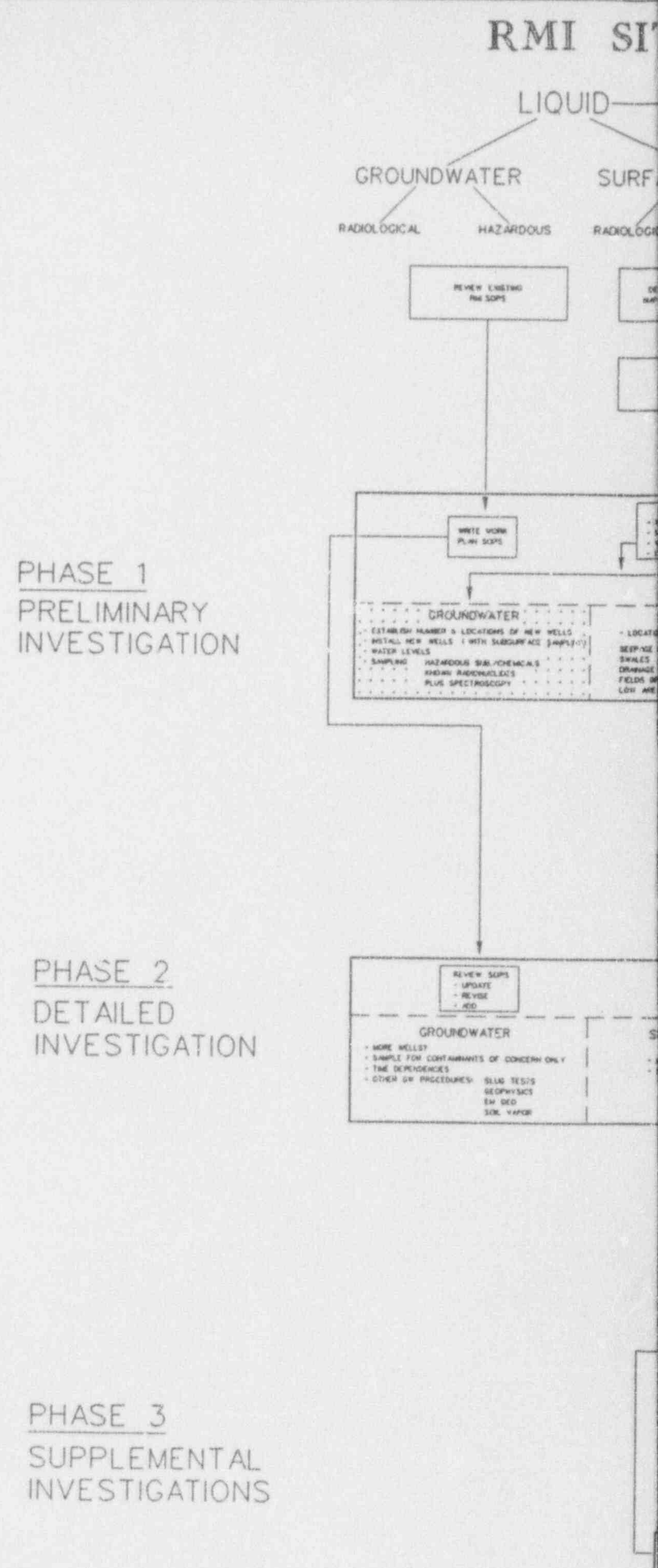
Document	Application	Rationale
NRC License SMB-602	Site Characterization	License condition to submit SCP
10 CFR 40.42 *Domestic Licensing of Source Material*	Termination of Licenses	Requires conduct of termination survey
FR Notice on SDMP Sites	Identifies Action Plan for RMI	Requires Site Characterization per NRC BTP

Table 5-2 - Guidance for Site Characterization

Document	Application	Rationale
(Draft) NRC *BTP for Site Characterization*	Site Characterization	Provides guidance for radiological characterization
(Draft) NUREG/CR-5849 *Manual for Conducting Radiological Surveys in Support of License Termination*	Final Termination Survey	Provides methodology for acceptable survey
SW-846 *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*	RCRA Hazardous Analysis	Requires specific analysis methods
RMI Decommissioning Plan	Provides outline of site remediation	Identifies survey/characterization for site remediation
US EPA *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*	Groundwater wells	Provides guidance for monitoring well installation and background determination
DOE Order 5820.2A *Radioactive Waste Management*	Waste Characterization	Requires proper characterization of waste for waste management process
NVO-325, Rev. 1 Nevada Test Site *Defense Waste Acceptance Criteria, Certification, and Transfer Requirements*	Radiological and RCRA characterization	Provides analytical waste acceptance criteria

Table 5-3 - Related Guidance for Site Characterization

Document	Application	Rationale
29 CFR 1910.120(e) *Occupational Safety and Health Standards*	Training	Characterization activities covered by training for work hazards
RCRA Hazardous Waste Management Facility Permit (OHD 980 683 544)	Reporting Requirements for SWMUs	Sampling and analysis resulting in identification of new contaminants
49 CFR 173 *Shippers General Requirement for Shipments and Packaging*	Transportation	Samples properly packaged and shipped
49 CFR 172 Hazardous Materials Tables, Special Provisions, *Hazardous Materials Communications, Emergency Response Information, and Training Requirements*	Transportation	Samples properly categorized and shipped
40 CFR 261 *Identification and Listing of Hazardous Waste*	RCRA Hazardous Waste	Requires proper listing and classification
10 CFR 71 *Packaging and Transportation of Radioactive Materials*	Transportation	Identifies NRC classification and shipment
10 CFR 20 *Standards for Protection against Radiation*	Radiation Protection Standards	Requires worker radiological protection
American Society of Mechanical Engineers (ASME) NQA-1 *Quality Assurance Program Requirements for Nuclear Facilities*	Quality Assurance	Sampling, handling, and analysis must meet QA standards
QAMS 005/80 *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*	Quality Assurance	Requires QA project plans
49 CFR 178 *Specifications for Packaging*	Transportation	Provides specifications for packaging radioactive material



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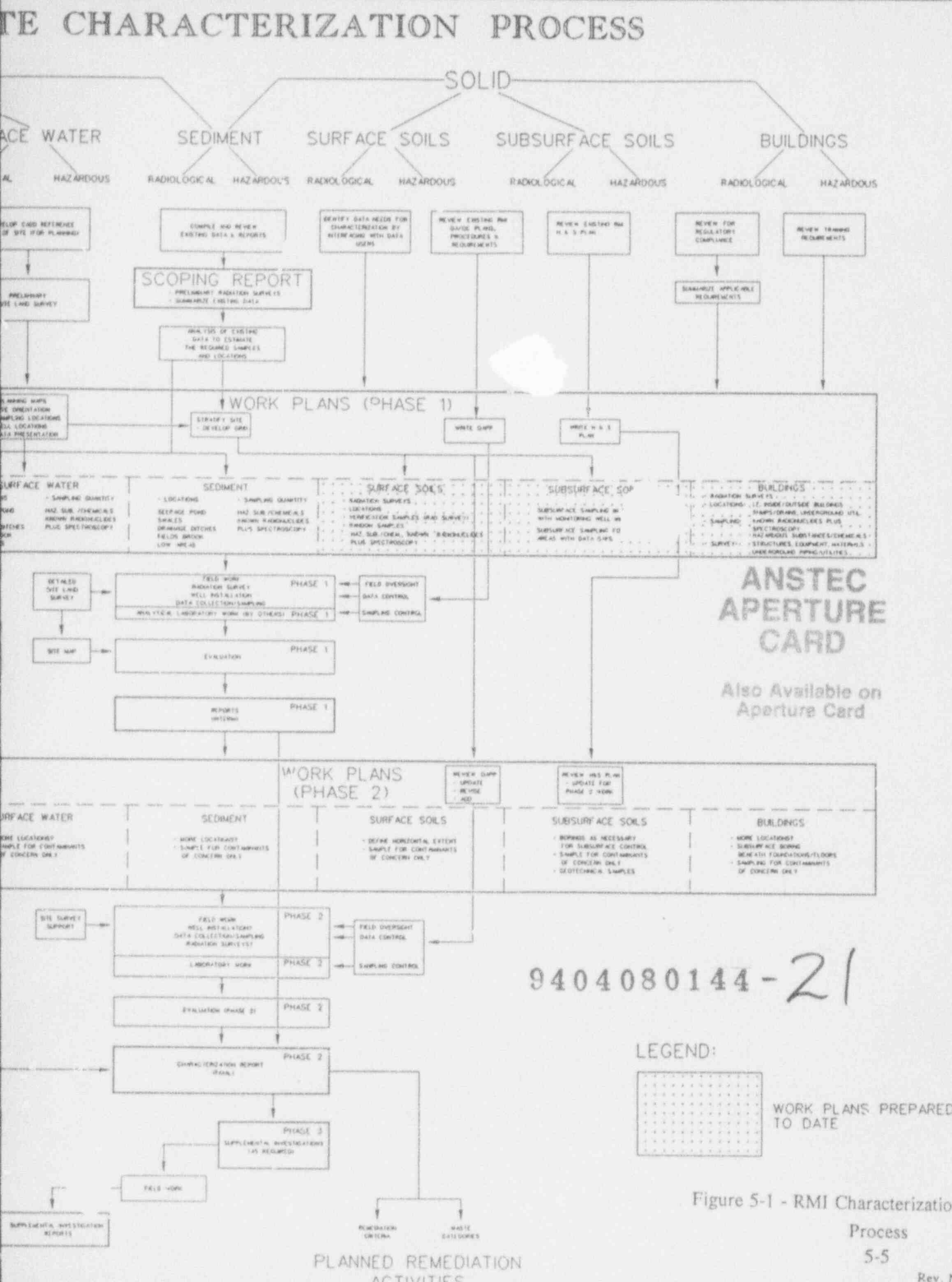

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Figure 5-1 - RMI Characterization Process

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The RMI site characterization will consist of three phases; they are:

1) Preliminary
2) Detailed
3) Supplemental

Each phase will provide for the evaluation of characterization data at the end of that phase. By evaluating the data gained at the end of each phase, the characterization investigation can identify potential data gaps. The next phase of investigation can then be designed to focus on gathering necessary data in areas where the uncertainty remains above an acceptable level.

5.2.1 Phase 1 - Preliminary Investigation

The first phase, or preliminary phase, serves to establish the type, extent and magnitude of contamination for the various media at the RMI site. Preliminary investigation activities are guided by a work plan. Early activities of characterization include:

1) Review of regulations and guidance applicable to the characterization investigation. Applicable requirements are summarized.

2) Review and revision of existing RMI Standard Operating Procedures (SOP) that support the investigation. New procedures may need to be developed to support the investigation, e.g., sampling, chain of custody, data validation, etc.

3) Review of Quality Assurance/Quality Control (QA/QC) plans and procedures.

4) Review and revision of existing RMI Health and Safety plans and procedures. A Health and Safety Plan specific to the characterization investigation will be developed.

5) Development of reference maps of the site and facilities.

6) Compile and summarize existing data reports to provide a Scoping Report that serves as a starting point for developing work plans.

7) Identify data needs by interfacing with the data users. The data users include characterization, risk assessment, remediation, and waste management activity support personnel.

8) Review personnel training requirements to support work plan activities.

The results of these activities provide the information basis for the media specific work plans and identify the procedures to be developed and implemented, prior to initiating the work plan.

The preliminary investigation consists the initial activities of the site characterization. The plan for the investigation includes locations, types, and number of samples to be taken. The format and content of the work plans are presented in Subsection 5.4.

Upon approval of the work plan, procedures, training plans, and subsequent personnel training, the field work will be initiated to collect the data specified. Data collection activities include radiation surveys, contamination surveys, well installation, surveying of well locations, soil sampling, groundwater sampling, and sampling of the buildings/equipment. Analysis of the data will determine the nature, level .. extent of radiological and RCRA hazardous contaminants. It will also determine the need or direction for further characterization.

5.2.2 Phase 2 - Detailed Investigation

The need to conduct the second phase, or detailed investigation, is based upon the data needs identified in the preliminary phase. Planning activities and development of Phase 2 work plans are similar to that of the preliminary investigation. Data gained in this phase serves to further refine the nature level and extent of contamination as necessary to reduce uncertainty and meet decommissioning requirements. Data gained in this phase may include geotechnical, hydrological and physical property information. Additional activities to those listed for the preliminary phase include:

1) Incorporate data needs identified in Phase 1 and develop objectives around those needs.

2) Review and update SOPs and the Phase 1 Health and Safety Plan to support Phase 2 activities. Procedures will be developed for new activities.

3) Prepare Phase 2 work plans.

As with Phase 1, upon approval of the work plan, procedures, training plans, and subsequent personnel training, Phase 2 will be implemented if necessary.

5.2.3 Phase 3 - Supplemental Investigations

Upon evaluation and analysis of Phase 1 and Phase 2 data, if there are areas of uncertainty identified that do not meet established confidence levels, they will become the topics of supplemental investigations. Phase 3 investigations serve to address such areas of uncertainty. The supplemental investigation will have highly defined objectives and be narrowly focused. Data gathered and analyzed will be presented in a report or series of topical reports.

5.3 Work Plan Content and Format

Work plans are designed to address separate media requiring site characterization data. These work plans are based on the specific medium under investigation (i.e., soils, groundwater, buildings and equipment). The same general format will be used for each work plan, where practicable. There will be variations due to differences inherent in characterizing natural verses manmade systems. The topics covered in the work plans are given below.

1) Purpose, scope and objectives
2) Background and technical approach based upon existing data
3) Data quality objectives
4) Specific task descriptions
5) Corrective actions
6) Technical guidance documents
7) Reporting requirements

The topics above should be incorporated into the individual work plans to facilitate clarity and implementation. The topics are not prioritized by any hierarchy.

5.4 RMI Decommissioning Project Organization

The RMI Project Decommissioning Project Organization will direct the site characterization. The interfaces between RMI as the Project Management Company and the responsible individuals within RMI are presented in this subsection.

5.4.1 Characterization Project Management

RMI will serve to coordinate the project management and maintain liaison with the NRC, DOE, US EPA, Ohio EPA, and any other local agencies as needed. Materials and services required for the characterization investigations will be acquired through an appropriate bid process as required by DOE Project Management Orders. Various subcontractors may be employed for tasks in the site characterization effort. Tasks currently identified for which RMI may use subcontractors are survey, drilling, and geological oversight of groundwater monitoring wells and subsurface soil sampling near utilities. Laboratory services, as needed, will be subcontracted for chemical and radiological analysis services as identified by RMI.

5.4.2 Individual Responsibilities

The SCP will be implemented by qualified RMI personnel. The RMI organizational structure and functions are presented in Figure 5-2. For clarity, not all positions are shown on the organization chart.

Key personnel in the characterization effort are listed below:

1) The **Program Manager** will be responsible for oversight in the implementation of the Site Characterization and Decommissioning Plan and the associated separate Work Plans.

2) The **Deputy Program Manager** will be responsible for the overall project management and will administratively report to the Program Manager.

3) The **Director Decommissioning and Decontamination** will be responsible for the management of the technical support services, characterization, and decommissioning efforts. The Director Decommissioning and Decontamination administratively and technically reports to the Deputy Program Manager.

4) The **Manager Decommissioning and Decontamination Operations** will be responsible for the management of the characterization, decommissioning, and support services. The Manager Decommissioning and Decontamination Operations administratively reports to the Deputy Program Manager and technically reports to the Director Decommissioning and Decontamination.

5) The **Manager Field Engineering** will be responsible for the management of the site characterization and decommissioning implementation. The Manager Field Engineering administratively reports to the Manager, Decommissioning and Decontamination Operations.

6) The **Environmental Safety and Health Manager** will be responsible for the management of the environmental compliance, health, safety, and laboratory services. The Environmental Safety and Health Manager administratively reports to the Deputy Program Manager.

7) The **Manager Regulatory Compliance** will be responsible for evaluating and coordinating the integration of Federal, State, and Local laws and regulations to project technical documentation and activities. The position assures that remediation is conducted in compliance with regulations, DOE Orders, and specified plans and procedures. The Manager Regulatory Compliance administratively reports to The Environmental Safety and Health Manager.

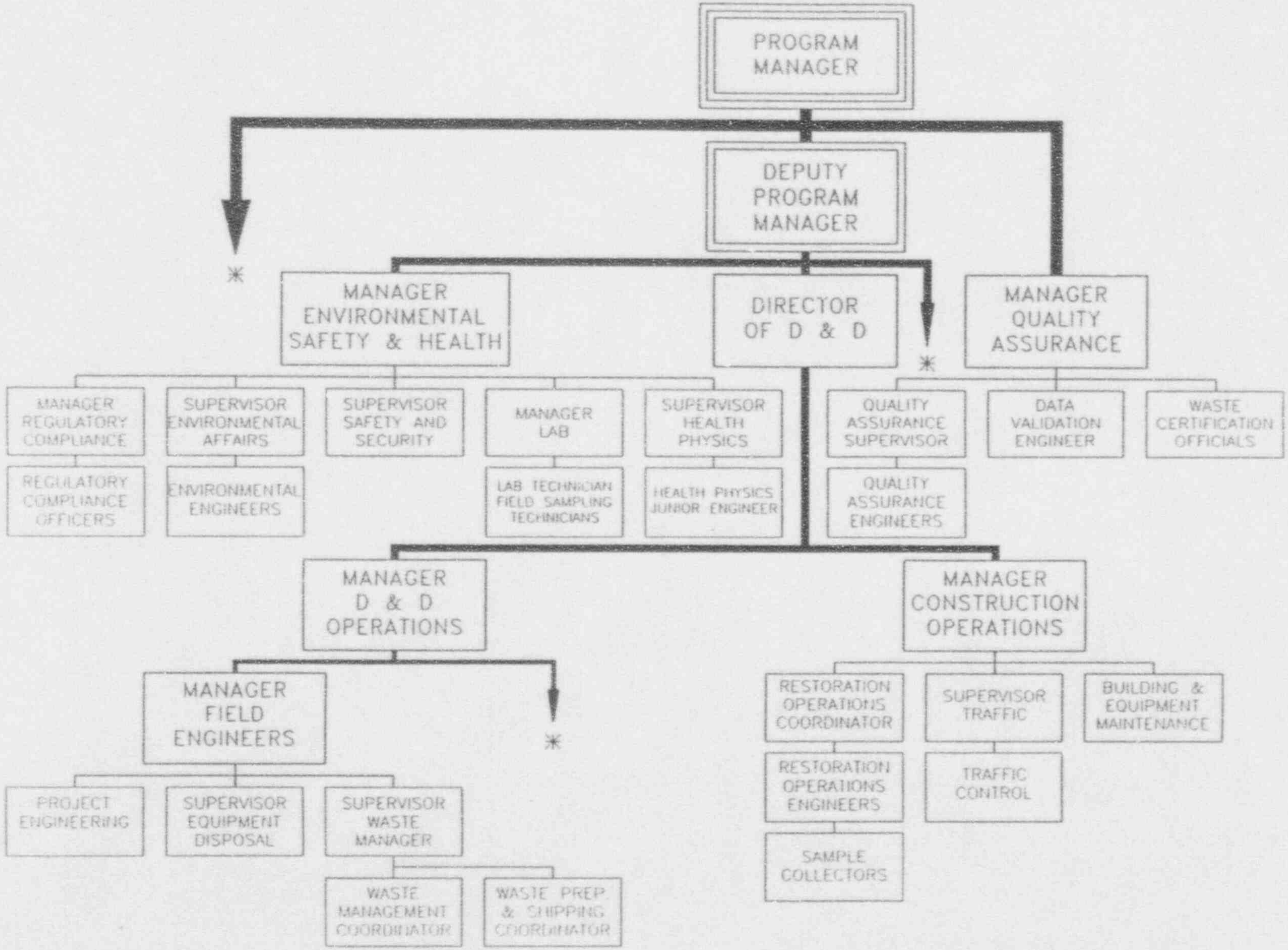


Figure 5-2 Functional Organization Structure

8) The **Manager of Quality Assurance** will be responsible for the management of the QA throughout the complete project, including data validation and waste certification. Any changes on alterations to characterization procedures will be conducted in accordance with QA procedures. The Manager of Quality Assurance administratively reports to the Program Manager.

5.4.3 Project Personnel Responsibilities

5.4.3.1 RMI Laboratory Personnel

The RMI Laboratory will be responsible for supplying necessary equipment, forms, and sample numbers to the sample collectors; logging and tracking of completed sample forms; preserving and storing samples; preparing blank samples; and shipping samples to contract laboratories in accordance with approved procedures. The RMI Laboratory will conduct radiological and chemical analysis of characterization samples in accordance with RMI standard operating procedures, the media-specific work plans, and the requirements of RMI-L-125, "Site Quality Restoration Assurance Program Plan." Laboratory personnel report administratively to the Manager of Technical Service and Laboratory.

5.4.3.2 Restoration Operations Engineers

Restoration Operations Engineers will be responsible for providing direct oversight of the sample collectors and for assuring that the appropriate procedures are being followed. The Restoration Operation Engineers report administratively to the Manager, Engineering and Restoration Operations.

5.4.3.3 Sample Collectors

Sample Collectors are Restoration Operations personnel who will be responsible for collecting samples, completing necessary documentation, transferring samples to the RMI Laboratory and assisting with sample compositing, as required.

5.4.3.4 Health Physics Junior Engineers

Health Physics Junior Engineers will be responsible for conducting the following activities in accordance with approved RMI procedures: (1) surveying the appropriate work areas for radioactivity, (2) surveying sample packages, (3) writing any radiation work permits (RWPs), and (4) monitoring of personnel and equipment as necessary. Health Physics Junior Engineers report administratively to the ES&H Manager through the Radiation Safety Officer.

5.4.3.5 Certification Officials

Certification Officials will be responsible for auditing the activities during the characterization effort and notifying the Manager Regulatory Compliance of any deviations from the approved procedures. The Certification Officials report administratively to the Quality Assurance Manager.

5.4.3.6 Equipment Disposition Supervisor/Project Engineer

This individual will be responsible for supervising the field characterization effort and coordinating between different departments involved in the characterization/remediation activities. The Equipment Disposition Supervisor/Project Engineer reports administratively to the Manager of Field Engineering.

SECTION 6

GROUNDWATER CHARACTERIZATION

6.1 Data Needs

Table 6-1 lists the overall and groundwater characterization objectives presented in Section 1. Table 6-2 presents data needs for the groundwater characterization. The data needs are listed in the table by area subdivision (e.g., Area A, B, etc.) and are compared with overall site characterization objectives listed in Subsection 1.2.1 and a general description of the activity planned to meet these objectives during the Phase 1 investigation. The table also indicates a series of "groundwater objectives." Like the hierarchy of documents, there exists an identified work flow of objectives.

The overall objectives were developed based on identification of data "gaps" or "data needs" as indicated in the site SR. Each media-specific work plan is structured around a set of media-specific objectives based on verified data needs. Individual tasks within the work plans have specific focused objectives. With each planning document in the hierarchy, the objectives become increasingly refined and less general.

Table 6-2 brings together the data needs, overall objectives, groundwater objectives, planned activities, an work plan tasks organized by area/subdivision. For the specific tasks listed, objectives and attendant activities are presented in Section 4 of the Groundwater Characterization Work Plan.

Because the groundwater characterization approach begins by concentrating on areas of known contamination; the approach is designed to expand areally, as necessary, to trace contaminant extent. The first phase studies are focused in Areas B and C. If contaminants are identified at the Area B boundary, then later groundwater investigation phases will extend beyond Area B.

6.2 Guidance Documents

Several guidance documents provide guidance for developing the groundwater characterization work plans. Table 6-3 lists the primary documents.

Table 6-1 - Site Characterization Objectives

Overall Site Characterization Objectives:	Groundwater Characterization Objectives:
1) Establish a baseline for natural conditions (background) with respect to known or suspected contaminants identified in Table 4-1 of Subsection 4.1 of the SCP and review existing data, reports, and the SR that serve as a basis for development of the media-specific, or topically focused work plans	1) Collect hydrogeologic information and data for areas potentially contaminated by release sources and the general site area
2) Establish the nature, level, and extent of contaminants listed in Table 4-1 of Subsection 4.1 of the SCP in Areas A through G with respect to known or suspected contaminants for the individual areas by sampling and analysis of soils, groundwater, and buildings	2) Establish background concentrations for contaminants and selected analytical screening parameters
3) Determine site stratigraphy and hydrogeology through the use of existing geological and hydrogeological data, geologic logging of borings, and geophysical borehole logging	3) Define the vertical and horizontal extent and concentration of groundwater contamination present
4) Define local groundwater flow directions through use of existing groundwater data and by installing additional monitoring wells	4) Establish initial concentrations of contaminants and selected analytical screening parameters
5) Provide data to assess the concentration or exposure hazard and determine if special precautions or monitoring of the contaminants during remediation are required	
6) Provide data to support engineering evaluation, selection and design remediation options, and assist in preparation for the final termination survey	

Table 6-2 - Data Needs for the Groundwater Characterization

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Groundwater Objective	
Area meeting *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (TEGD) requirements for background monitoring wells	Background groundwater quality data in each of the three water bearing zones	1	2	Evaluation of existing off-site wells for use as background wells. Installation and development of an upgradient monitoring well south of East 21st Street meeting TEGD requirements for a background well; collect and analyze groundwater samples for suspected contaminants and selected analytical parameters (Tasks 1, 2, 3, and 4)
A	Area A has been classified as a radiologically unaffected area with respect to groundwater contamination and is not expected to have been impacted by RCRA groundwater contaminants resulting from RMI Extrusion Plant operations. Additional data or information may be required based upon the initial phase of groundwater characterization for Areas B and C, or characterization of soils in Area A	NA	NA	No groundwater activities planned for the Phase 1 preliminary investigation.

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 6-1.

NA - Not Applicable for Phase 1

Table 6-2 - Data Needs for the Groundwater Characterization (Continued)

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Groundwater Objective	
B	Nature, level and extent of radiological and RCRA groundwater contamination in the general area of the RMI Extrusion Plant buildings	2, 3, 4, 6	1, 3, 4	Installation and development of additional monitoring wells along the downgradient perimeter of Area B; collect and analyze groundwater samples from new and existing wells for suspected contaminants and selected analytical screening parameters (Tasks 1, 2, 3, and 4)
	Nature, level and extent of radiological and RCRA groundwater contamination at specific localized areas of known or suspected subsurface contamination	2, 3, 4, 6	1, 3, 4	Installation and development of additional monitoring wells; collect and analyze groundwater samples from new wells for suspected contaminants and selected analytical screening parameters (Tasks 1, 2, 3, and 4)
	Hydrogeologic information	2, 3, 4, 6	1, 3, 4	Geological and geophysical logging of well borings during installation and determination soil grain-size distribution of screened interval in new wells, seasonal monitoring of groundwater elevations for all wells (Tasks 1, 2, and 3)

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 6-1.

NA - Not Applicable for Phase 1

Table 6-2 - Data Needs for the Groundwater Characterization (Continued)

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Groundwater Objective	
C	Nature, level and extent of radiological and RCRA groundwater contamination at specific localized areas of known or suspected subsurface contamination	2, 3, 4, 6	1, 3, 4	Collect and analyze groundwater samples from wells of existing CAMU monitoring network for suspected contaminants and selected analytical screening parameters (Tasks 2, 3, and 4)
	Hydrogeologic information	2, 3, 4, 6	1, 3, 4	Seasonal monitoring of groundwater elevations for existing CAMU monitoring well network (Tasks 1 and 3)
D	Area D has been classified as an radiologically unaffected area with respect to groundwater contamination; additional data or information may be required based upon the initial phase of groundwater characterization for Areas B and C, or the characterization of soils and subsurface utilities in Area D	2, 3, 4, 6	1, 3, 4	Collect and analyze groundwater samples from the existing monitoring well (installed by Woodward-Clyde for Fields Brook RI/FS study) for suspected contaminants and selected screening parameters (Tasks 3 and 4)
	Hydrogeologic information	2, 3, 4, 6	1, 3, 4	Seasonal monitoring of groundwater elevations for existing Woodward-Clyde monitoring well (Tasks 2 and 3)

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 6-1.

NA - Not Applicable for Phase 1

Table 6-2 - Data Needs for the Groundwater Characterization (Continued)

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Groundwater Objective	
E	Area E has been classified as an unaffected area with respect to groundwater contamination; this area was not used by RMI and is not a site of former industrial activity	NA	NA	No groundwater activities planned for the Phase 1 preliminary investigation.
F	Area F has been classified as a radiologically unaffected area with respect to groundwater contamination; additional data and information may be required based upon the initial phase of groundwater characterization for Area B, or the characterization of soils and utilities in Area F	NA	NA	No groundwater activities planned for the Phase 1 preliminary investigation.
G	Area G has been classified as a radiologically unaffected area with respect to groundwater contamination based on its upgradient location from the RMI Extrusion Plant; additional data or information may be required based on characterization of soils and utilities in Area F and G	NA	NA	No groundwater activities planned for the Phase 1 preliminary investigation.

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 6-1.

NA - Not Applicable for Phase 1

Table 6-3 - Groundwater Characterization: Primary Guidance Documents

Titles	Reference (see Section 13)	Guidance for:
RCRA Ground-Water Monitoring Technical Enforcement Guidance Document	US EPA 1986a	1) Monitoring well installation guidance 2) Background determination
(Draft) Manual for Conducting Radiological Surveys in Support of License Termination, NUREG/CR-5849	NRC 1992b	Final termination survey guidance
(Draft) Branch Technical Position on Site Characterization for Decommissioning Sites	NRC 1992a	Hydrogeologic characterization, methods and monitoring practices
Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance	US EPA 1989	Analysis of groundwater monitoring data
Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846)	US EPA 1986b	RCRA Analytical Methods
Data Quality Objectives for Remedial Response Activities, Vol. 1 (US EPA/9355, O-07B)	US EPA 1987	DQOs

6.3 Technical Basis

Characterization of the groundwater at the RMI site will build upon the data collected from previous investigations. Investigations performed since 1985 were conducted primarily to determine the movement rate and the extent of contamination of the groundwater within the CAMU. However, many of the wells and associated data can be used to evaluate sitewide groundwater conditions. Remediation of VOC and radionuclides in groundwater within the CAMU is addressed in the CMS (Eckenfelder 1992). Therefore, the initial phase of this effort will focus on characterizing the groundwater at other areas of the site for both radiological and RCRA hazardous contaminants, focusing the preliminary investigation in areas of known surface contamination in Area B.

The characterization of groundwater at the RMI site will consider each water-bearing zone (till, till/shale interface, and shale) across the site and assess potential for each zone having been contaminated by the activities conducted at the RMI plant. This will be accomplished by providing general coverage as well as localized investigative coverage of areas and groundwater zones suspected of specific contamination. Figure 6-1 - Proposed Well Locations, shows the proposed new boring locations and their relationship to existing wells in Area B. Figure 6-2 - Monitoring Well Construction Diagram, shows a generalized cross section of a typical monitoring well and provides detail regarding well screen, filter pack, annular seals, and surface structure. Subsection 6.6 provides a brief location description, rationale for the location and proposed depth of each new well. Existing information on the groundwater flow, previously drilled wells, and monitoring data can be found in the site SR.

6.4 Background Characterization

In accordance with the *RCRA Groundwater Monitoring Technical Enforcement Guidance Document* (US EPA 1986a), upgradient monitoring wells are to provide background groundwater quality data in each of the three aquifer zones to be characterized. Backgrounds will be determined for both radiological and hazardous contaminants. Wells used for background characteristics must meet the three following requirements given below:

1) Located beyond the upgradient extent of potential contamination from the source to provide samples of background quality

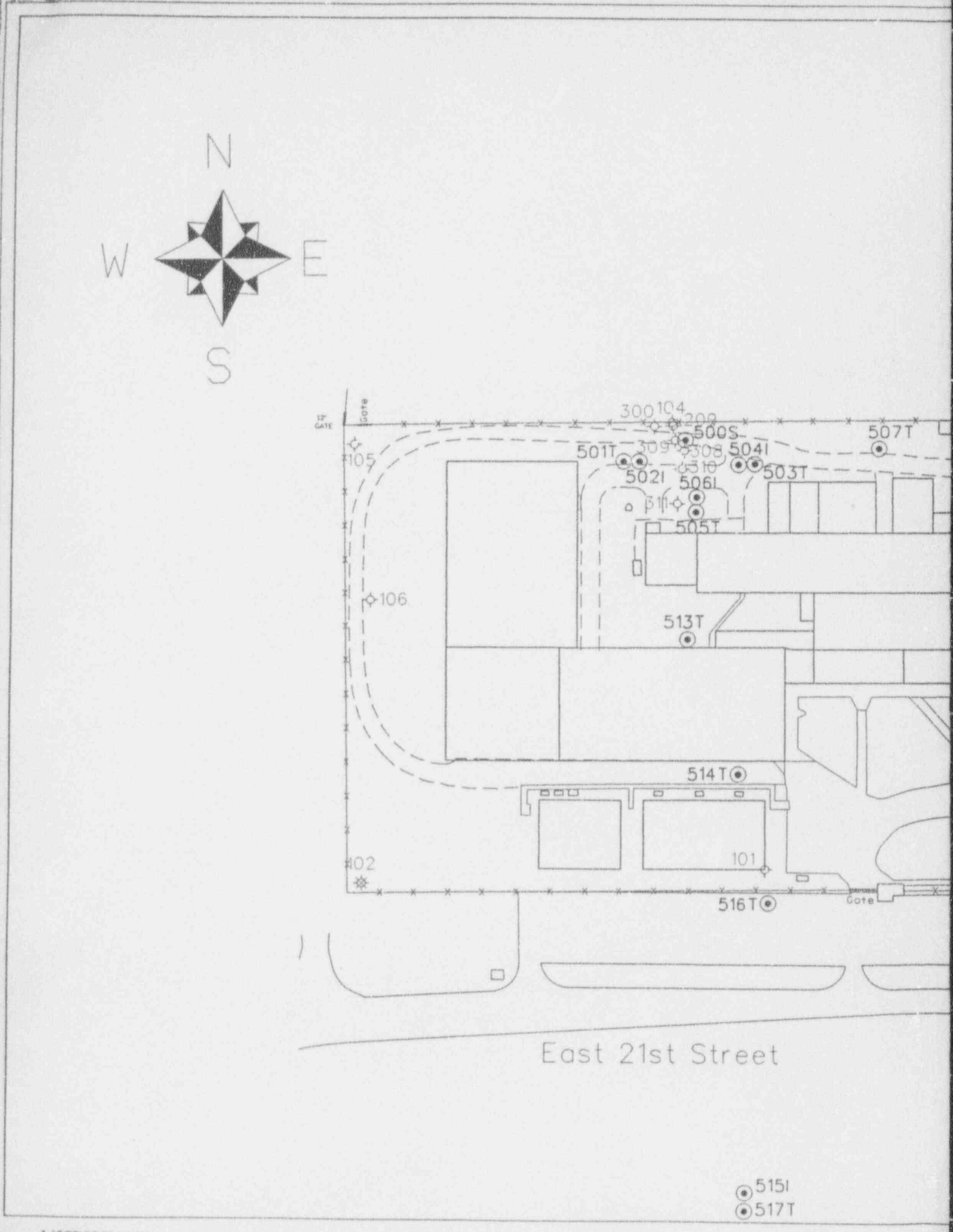
2) Screened within comparable stratigraphic horizons as the downgradient wells to ensure compatibility of data

3) Of sufficient number to account for heterogeneity in background groundwater quality

Existing MWs 100, 401, and 402 were installed to establish background groundwater quality in the three water-bearing zones. Based on the hydraulic gradient which has been recorded at the site, these three wells in the southeast corner of the plant are upgradient of the CAMU but may not be upgradient of MW 101; therefore, MW 517T will be installed for the purpose of defining background groundwater quality in the till.

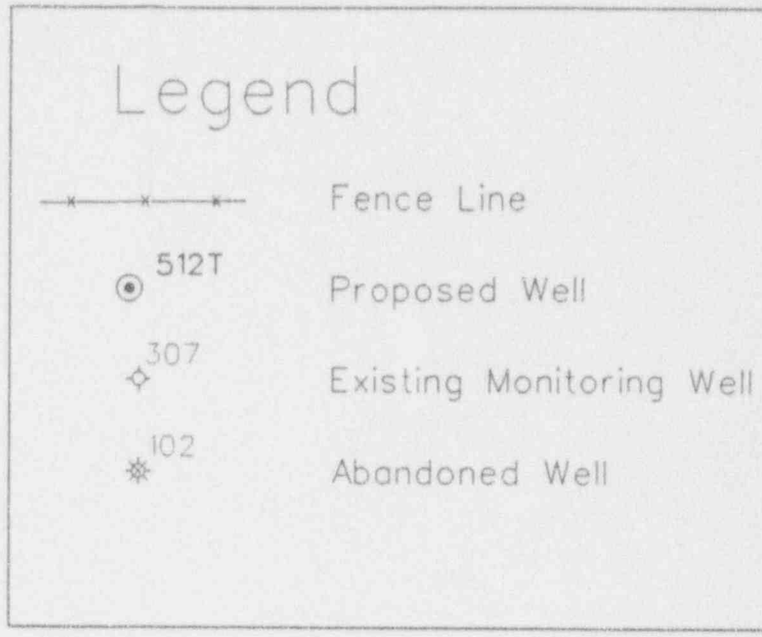
6.5 Areas to be Characterized in the Preliminary Investigation Phase

For purposes of the groundwater characterization, wells will be installed in areas of known or suspected subsurface contamination as well as Area B in general.



A:\SCP\SECT6.RV0

DWG NO.
GWP-0001.DGN



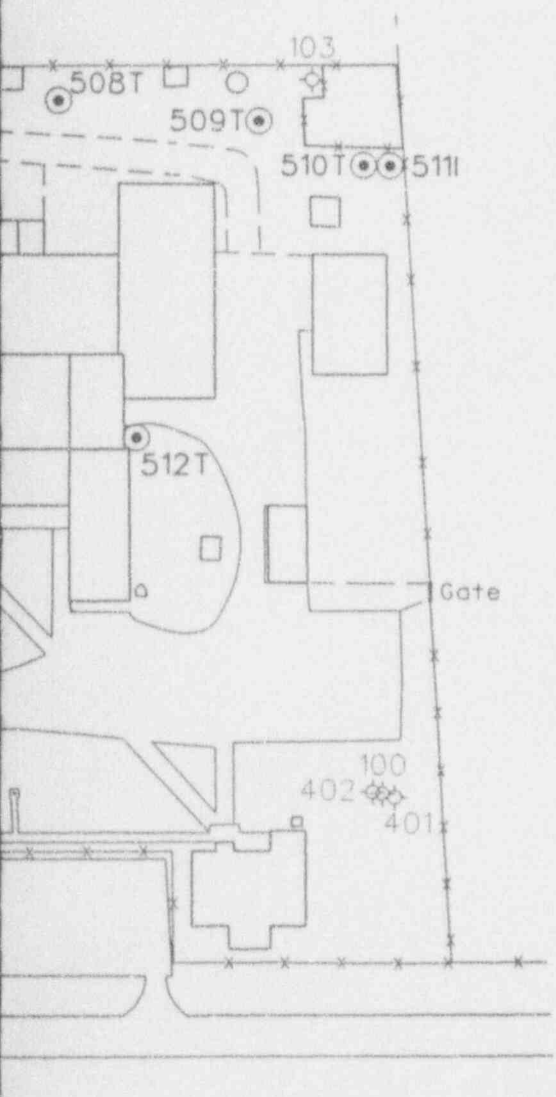


Figure 6-1 - Proposed
Well Locations
6-9

9404080144 - 22

REVISION		
DATE	NO.	DESCRIPTION

RMI COMPANY
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004
DESIGN TO FIT: GWP-0001.DGN
DATE: 8/31/93
SCALE:
TITLE: PROPOSED WELL LOCATION MAP
DRN. BY: L.GEORGE
CHK. BY: ERNST
WBS: 1.1.2.2.1
DWG. NO.: GWP-0001

Rev. No.: 0

General Monitoring Well Cross Section

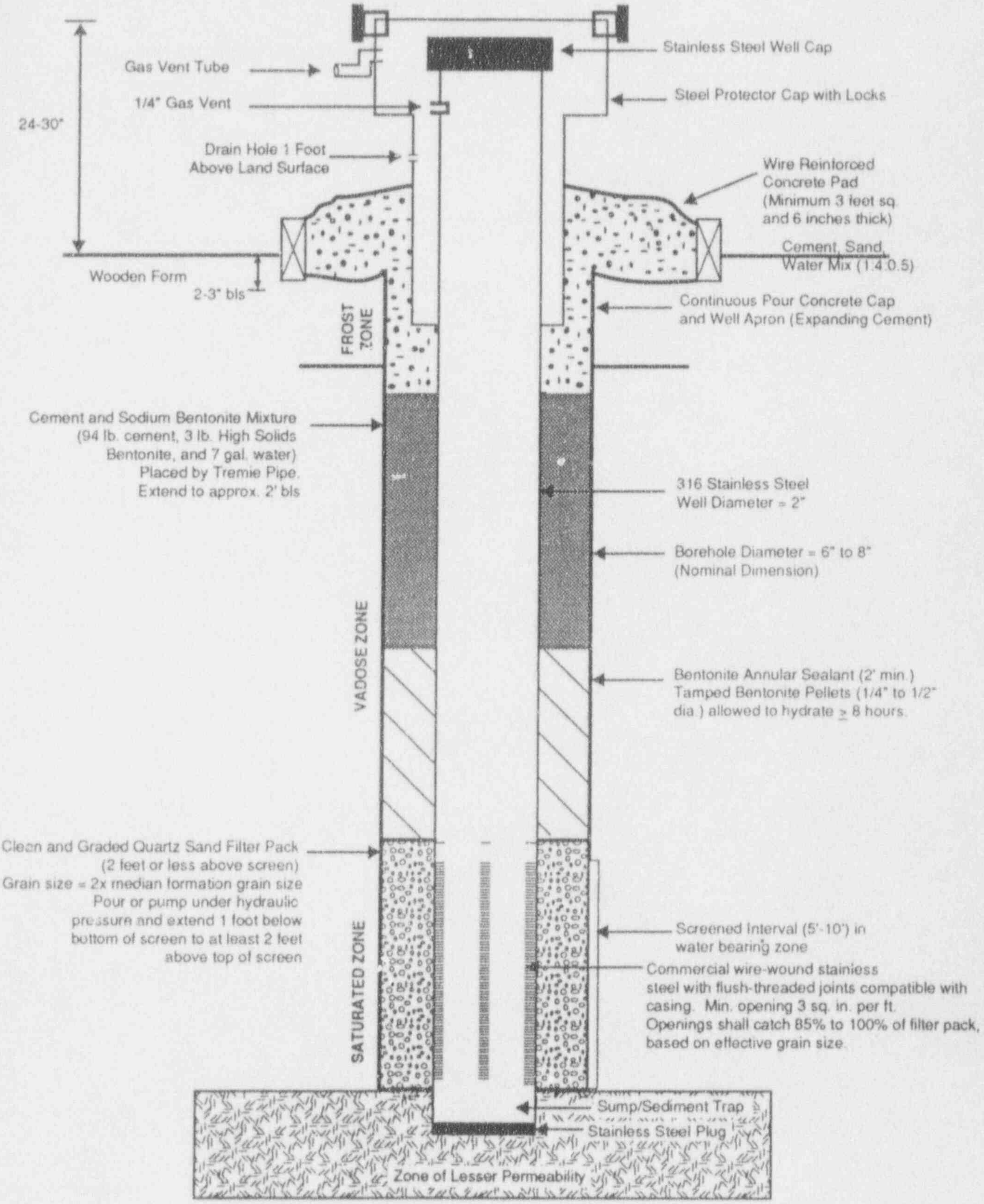


Figure 6-2 - Monitoring Well Construction Diagram

6.5.1 Characterization of Known or Suspected Subsurface Contamination

Monitoring wells will be installed and soil will be sampled to characterize specific locations of known or suspected sub-surface contamination. The extent of contamination upgradient and to the sides of the former evaporation pond will be more thoroughly defined. Groundwater from wells outside the CAMU which have exhibited contamination above the action levels will require further characterization to define the current extent of contamination. This will include the vicinity around existing MW 101 and MW 103. To define the extent of contamination, additional wells will be installed in the same water-bearing zone where contamination was previously detected and in the deeper water-bearing zone to determine if vertical migration has occurred. Based on the results of the Phase I preliminary characterization, additional wells and/or soil borings may be necessary to fully define the extent of contamination.

Existing MW 200 is the only well screened into the shale zone which has contained hazardous constituents. Since it is screened across both the interface and the shale water-bearing zones, contaminants detected there may be attributable to contamination in the interface. To validate this assumption, a new well will be installed upgradient and adjacent to the former well to determine if contamination exists in the shale water-bearing zone.

6.5.2 General Area Characterization

The *RCRA Groundwater Monitoring Technical Enforcement Guidance Document (TEGD)* points out that a minimum of four monitoring wells are necessary to adequately characterize the groundwater at a site. This would include one well placed upgradient and three wells downgradient of the potential contamination source. As summarized in the site SR, the RMI plant, Area B, is the primary source of contamination of the RMI site to be characterized. Due to multiple water-bearing zones and potential contaminant locations, the complexity of the RMI site necessitates the need for more than four monitoring well locations.

The uppermost aquifer in the till zone has the greatest potential for receiving contaminant migration downgradient from the RMI plant. The horizontal spacing of wells placed within this zone will require the highest density to ensure adequate characterization. Additional wells beyond those proposed will not be installed in the till/shale interface or the shale water bearing zones unless contamination at concentrations above the designated action levels has been detected in the glacial till zone.

Existing MWs 103, 104, 105, and 106 can be used to assist in the characterization of groundwater downgradient in the till zone. Additional wells in the till zone will be needed to provide thorough characterization downgradient of the RMI plant. By thoroughly characterizing the till zone along the downgradient perimeter of the RMI plant (Area B), a determination can be made whether or not additional investigations would be required further downgradient. If the initial downgradient characterization in the till zone confirms that no contamination is present, then it can be concluded that all groundwater downgradient of the perimeter is also free of contamination originating from RMI without additional sampling being required.

6.6 Well Locations

The proposed well locations are based on an evaluation of the data presented in reports of previous investigations. The primary focus of the proposed investigation is to characterize the groundwater beneath areas where surface contamination is known or suspected to exist. New monitoring wells will be identified as the 500 series wells. Each monitoring well identification number shall be followed by a suffix (T, I, or S) to indicate the water-bearing zone (till, till/shale interface, or shale) into which the well is to be installed. Table 6-4 presents the rationale for the proposed location and depth of the wells.

Table 6-4 - Proposed Well Location Rationale

Well Number	Location	Rationale
MW-500S	Water-bearing zone in shale, immediately upgradient and adjacent to MW-200.	TCE has been detected in MW-200 but the screen of MW 200 spans the shale and interface zones. This well will confirm whether or not TCE detected at MW 200 came from the shale or interface water bearing zone.
MW-501T	Water-bearing zone in till, approximately 15 feet west of the former evaporation pond, nested with MW-502I.	To further define the extent of contamination upgradient and to the sides of the former evaporation pond.
MW-502I	Water-bearing zone at interface, approximately 15 feet west of the former evaporation pond, nested with MW-501T.	To further define the extent of contamination upgradient and to the sides of the former evaporation pond.
MW-503T	Water-bearing zone in till, approximately 15 feet east of the former evaporation pond, nested with MW-504I.	To further define the extent of contamination upgradient and to the sides of the former evaporation pond.
MW-504I	Water-bearing zone at interface, approximately 15 feet east of the former evaporation pond, nested with MW-503T.	To further define the extent of contamination upgradient and to the sides of the former evaporation pond.
MW-505T	Water-bearing zone in till, approximately 15 feet south of former evaporation pond, nested with MW-506I.	To further define the extent of contamination upgradient and to the sides of the former evaporation pond.
MW-506I	Water-bearing zone at interface, approximately 15 feet south of former evaporation pond, nested with MW-505T.	To further define the extent of contamination upgradient and to the sides of the former evaporation pond.

Table 6-4 - Proposed Well Location Rationale (Continued)

Well Number	Location	Rationale
MW-507T	Water-bearing zone in till, north of the Tool Crib Building between the perimeter road and the north property fence.	To provide general coverage for characterization downgradient of the Main Plant Building.
MW-508T	Water-bearing zone in till, North of the Compressor Room between the perimeter Road and the north property fence.	To provide general coverage for characterization downgradient of the Main Plant Building.
MW-509T	Water-bearing zone in till, approximately 15 feet southeast of the batch reactor.	To further define the extent of contamination detected at MW-103 and to provide general coverage for characterization downgradient of the Main Plant Building.
MW-510T	Water-bearing zone in till, approximately 15 feet north of the manhole located south of the southeast corner of the substation fence, nested with MW-511I.	To further define the extent of contamination at MW-103 and to determine if contaminants have leaked from the sanitary sewer near the manhole.
MW-511I	Water-bearing zone at interface, approximately 15 feet north of the manhole located south of the southeast corner of the substation fence, nested with MW-510T.	To further define the extent of contamination detected at MW-103 and to determine if contaminants have leaked form the sanitary sewer near the manhole.
MW-512T	Water-bearing zone in till, approximately 10 feet outside the northeast corner of the Truck Ramp Enclosure.	This area is susceptible to surface water infiltration from roof tops, traffic areas, and storage areas. This well will also provide general areal coverage for characterization of contaminants east of the plant building.
MW-513T	Water-bearing zone in till, approximately 10 feet north of RF-6 Building between Stack #8 and Enclosed Ramp.	To characterizes groundwater downgradient of the sump in the RF-6 Building near the center of the plant.

Table 6-4 - Proposed Well Location Rationale (Continued)

Well Number	Location	Rationale
MW-514T	Water-bearing zone in till, on the edge of the fire road north of the Modular Office.	To further characterize the extent of contamination detected at MW-101.
MW-515I	Water-bearing zone at the interface nested with MW-517T.	To provide background characterization upgradient from MW-101.
MW-516T	Water-bearing zone in till, at the edge of the parking lot south of MW 101.	To further characterize the extent of contamination detected at MW-101.
MW-517T	Water-bearing zone in till, approximately 15 feet south of Area G directly south of MW-101.	To provide background characterization upgradient from MW-101.

SECTION 7

SOILS CHARACTERIZATION

7.1 Data Needs

Table 7-1 lists the overall and soils objectives presented in Section 1. Table 7-2 presents data needs for the soils characterization. The data needs are listed in the table by area subdivision (e.g., Areas "A," "B," etc.) and are compared with overall site characterization objectives listed in Subsection 1.2.1 and a general description of the activity planned to meet those objectives. The table also indicates a series of "soils objectives." Like the hierarchy of documents, there exists a logical sequence of objectives for characterization.

The overall objectives were developed based on identification of data "gaps" or "data needs" as indicated in the site SR. Each media-specific work plan is structured around a set of media-specific objectives based upon verified data needs. Individual tasks within the work plans have specific focused objectives. With each planning document in the hierarchy, the objectives become increasingly refined and less general.

Table 7-2 brings together the data needs, overall objectives, soils objectives, planned activities, and work plan tasks organized by area/subdivision. For the specific tasks listed, task objectives and attendant activities are presented in Section 4 of the Soil Characterization Work Plan.

7.2 Guidance Documents

Several guidance documents provide guidance for developing the soils characterization work plans. Table 7-3 lists the primary documents.

Table 7-1 Site Characterization Objectives

Overall Site Characterization Objectives:	Soils Characterization Objectives:
1) Establish a baseline for natural conditions (background) with respect to known or suspected contaminants identified in Table 4-1 of Subsection 4.1 of the SCP and review existing data, reports and the SR that serve as a basis for development of the media-specific, or topically focused work plans	1) Evaluate the degree and lateral extent of radiological and RCRA contamination
2) Establish the nature, level, and extent of contaminants listed in Table 4-1 of Subsection 4.1 of the SCP in Areas A through G with respect to known or suspected contaminants for the individual areas by sampling and analysis of soils, groundwater, and buildings	2) Generate baseline radiological and RCRA data for potential decommissioning wastes
3) Determine site stratigraphy and hydrogeology through the use of existing geological and hydrogeological data, geologic logging of borings, and geophysical borehole logging	3) Evaluate the ability to meet disposal site waste acceptance criteria as established in *Nevada Test Site Waste Acceptance Criteria, Certification, and Transfer Requirements* (Nevada Field Office [NVO]-325, Rev. 1) (DOE 1992) and assist in development of waste volume estimates
4) Define local groundwater flow directions through use of existing groundwater data and by installing additional monitoring wells	
5) Provide data to assess the concentration or exposure hazard and determine if special precautions or monitoring of the contaminants during remediation are required	
6) Provide data to support engineering evaluation, selection and design of remediation options, and assist in preparation for the final termination survey	

Table 7-2 - Data Needs for the Soils Characterization

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Soils Objective	
A	Unaffected: Confirm or deny the assumption of lack of contamination of surface soils	2	1,3	Sampling at 30 randomly selected grid nodes on an existing 10-meter grid of surface soils from 0-6 inches; analysis for uranium, and Th-232 and Tc-99 as necessary (Tasks 1, 2, and 5)
	Localized Areas of Elevated Radioactivity (affected): Nature, level and extent of radiological contamination at identified discrete locations	2	1,3	Biased soil sampling and analysis for isotopic uranium to identify source; and/or systematic sampling at the discrete location and analysis for uranium, and Th-232 and Tc-99 as necessary to evaluate extent (Tasks 1, 2 and 5)
	Unaffected: Confirm or deny the assumption of lack of contamination in drainage ditch which diverts surface runoff west and north to Fields Brook	2	1,3	Biased sampling of surface sediments (0-6 inches) at regular intervals along the ditch; analysis for uranium, and Tc-99 as necessary (Tasks 2 and 5)
B	Affected: Nature, level and extent of radiological contamination of soils	2	1,3	Systematic soil sampling at 20-meter intervals on an existing 10-meter grid (10-meter intervals or less near buildings) at varying depths up to 2 feet; analysis for uranium, and Th-232 and Tc-99 as necessary (Tasks 1, 2, and 5)
	RCRA: Nature, level and extent of RCRA contamination in potential or suspect areas	2	1,2,3	Biased area samples, systematically collected at varying depths up to 2 feet; analysis for RCRA compounds including eight RCRA metals, volatile, and semivolatile compounds: Biased areas are: 1) Fenceline 2) Area north of Main Plant 3) Burn Pad 4) Fire Road 5) Area south of RF-6 Butler Building/Main Plant (Tasks 1,2, and 5)
	Affected and RCRA: Nature, level and extent of radiological and RCRA contamination in soil piles	2,5,6	1,3	Sampling and analysis of soil piles to meet the requirements of NVO-325, Rev.1

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 7-1.

Table 7-2 - Data Needs for the Soils Characterization (Continued)

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Soils Objective	
B (cont'd)	Affected and RCRA: Nature, level and extent of radiological and RCRA contamination resulting from leaking, leaching, etc. of underground utilities	2,3	1	Location and investigation of suspect utility lines. Biased sample locations selected using a gamma probe; followed by soil borings to collect soil samples. Samples will be analyzed for uranium, Tc-99 as necessary, and RCRA characteristics based on field screening of samples and process knowledge (Tasks 3, 4, and 5)
	Affected: Nature, level and extent of potential transuranic elements in soils in the vicinity of the former evaporation pond	2,3,5,6	1,2	Collection of soil samples at ground surface and at depth, and analysis for transuranic elements on samples containing elevated levels of uranium (Tasks 4 and 5)
C	Affected: Nature, level and extent of radiological contamination of soils	2,3,5,6	1,2,3	Systematic soil sampling at 20-meter intervals on an existing 10-meter grid at varying depths up to 2 feet; analysis for uranium, and Th-232 and Tc-99 as necessary (Tasks 1, 2, and 5)
D	Affected: Nature, level and extent of radiological contamination of soils	2	1,3	Biased soil sampling at 20-meter intervals on an existing 10-meter grid at varying depths up to 2 feet; analysis for uranium, and Th-232 and Tc-99 as necessary (Tasks 1, 2, and 5)
	Affected: Nature, level and extent of radiological contamination at discrete localized areas of elevated radioactivity	2	1,3	Biased soil sampling at the discrete locations; analysis for uranium, and Th-232 and Tc-99 as necessary to evaluate extent (Tasks 1,2 and 5)
	Affected and RCRA: Nature, level and extent of radiological and RCRA contamination resulting from leaking, leaching, etc. of outfall line to Fields Brook	2,5,6	1,2	Location and investigation of the outfall line. Biased sample locations selected using a gamma probe; followed by soil borings to collect soil samples. Samples will be analyzed for uranium, Tc-99 as necessary, and RCRA characteristics based on field screening of samples and process knowledge (Tasks 3,4, and 5)

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 7-1.

Table 7-2 - Data Needs for the Soils Characterization (Continued)

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Soils Objective	
D (cont'd)	Affected: Nature, level and extent of radiological contamination in the vicinity of a previously excavated area near the Fields Brook Outfall	2,3,6	1,3	Systematic soil sampling on a grid interval determined by field screening of the historical excavation area and adjacent undisturbed soils; analysis of samples for uranium, and Tc-99 as necessary (Tasks 1, 2, and 5)
	Affected: Nature, level and extent of radiological contamination in drainage ditch which diverts surface runoff north to Fields Brook	2	1,3	Biased sampling of surface sediments (0-6 inches) at regular intervals to be determined by field screening along the ditch; analysis for uranium, and Tc-99 as necessary (Tasks 2 and 5)
E	Unaffected and RCRA: Confirm or deny the assumption of the lack of contamination of surface soils	2,5,6	1,3	Sampling at 30 randomly selected grid nodes on an existing 10-meter grid of surface soils from 0-6 inches depth; analysis for uranium, and Tc-99, eight RCRA metals, volatile, and semivolatile compounds as necessary (Tasks 1, 2 and 5)
F	Affected: Nature, level and extent of radiological contamination of soils	2	1,2,3	Systematic soil sampling at 20-meter intervals on an existing 10-meter grid at varying depths up to 2 feet; analysis for uranium, Th-232 and Tc-99 as necessary (Tasks 1, 2, and 5)
	Affected: Nature, level and extent of radiological contamination in drainage ditch located parallel to and north of East 21st Street	2	1,3	Biased sampling of surface sediments (0-6 inches) at regular intervals to be determined by field screening along the ditch; analysis for uranium, and Tc-99 as necessary (Tasks 2 and 5)
	Affected and RCRA: Nature, level and extent of soil contamination resulting from leaking, leaching, etc. of underground utilities	2	1,3	Location and investigation of suspect utility lines. Biased sample locations selected using a gamma probe; followed by soil borings to collect soil samples. Samples will be analyzed for uranium, Tc-99 as necessary, and RCRA characteristics based on field screening of samples and process knowledge (Tasks 3, 4, and 5)
G	Affected: Nature, level and extent of radiological contamination in drainage ditch located parallel to and south of East 21st Street	2	1,3	Biased sampling of surface sediments (0-6 inches) at regular intervals to be determined by field screening along the ditch; analysis for uranium, and Tc-99 as necessary (Tasks 2 and 5)

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 7-1.

Table 7-2 - Data Needs for the Soils Characterization (Continued)

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Soils Objective	
G (cont'd)	Affected: Nature, level and extent of ground surface radiation levels	2	1	Radiation walkover survey of the 30 meter by 250 meter area (Task 8)
Off-Site Conneaut Silt Loam Locations	Baseline for natural conditions (background) with respect to uranium, thorium and RCRA metals	1	1	Soil sampling (0-6 inches) at off-site Conneaut Silt Loam locations and analysis of samples for uranium, thorium and eight RCRA metals (Tasks 1,2 and 5)

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 7-1.

Table 7-3 - Soils Characterization: Primary Guidance Documents

Titles	Reference (see Section 13)	Guidance for:
Environmental Implementation Guide for Radiological Survey Procedures	ORNL 1992	Sample plan design
(Draft) Manual for Conducting Radiological Surveys in Support of License Termination, NUREG/CR-5849	NRC 1992b	Sample plan design
(Draft) Branch Technical Position on Site Characterization for Decommissioning Sites	NRC 1992a	Plan requirements Sample plan design
Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, NVO-325, Rev. 1	DOE 1992	Analytical Waste Acceptance Criteria
Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846)	US EPA 1986b	RCRA Analytical Methods
Data Quality Objectives for Remedial Response Activities, Vol. 1 (US EPA/9355, O-07B)	US EPA 1987	DQOs

7.3 Technical Basis

To achieve the soils characterization objectives stated in Section 1, an observational approach will be used to categorize the site into representative areas based upon the surface radiation survey and process knowledge. The strategy employs combinations of random sampling, biased sampling, and systematic sampling, as defined in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846* (US EPA 1986). Additional walkover radiation surveys will be conducted to guide supplemental soil sampling efforts in Area G.

Random sampling will be performed where existing data indicate that contaminants are uniformly distributed across or not suspected in the sample area.

Systematic sampling will be used to evaluate the distribution of contaminants in areas known or suspected to be contaminated. Areas presumed to be unaffected will be sampled at randomly selected nodes on the 10-meter grid.

Biased sampling will be used to delineate discrete localized areas identified during the surface radiation survey, where readings were 100 cpm above background or to identify the point of greatest contamination. To determine the extent of contamination, a phased or iterative approach may be necessary when using biased or systematic sampling. By refining the contamination boundary, the volume of waste generated during decommissioning can be minimized.

The sampling program will target specific areas of suspected contamination based upon historic analytical data, radiation survey data, process knowledge, and previous operational occurrences. Laboratory analysis of samples collected from specific areas will address the list of target analytes identified for each area. An observational approach based upon site history, process knowledge, or previous analytical data was used to identify the analytical parameters within a sampling area.

7.4 Background Characterization

Random surface soil samples (0-6 inches) will be collected from 3 off-site locations underlain by Conneaut silt loam not affected by RMI or other industrial activities. The Conneaut silt loam is present at the site, and at several locations near the site (See Soils Characterization Work Plan, Subsection 3.3 and Figure 3-9). Samples will be analyzed for the eight RCRA metals, uranium and thorium. The background concentration of uranium in surface soils determined annually between 1986 and 1992, in support of the ASER, will also be used for characterization and remedial design. An iterative approach to evaluation of background analyte concentrations may be necessary.

The number of background soil samples required for a specified confidence interval in the data will be developed in accordance with NUREG/CR-5849 and the *Environmental Implementation Guide for Radiological Survey Procedures*, (ORNL 1992) and US EPA Technical Guidance Documents.

7.5 Areas to be Characterized in the Preliminary Investigation Phase

7.5.1 Radiological Investigative Sampling

For the radiological characterization of soils, the area to be characterized is divided into unaffected and affected areas as introduced in Section 4.5. Figure 4-20 shows the unaffected and affected areas. NUREG/CR-5849 defines "affected" and "unaffected". Within these areas are specific features, or investigative units, that are targeted for discrete radiological sampling. The investigative units include:

1) Localized areas of elevated radioactivity
2) Soil piles
3) Drainage ditches
4) Underground utilities
5) Fields Brook outfall

6) Former evaporation pond

For convenience and ease of discussion, the entire area to be characterized has been divided into Areas A through G (Figure 2-6).

7.5.1.1 Unaffected Areas

The surface radiation survey conducted in support of the SR was used to classify two parcels of land as unaffected: Areas A and E. The Mitchell Transport, Inc. (MTI) property located west of the RMI plant has been identified as Area A for site characterization. Discrete localized areas of with radiation readings of 100 cpm above background within otherwise unaffected areas were identified during the walkover radiation survey (PARSONS 1993) and are excluded from this unaffected area. The fenced area referred to as Area E, is owned by RMI and is located to the northeast.

<u>Area A</u>

Radiological contaminants are the focus of investigations in Area A. If analyses indicate contamination, further investigation will be conducted. Sampling of surface soils (from 0-6 inches depth) at 30 randomly selected grid nodes of a 10-meter grid and analysis for uranium and Tc-99 will be conducted. Approximately ten percent of the samples collected will be analyzed for Th-232.

<u>Area E</u>

Area E encompasses approximately 11 acres. This area is located in the prevailing down wind direction from the plant and, therefore, will be assessed for the presence of uranium and Tc-99. Although this area is not anticipated to be contaminated by RCRA materials since it was not used by RMI and is not a site of former industrial activity, samples will be tested for RCRA constituents.

Because the walkover radiation survey of this area indicated background and the area was therefore classified as unaffected, 30 samples will be collected from randomly identified nodes on a 10-meter grid. Analyses will be conducted for uranium, Tc-99, the eight RCRA metals, and semi-volatile and volatile organics.

7.5.1.2 Affected Area

The surface radiation survey was conducted to identify potentially affected areas. These areas were identified as B, C, D, and F. The affected areas had surface radiation survey grid readings over 100 cpm net. Isolated areas of elevated surface radioactivity in areas A and D will be targeted for specific characterization (see Subsection 7.5.1.3).

A systematic sampling approach will be employed to delineate radiological surface soil concentrations within the affected area. The data will be used to create uranium isopleths to a depth of 2 feet bls. Samples will be systematically collected at 20-meter intervals on a 10-meter grid from the affected area. Sample spacing may be decreased to 10 meters or less in the vicinity of the buildings (Area B).

Samples will be collected and analyses conducted for uranium and Tc-99. Isotopic uranium analyses will be conducted on about 20 percent of the samples. The remaining 80 percent of the samples will be analyzed for total uranium by gamma spectroscopy. The isotopic data will be used to determine uranium isotopic ratios. Samples for isotopic analysis will be selected to provide adequate coverage, representativeness and confidence in the data used to determine the ratios for soils in the affected area. Approximately 10 percent of the samples collected will be analyzed for Th-232.

Area G, located adjacent to and south of East 21st Street, is assumed to be affected. A surface walkover radiation survey will be performed during Phase 1. Supplemental soil sampling tasks will be developed to assess radionuclide concentrations in soils after the radiation survey data has been assessed.

7.5.1.3 Localized Areas of Elevated Radioactivity

Discrete localized areas of elevated surface activity were identified by the surface radiation survey. Survey personnel reported that such an area is located near grid coordinates -K,3 in Area A and appears to be confined to a single pocket of soil located at the base of a tree. This area will be sampled and analyzed for isotopic uranium to evaluate the source of the material. A second area is located on MTI property near coordinate -H,12. This area of elevated radioactivity will be sampled to determine the extent of surface contamination. A third area, located within the fenced area east of the plant, between the drainage ditch and the National Pollutant Discharge Elimination System (NPDES) permitted outfall, will be sampled to evaluate the lateral extent of contamination.

To determine the extent of contamination in these localized areas, sampling and analyses will be conducted for uranium and Tc-99. Ten percent of the samples collected will be analyzed for isotopic thorium.

7.5.1.4 Soil Piles

The site contains soil piles as a result of construction activities over the past several years. Characterization of the soil piles for off-site disposal is addressed under a separate sampling and analysis plan. The plan incorporates waste acceptance criteria per NVO-325, Rev. 1, and comments from the disposal site. Access to the underlying soils will be necessary to complete site characterization. It is preferred that the soil piles will be removed prior to further sampling for site characterization. If the soil piles remain in place during the site characterization, then provisions will be made for access to the historical soil surface for sample collection.

7.5.1.5 East 21st Street Drainage Ditches

The drainage ditch south of Area F diverts surface runoff east and north to Fields Brook, and west and north, across Area A. Sediment sampling will be conducted to determine if sediments from RMI property were transported and deposited along the ditch. Samples will be collected at regular intervals along the ditch and used to evaluate the presence and/or lateral extent of contamination. The initial sampling point will be located at the highest elevation of the ditch as determined by topographic survey. Surface sediments (0 - 6 inches) will be collected at low points along the ditch and analyzed for uranium and Tc-99. The drainage ditch adjacent to and south of 21st Street (Area G) will also be sampled after the walkover radiation survey has been conducted, the data analyzed, and a supplemental sampling task prepared.

7.5.1.6 Underground Utilities

Underground utilities on site constitute a specific investigative unit. These utilities transport stormwater, treated and untreated sanitary wastes, treated and untreated process effluent, and non-contact cooling water. Liquid wastes are treated on site, combined into a 30-inch outfall and discharged to Fields Brook in accordance with the NPDES permit. A biased sampling program will be used to identify and characterize potential locations of elevated radioactivity. The biased sample locations will be identified through the use of a gamma probe and video camera system to detect areas of increased activity within the utility pipes and to provide a visual identification of pipe deterioration and material buildup. Other biased sampling locations will be determined based upon access to the utility (some utilities may not be accessible due to the presence of surface obstructions). In the absence of identifiable elevated radioactivity (greater than 1.5 times background), each of the utility lines listed below will be sampled at up to 3 locations.

The following utility lines identified by plan drawings will be investigated:

1) Drainage tile and catch basin leading from the southwest area of the RF-3 Butler Building to the wastewater treatment plant, and piping from the building east to the Main Plant

2) The process water line from the RF-6 Butler Building lab acid neutralization pit to the Sparkler filter system and the associated 6-inch line leading from the Sparkler filter system to the 18-inch storm sewer

3) The 18-inch abandoned storm sewer south of the plant

4) The 30-inch combined outfall leading to Fields Brook

5) Piping leading from the sump west of the burn pad

6) The 18-inch sanitary sewer north and under the Main Plant

7) The argon gas line north of the Main Plant

Samples will be collected from a depth consistent with the base of the piping. To evaluate vertical migration of radionuclides, all soil samples will be field screened for beta-gamma activity using a G-M, scintillation or proportional type detector. Sample collection at 5-foot depth intervals in borings will continue until field screening indicates activity less than 1.5 times background or the bedrock shale unit is encountered. The maximum depth of the borings will be about 30 feet. The first sample below the base of the utility with detectable activity less than 1.5 times background will also be collected for laboratory analysis. Samples will be analyzed for uranium and Tc-99. If field screening indicates that wastewater has contaminated the soils, additional analysis for RCRA characteristics, based on process knowledge of effluent, is warranted. Additionally, select samples will be screened for waste acceptance criteria. A phased approach to delineate the extent of contamination will be employed if contaminants are detected above regulatory limits.

7.5.1.7 Fields Brook Outfall

The Fields Brook outfall is a NPDES permitted discharge for plant process effluent, non-contact cooling water, and sanitary wastes treated on site. Storm water drained from building gutters, paved areas and unpaved areas is also discharged through the NPDES outfall. A cleanup of uranium contaminated soils at the outfall was conducted at the request of the NRC in the 1980s. The cleanup consisted of excavation of contaminated soils. Samples were collected during the excavation and analyzed for uranium. The excavation, sampling, and analysis continued until the uranium contaminated soils were removed. The excavation was backfilled with soils obtained from an unknown source. Documentation regarding the volume of soils excavated, final clean-up level, and disposal of the soils is not available.

Systematic sampling at the base of the historical excavation and of adjacent undisturbed soils will be conducted to assess the ability of the previous cleanup to meet release requirements for unrestricted use and to evaluate potential presence and lateral extent of residual uranium in subsurface soils. Soil samples will be collected at grid nodes. The lateral extent and depth of the sampling effort is dependent upon the lateral extent and depth of the excavation. Analyses will be conducted for uranium and Tc-99. The number and location of samples to be collected will be determined after initial characterization information is available.

7.5.1.8 Former Evaporation Pond

The former evaporation pond is part of the CAMU which also includes the swale, and the seep pond. Soils in the vicinity of the former evaporation pond have been removed and placed in drums for temporary storage. The CMS completed by Eckenfelder (Eckenfelder 1992) for remediation of the

CAMU incorporates US EPA and NRC clean-up levels for TCE and uranium in soils. Additional characterization of the CAMU for design of remedial alternatives or waste volume estimates is not required at this time.

The RFIES for RMI identifies the presence of transuranic elements in drummed materials (evaporation pond sediment and soil mixture) excavated from the former evaporation pond. Although transuranics are not expected to be a significant contributor to soil contamination or worker exposure, quantification of the presence of these elements, specifically plutonium and neptunium, is required to achieve characterization objectives. Soil samples will be collected at ground surface and at depth in the vicinity of the former evaporation pond. Sample locations are located to identify the potential extent of transuranic elements in subsurface soils. Samples will be analyzed by alpha spectroscopy to identify and quantify the presence of transuranic elements. The soil boring and sampling activities will be conducted in conjunction with Task 1 of the Phase 1 Groundwater Characterization Work Plan.

7.5.2 Potential RCRA Investigative Sampling

The SR identifies several areas of potential RCRA contamination. Although these areas may be contained within radiologically affected areas scheduled for remediation, the presence of RCRA materials will be evaluated, particularly in regard to regulatory cleanup guidelines and land disposal restrictions. Therefore, the sampling program for RCRA contaminants is biased toward areas of suspected and/or known contamination. Within each biased study area, samples will be systematically collected at varying depths up to 2 feet to identify and delineate potentially contaminated soils. Potentially contaminated RCRA investigative units include the Area B fenceline, the area north of the main plant, the burn pad, the fire road, and the RF-6 Butler/Main Plant South. At several sample locations, the investigative units described below (e.g., the fenceline, the area between the Main Plant and the north fenceline of Area B, and the fire road) overlap. Analytical data obtained from such locations may be used to evaluate any of the applicable investigative units.

7.5.2.1 Fenceline

The fenceline enclosing Area B constitutes a separate investigative unit due to the reported application of waste oils from the hydraulic press as a weed suppressant. The extent or frequency of this practice is not known. Soils along the fenceline will be systematically sampled to evaluate the presence of residual RCRA metals, and volatile and semi-volatile organic compounds

7.5.2.2 Area North of the Main Plant

The area north of the Main Plant, and extending north to the Area B perimeter fenceline, was previously used for equipment and drum storage, and as a laydown area for equipment cleaning. Hydraulic oil leaks from plant presses were also discharged north of the Main Plant. Currently, the area is partially covered with soil piles from previous site activities. As discussed in Subsection 7.5.1.4, a separate soil pile sampling and analysis plan has been developed. This soil characterization work plan assumes the piles will be characterized and packaged or moved as necessary to provide access to the previous ground surface.

Systematic sampling in this biased area will be used to determine the chemical contamination of surface soils. Soil samples will be collected at 5 to 10 meter intervals on a 10-meter grid. Analyses will be conducted for RCRA compounds known to occur on site, including the eight RCRA metals, and volatile and semi-volatile organic compounds. Samples obtained from the drum storage portion of this area will be analyzed for the presence of transuranic elements.

7.5.2.3 Burn Pad

RMI burned light combustible materials such as wood and cardboard from 1962 to 1975 on a burn pad located at the northeast corner of Area B. Documentation concerning quantity and types of burned materials is not available. A systematic, phased approach to soil sampling will be used. Samples will be collected at grid nodes on a 10 meter grid.

The area is included in the larger affected area; therefore samples collected under this phase need not be analyzed for radiological compounds. Analyses will be conducted for the presence of RCRA compounds, including the eight RCRA metals, and volatile and semi-volatile organic compounds. If RCRA compounds are identified in soil samples, an additional sampling phase may be necessary.

7.5.2.4 Fire Road

The fire road is a gravel and dirt roadway constructed to provide fire fighting equipment, trucks, and personnel access to all sides of the plant in case of fire. Records indicate that waste oils were periodically applied to the roadway to suppress generation of dust. It is possible, however, that this practice resulted in residual contamination of the underlying soils, primarily by metals and organic compounds.

A systematic random sampling approach will be used to evaluate contamination in this area. Soils will be collected from a depth below the base of the road construction materials (primarily ballast stone). The first sample location will be randomly selected, and remaining samples will be collected at specified intervals around the road to provide comprehensive coverage. In addition to radiological testing, laboratory analyses will include organic compounds (volatile, semi-volatile) and metals.

7.5.2.5 RF-6 Butler Building/Main Plant South

The area south of the RF-6 Butler Building roll-up door was historically used as a laydown area for equipment cleaning. It is suspected that small quantities of waste solvent may have been used of in the area on an infrequent basis. Additionally, soils from this area may have been used as backfill south of the RF-6 Butler Building and the Main Plant.

A systematic sampling approach will be used to evaluate the presence of residual contamination from these activities. A phased or iterative approach may be used if necessary to closely define the lateral extent of contamination and average concentrations if compounds are detected. The area will be sampled for organic compounds (volatile and semi-volatile) and the eight RCRA metals.

7.6 Sample Locations

For the areas discussed above, soil samples will be collected at the sample interval and locations presented in Table 7-2. Drawings showing the sampling grids and sample locations can be found in Section 3 of the Soils Characterization Work Plan.

SECTION 8

BUILDING/EQUIPMENT

8.1 Data Needs

Table 8-1 lists the overall and buildings/equipment objectives presented in Section 1. Table 8-2 presents data needs for the buildings/equipment characterization. The data needs are listed in the table and are compared with overall site characterization objectives listed in Subsection 1.2.1 and a general description of the activity planned to meet those objectives. The table also indicates a series of "buildings objectives." Like the hierarchy of documents, there exists a work flow of objectives.

The overall objectives were developed based upon identification of data "gaps" or "data needs" as indicated in the site SR. Each media-specific work plan is structured around a set of media-specific objectives based upon verified data needs. Individual tasks within the work plans have specific focused objectives. With each planning document in the hierarchy, the objectives become increasingly refined and less general.

Table 8-2 brings together the data needs, overall objectives, buildings objectives, planned activities, and work plan tasks for the plant buildings which are all located in Area B. For the specific tasks listed, task objectives and attendant activities are presented in Section 4 of the Buildings Characterization Work Plan.

8.2 Guidance Documents

Several guidance documents provide guidance for developing the Building Characterization Work Plans. Table 8-3 lists the primary documents.

8.3 Technical Basis

The buildings characterization incorporates two separate approaches. First, the radiological characterization approach is based upon radiological contamination levels. Random and judgmental surveys will be made to determine the level and extent of radiological contamination. Selected samples will be taken to determine uranium isotopic ratios and levels of radiological contaminants present. A separate second approach is based upon an observational and historical process knowledge for the RCRA hazardous contaminants. Should materials be identified which have both radiological and RCRA hazardous contaminants then the resulting waste materials, i.e. mixed waste, must be managed in accordance with the appropriate regulations.

Table 8-1 - Site Characterization Objectives

Overall Site Characterization Objectives:	Buildings Characterization Objectives:
1) Establish a baseline for natural conditions (background) with respect to known or suspected contaminants identified in Table 4-1 of Subsection 4.1 of the SCP and review existing data, reports, and the SR that serve as a basis for development of the media-specific or topically focused work plans	1) Establish baseline radiological characterization data for estimating total U, isotopic U, Th-232, and Tc-99 concentrations in potential decommissioning wastes and for evaluating the ability of these wastes to meet disposal site acceptance criteria.
2) Establish the nature, level, and extent of contaminants listed in Table 4-1 of Subsection 4.1 in Areas A through G with respect to known or suspected contaminants for the individual areas by sampling and analysis of soils, groundwater, and buildings	2) Provide additional data to verify the levels of Th-232, Tc-99 and TRU contamination are not significant contributors to worker exposures and special precautions or monitoring of these contaminants during decommissioning are not required.
3) Determine site stratigraphy and hydrogeology through the use of existing geological and hydrogeological data, geologic logging of borings, and geophysical borehole logging	3) Provide a structured approach for identifying materials which may become a RCRA hazardous waste during building decommissioning.
4) Define local groundwater flow directions through use of existing groundwater data and by installing additional monitoring wells	4) Provide data to further define the scope of remediation activities that includes determining if the soil and utilities underneath the buildings are contaminated and the depth of penetration of contamination on selected concrete surfaces.
5) Provide data to assess the concentration or exposure hazard and determine if special precautions or monitoring of the contaminants during remediation are required	5) Provide data to support engineering evaluations of decontamination techniques to allow unrestricted release of equipment and building materials.
6) Provide data to support engineering evaluation, selection and design of remediation options, and assist in preparation for the final termination survey	6) Provide data to support the development of dose assessments and the establishment of clean-up levels.

Table 8-2 - Data Needs for the Buildings Characterization

Area	Data or Information Need	Supports		Activity and Work Plan Task Number
		Overall Objective	Building Objective	
B BUILDINGS	Presence or absence and the level and extent of fixed and removable alpha and beta contamination on building and selected equipment surfaces	2	1,6	Random and judgmental building surfaces and selected equipment will be surveyed for alpha and beta contamination (Tasks 2, 3, 6, and 7)
	Depth of contamination on concrete and painted surfaces	2,5,6	1,4	Concrete core samples (Task 4) and paint chip (Task 3) samples will be collected
	Presence or absence and level and extent of Th-232 contamination	2,5	2	Th-232 analysis will be conducted on samples collected at selected floor grids (Tasks 2, 4, and 5)
	Presence or absence and level and extent of radiological soil contamination underneath the buildings	2,5,6	1,2,4	Uranium, Th-232, Tc-99, and isotopic Pu analyses will be conducted on selected soil samples (Task 5)
	Presence or absence and level and extent of Tc-99 contamination	2,5,6	2	Tc-99 analysis will be conducted on samples collected at selected floor grids (Tasks 2, 4, and 5)
	Presence or absence and level and extent of Pu contamination	2,5,6	2	Isotopic Pu analysis will be conducted on samples collected at selected floor grids (Tasks 2, 4, and 5)
	Uranium isotopic concentrations in contamination	2	1	Isotopic uranium analysis will be conducted on samples collected (Tasks 2, 4, and 5)
	RCRA hazardous contaminants which could result in a RCRA hazardous or mixed waste during decommissioning	2,5,6	3	An evaluation of potential RCRA hazardous contaminants will be made (Task 8)

Note: Numbers in "Objective" columns represent numbered objectives presented in Table 8-1.

Table 8-3 - Buildings Characterization: Primary Guidance Documents

Title	Reference (See Section 13)	Guidance for:
(Draft) Manual for Conducting Radiological Surveys in Support of License Termination, NUREG/CR-5849	(NRC 1992b)	Radiation survey design
Monitoring for Compliance with Decommissioning Termination Survey Criteria, NUREG/CR-2082	(NRC 1981)	Radiation survey design
Test Methods for Evaluating Solid Waste (SW): Physical/Chemical Methods, SW-846	(US EPA 1986b)	1) Sampling design 2) Quality assurance project plan 3) Sampling documentation 4) Analytical methods
Data Quality Objectives for Remedial Response Activities	(US EPA 1987)	1) Sampling design 2) Data quality objectives
Survey Procedures Manual for the Oak Ridge Associated Universities (ORAU) Environmental Survey and Site Assessment Program (ESSAP)	(DOE 1990)	Radiation Survey Procedures
Quality Assurance (QA) Program Requirements for Nuclear Facilities, NQA-1-1989	(ASME 1989)	Overall QA requirements
(Draft) Branch Technical Position Paper on Site Characterization for Decommissioning Sites	(NRC 1992a)	Sampling design
Nevada Test Site Defense Waste Acceptance Criteria, Certification and Transfer Requirements, NVO-325, Rev. 1	(DOE 1992)	1) Analytical requirements 2) QA requirements

8.3.1 Radiological Characterization

Sampling locations will be selected using both random and judgmental sampling designs. A stratified design will be used to determine the random sample locations for the RMI buildings. This design was selected because it is flexible and useful for estimating average contamination concentrations. Based on existing information, the RMI facility was stratified into the 20 locations or buildings. Each location was further stratified into walls, floor, and ceiling. Each stratum is subsequently randomly sampled to provide an estimate of the population mean.

The radiological parameters of concern include alpha and beta/gamma radioactivity expressed in units of dpm per 100 cm^2. The number of samples was estimated using existing data by the formula:

$N = t^2s^2/E^2$ or $(ts/E)^2$(US EPA 1986)

where: s^2 = the sample variance,
t^2 = Student's T value, and
E = the desired half-width of the error interval

The number of samples was allocated proportionately to the relative area of the structure. Fifty percent of the samples were allocated to the floor. Of the remaining 50 percent of the samples, half were allocated to walls, one-forth to ceilings, and one-forth to equipment and additional judgmental samples. Those areas that were inaccessible because of equipment or other reasons were excluded from sampling consideration. The margin of error was selected as that value within 25 percent of the mean; an alpha value of 0.10 (90 percent confidence) was selected.

Judgmental sampling is appropriate to estimate the radiological contamination present on selected equipment, piping, ductwork, etc., and the soil underneath selected buildings. Sample locations were determined using process histories, engineering judgement, drawings, swipe test results and other pertinent material. Samples will be selectively taken in those areas having the greatest potential for being contaminated.

8.3.2 RCRA Hazardous Characterization

RCRA Characterization will be conducted using an observational approach based upon operational history. An evaluation will be done to identify potential materials which may contain RCRA contaminants above regulatory levels. If a review of available data is unable to demonstrate the material would not contain RCRA contaminants above regulatory levels, sampling of the material may be conducted. This task follows the approach developed for characterization of the old RF6 offices and documented in RMI-L-175, *Characterization of Building Materials in the Old Offices in the RF-6 Butler Building*.

8.4 Areas to be Characterized in the Preliminary Investigation Phase

All of the 25 buildings being characterized are within Area B. Of these 25 buildings, five are used daily (modular offices, modular laboratory, ES&H Building, Guardhouse, and Health Physics offices). As a result, contamination levels may vary significantly over time. Each of these areas is maintained as a non-radiological area (i.e., < 700 dpm/100 cm^2 removable and $< 3{,}700$ dpm cm^2 fixed contamination). The modular offices and modular laboratory will be excluded from this characterization plan because these structures were installed after production operations stopped and the soil underneath these buildings was remediated to unrestricted release levels. Direct and removable radiation data are routinely collected as part of RMI's radiation control program. Limited sampling will be conducted in the ES&H building, Guardhouse and Health Physics offices.

8.5 Building/Equipment Sample Locations

The estimated number of sample locations is presented in Table 8-4. Drawings and tables describing the sample locations are presented in the Buildings Characterization Work Plan. The locations to be sampled, the number of samples collected, and the analyses conducted may be modified as data is collected and evaluated. Deviations from the work plan will be approved and documented in accordance with approved procedures.

Estimated number of samples for direct and removable alpha and beta radioactivity at the RMI facility.

Location	Area (ft2)	Percent	Samples Required	Sample Allocation Floor	Walls	Ceiling	Judgemental
RF6 Building	20350	21.2	551	282	141	71	56
Northwest Storage Building	18810	19.6	509	261	130	65	52
Main Plant (High Bay)	15303	15.9	414	212	106	53	42
RF6 Butler Building Addition	9650	10.0	261	134	67	33	27
Main Plant (Low Bay)	8446	8.8	229	117	59	29	23
Billet Storage Warehouse	5615	5.8	152	78	39	19	16
RF3 Butler Building	2720	2.8	74	38	19	9	8
Enclosed Truck Ramp (See Note 1)	2457	2.6	68	35	17	9	7
Tool Crib	2250	2.3	61	31	16	8	6
Wastewater Treatment Plant	2024	2.1	55	28	14	7	6
Die Head Filter Building	1680	1.7	45	23	12	6	5
Dock Area	1510	1.6	41	21	10	5	4
Enclosed Ramp	1500	1.6	41	21	10	5	4
Saw Filter Building	1125	1.2	30	16	8	4	3
Runout Table Filter Building	900	0.9	24	12	6	3	2
RCRA Storage Building	800	0.8	22	11	6	3	2
Substation	474	0.5	13	7	3	2	1
Compressor Room	262	0.3	7	4	2	1	1
Sewage Disposal Plant	128	0.1	3	2	1	0	0
Emergency Equipment Storage Bldg.	120	0.1	3	2	1	0	0
TOTAL	96124		2602	1335	667	334	267

Note 1: Contamination data not available, used data from the RF3 Butler Building to conservatively estimate the number of samples

Table 8-4 - Estimated Number of Sample Locations

SECTION 9

QUALITY ASSURANCE

The RMI Site Restoration Quality Assurance Program Plan, RMI-L-125 (SRQAPP) serves as the quality assurance guidance document for all characterization activities. Incorporated in the SRQAPP are the standards of *Quality Assurance Program Requirements for Nuclear Facilities*, NQA-1 (ASME 1989), *Interim Guidelines and Specification for Preparing Quality Assurance Project Plans*, QAMS-005/80 (US EPA 1980), and *Quality Assurance*, DOE Order 5700.6C.

The program is designed to provide for appropriate levels of training, necessary documentation, clear definition of responsibility and authority among project participants, and conduct of all activities according to approved procedures. The overall objective is to develop and implement approved procedures for all activities in a manner that results in acquisition of sufficient defensible data of traceable and documented quality when measured against pre-established data quality objectives (DQOs).

9.1 Data Quality Objectives

DQOs presented in the work plans provide for the quantitative, qualitative, and areal selection of sampling sites, and are designed to assure development of sufficient data with a statistically-determined uncertainty that is acceptable and manageable. Specific DQOs, when linked with specific data needs, form the framework for design of a successful data collection effort based on detailed work plans and are implemented through approved procedures.

9.2 Data Quality Indicators

To meet the objectives of the characterization efforts, the data generated must be sufficiently accurate, precise and representative of the materials being investigated. A discussion of the indicators that provide assurance of data quality is included in Subsections 9.2.1 through 9.2.5.

9.2.1 Confidence

Unless stated otherwise in the media-specific work plans, a 90 percent confidence shall be used to describe the uncertainty in the data. To verify that a 90 percent confidence has been achieved, the confidence interval will be calculated using the equations stated in SW-846, *Test Methods for Evaluating Solid Wastes*, Third Edition, Table 8-1. These equations require the data to be normally distributed. If the data are not normally distributed, other statistical methods are required to confirm a 90 percent confidence interval has been achieved.

The regulatory thresholds for chemical contaminants are stated in 40 CFR Part 261. In accordance with NRC *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material*, for radiological samples of materials for free release, the regulatory threshold is the appropriate free release limit for the radionuclide being analyzed. A 90 percent confidence interval will be calculated to describe the uncertainty in the data.

The regulatory thresholds for groundwater chemical contaminants are stated in 40 CFR 141, National Primary Drinking Water Standards. Groundwater cleanup requirements for the CAMU are presented in Subsection 4.2.

9.2.2 Representativeness

It is anticipated that the samples obtained will be representative of the media being characterized. A combination of random, judgmental (biased), and systematic samples will be taken to increase the representativeness of the data.

9.2.3 Sampling Accuracy and Precision

Sample accuracy will be assessed through the comparison of the analysis of the unknown sample (obtained in the field) with the analysis of samples with known concentrations created in the laboratory. The accuracy of analytical data is tested through the analysis of laboratory blank samples, spiked samples, laboratory standards, reference samples and field duplicates. Sampling precision will be achieved by collecting the appropriate number of samples as necessary to achieve the desired confidence interval.

9.2.4 Completeness

Completeness is defined as the percentage of measurements or amount of data required in order to make a decision concerning the media being characterized. The completeness goal is essentially the same for all data uses. Completeness will be calculated as follows:

$$\text{Completeness (\%)} = \frac{\text{(No. of valid values reported per parameter)}}{\text{(No. of samples planned for analysis)}} \times 100$$

The target for completeness is 90 percent for all analyses. If 90 percent completeness is not achieved, the data will be reviewed by the environmental engineer, and a determination will be made as to whether additional samples must be collected to achieve the desired confidence limit. If the desired confidence limit is achieved, additional samples may not be required.

9.2.5 Comparability

Comparability expresses the confidence with which data sets can be compared. Sample data generated during this procedure will be comparable with other sample data if consistently documented field and laboratory procedures used for similar samples and similar sampling methods and sampling conditions are maintained.

9.3 Standard Procedures

Standard procedures and protocols currently used for conducting field work, laboratory work, and administrative quality assurance/quality control functions are referenced in Appendix B, General Procedures. The media-specific work plans provide the overall technical guidance for the site characterization activities, discussions of field quality control, and laboratory quality control. SOPs provide the detailed instructions for completing the various activities described in the work plans. Work not authorized by an approved procedure or work instruction shall not be performed until a work procedure or instruction has been prepared and approved.

RWPs will be prepared for all media-specific characterization activities. The RWP will be updated as necessary.

SECTION 10

HEALTH AND SAFETY

A Health and Safety Plan specific to the site characterization work plans was prepared to supplement OSHA 1910.120, "Safety and Health Plan," RMI-L-163. The goal of the Health and Safety Plan is to support the planned media specific work plans. The goal is achieved by planning activities and monitoring to assure the health and safety of the worker and other personnel on and off site. The OSHA 1910.120, "Safety and Health Plan" was prepared to be consistent with Title 29 Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response.

Specific activities are identified for the separate characterization work plans and incorporated into the Health and Safety Plan. The activities covered by this Health and Safety plan are listed below.

1) Conducting soil, groundwater, and building surveys
2) Collecting building concrete core samples
3) Collecting soils samples under buildings
4) Collecting soil samples
5) Collecting groundwater samples

SECTION 11

PROPOSED CHARACTERIZATION SCHEDULE

This section provides the tentative schedules for the individual media-specific work plans as defined by the major individual characterization tasks.

11.1 Tentative Schedules

The schedule for the RMI site characterization consists of three separate parts (one for each of the media-specific work plans). For each media-specific work plan the individual tasks are identified. Milestones for the individual tasks are provided in Tables 11-1 through 11-3.

A start date for each media-specific characterization work plan has not been included. A start date will be incorporated when the required contracts for sampling and analysis and all required training of personnel are in place. The initiation of each work plan could be independent of other work plans. The characterization activities can begin once the SCP is approved.

11.2 Work Activity Sequence

Activities for the media-specific work plans have common activity titles but are unique for the specific media. The proposed schedule takes into consideration the time constraints associated with each activity. For example, if a high priority is placed on shortening the schedule, then expedient laboratory analysis would be required and the cost would increase.

11.2.1 Groundwater Activities

The proposed Phase 1 groundwater sampling schedule duration is 7 months (see Table 11-1). Further sampling and analysis of the groundwater will be performed on a semiannual basis as a routine monitoring function (Steps 3, 4, and 5 of Table 11-1). The duration of one cycle of the routine monitoring of wells will be approximately 7 months. The groundwater monitoring activities identified as numbers 3, 4, and 5 on Table 11-1 will be repeated semi-annually as part of the routine groundwater monitoring program currently in place.

11.2.2 Soil Activities

The Phase 1 soils characterization is proposed to last for 9 months (see Table 11-2). Unique to the soils characterization is the initial establishment of a grid system and evaluation of soil contamination near underground utility lines. The total time required for the collection of surface samples and soil borings will be approximately 5-1/2 months. The quantity of samples and analyses specified in the work plan will require significant time for both laboratory analyses and data validation.

11.2.3 Buildings Activities

The proposed Phase 1 buildings/equipment schedule duration is 8 months from establishing the grid to completing the data validation (see Table 11-3). This represents establishing the grid system and conducting two separate characterization efforts. The radiological surveys and the collection of samples are conducted independently of the process history and the direct observation approach used for RCRA hazardous contaminants. The buildings characterization activities as described in Table 11-3 will be implemented on a building-by-building basis.

Table 11-1 - Proposed Phase 1 Groundwater Characterization Schedule

Activity		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7
1)	Install Wells	<---------->						
2)	Land Survey Locations	<---	-->					
3)	Sample Collection		<----->					
4)	Analysis		<--------	--------------	------------	-->		
5)	Data Validation			<-------	------------	------------	-->	
6)	Data Evaluation and Response					<---	-------------	-->

Note: Steps 3, 4, and 5 will be repeated semiannually for as part of the characterization activities and for routine groundwater monitoring.

Table 11-2 - Proposed Phase 1 Soil Characterization Schedule

Activity		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
1)	Establish Grid System	<----->								
2)	Evaluate Utilities	<--------	-->							
3)	Collect Surface Samples	<-----	------------	------------	------>					
4)	Soil Borings		<--------	-------->						
5)	Analysis	<-----	------------	------------	------------	-----------	------>			
6)	Data Validation			<----	------------	-----------	--------------	--------------	------>	
7)	Data Evaluation and Response				<---	-----------	--------------	--------------	------------	----->

Note: If data evaluation and response indicate that more information is necessary, steps 2 through 7 will be repeated as required.

Table 11-3 - Proposed Phase 1 Buildings/Equipment Schedule

Activity	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8
1) Establish Interior Grid System	<-------->							
2) Building Sampling - swipes, cores, etc.	<--------	------------	-------------	-->				
3) Equipment Sampling - swipes, cores, etc.	<--------	------------	-------------	-->				
4) Conduct Dose Rate Measurements	<--------	------------	-------------	-->				
5) Collect Floor Core Samples		<------	-------------	-->				
6) Collect Subslab Soil Samples		<------	-------------	-->				
7) Conduct Building Exterior Survey	<--------	-->						
8) Evaluate Building RCRA Contamination	<-----------	------------	-------------	-----------	-----------	-------->		
9) Analysis		<-----------	-------------	-----------	-----------	--------->		
10) Data Validation		<-----	-------------	-----------	-----------	------------	----->	
11) Data Evaluation and Response			<-----	-----------	-----------	------------	---------	----->

Note: The building characterization activities, numbers one through seven, are implemented in sequence by building.

SECTION 12

SITE CHARACTERIZATION REPORT

The Site Characterization Report (SCR) is a report that will summarize the nature, level, and extent of contamination present and will provide a basis for the remediation efforts deemed necessary to release the site for unrestricted use. The SCR format and content will be consistent with NRC BTP on Site Characterization for Decommissioning Sites.

SECTION 13

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APPENDIX A

GENERAL INFORMATION

Appendix A
General Information

CONTENTS

Table A-1 - Dimensions and Coverage of Selected Structures at the RMI Site, Ashtabula, Ohio

Building	Dimensions (ft.)	Area (sq. ft.)	Percent
Northwest Storage Building	114 x 165	18,810.0	18.0
RF-6 Butler Building Addition	96.5 x 100	9,650.0	9.2
RF-6 Butler Building	203.5 x 100	20,350.0	19.4
Enclosed Rampway	15 x 100	1,500.0	1.4
Locker Rooms, Foreman's Offices	29.3 x 183.4	5,380.2	5.1
Enclosed Truck Ramp	31.5 x 78	2,457.0	2.3
Dock Area	51.3 x 29.4	1,510.1	1.4
Emergency Equipment Storage Building	10 x 12	120.0	0.1
RCRA Storage Building	40 x 20	800.0	0.8
Billet Storage Warehouse	50/46.4 x 114	5,614.5	5.4
Main Plant High Bay	53.1 x 288.2	15,303.4	14.6
Main Plant Low Bay	26.3/25 x 170.5/158.5	8,445.8	8.1
Runout Table Filter Building	45 x 20	900.0	0.9
Saw Filter Building	45 x 25	1,125.0	1.1
Tool Crib	45 x 50	2,250.0	2.2
Die Head Filter Building	48 x 50	1,680.0	1.6
Sub Station	26.3 x 18.7	473.7	0.5
Compressor Room	14 x 18.7	261.8	0.3
Wastewater Treatment Plant	46 x 44	2,024.0	1.9
RF-3 Butler Building	68 x 40	2,720.0	2.6
ES&H Building	Irregular Shape	2,774.0	2.7
Guard House	Irregular Shape	316.7	0.3
Sewage Disposal Plant	10.6 x 12.1	128.4	0.1
TOTAL		104,594.6	100.0

Source: *Draft 1991 Annual Environmental Report for RMI Titanium Company Extrusion Plant, Ashtabula, Ohio*, RMI 1992.

Table A-2 - Building Descriptions

Building	Owner	Built	Description
Northwest Storage Building	DOE	1964	The Northwest Storage Building is approximately 114 feet wide by 165 feet long. A fence is installed to separate the building into north and south areas. It is constructed of a concrete foundation and slab with insulated sheet metal walls. The roof is pitched metal with 6-inch fiberglass batt insulation. The superstructure for the roof is all metal columns, struts, and purlins. There are 6-inch, 8-inch, and 18-inch diameter storm sewer drains running underneath the building that may be contaminated. South of the fence is a machine shop area containing various machine tools including: various lathes, saws, and grinders, and a drill press, milling machine, belt sander, hydraulic press, shear, and lift truck hoist. Along the east wall, shelves are installed for tool storage. North of the fence is a storage and waste packaging area. A small change room constructed of wood frame with plastic sheeting walls is located in the northeast corner of the building.
RF-6 Butler Building Addition	DOE	1968	The RF-6 Butler Building Addition is approximately 96.5 feet x 100 feet. It is a pre-engineered metal structure with concrete slab floor and insulated walls. The original roof is pitched metal with 14 foot eaves and 6-inch fiberglass batt insulation. A second, identical roof has been added over the first. This area was used for product/process development and is currently used for equipment, extrusion tooling, and drum storage. Equipment located along the east wall includes two acid neutralization tanks, forge area-stack #6, two caustic tanks, and a plate and frame filter press. Miscellaneous burial boxes, drums, extrusion tooling and equipment are stored in this building.
RF-6 Butler Building	DOE	1964	The RF-6 Butler Building is 100 feet by 200 feet with 14 foot eaves and constructed in a manner similar to two pre-engineered metal buildings joined along the sides with a roof valley down the center. A second, identical roof has been added over the first roof. The floor is concrete. Product/process development activities including pickling, inspection, machining,and packaging of depleted and enriched uranium occurred in this building. A small ventilation system is installed to ventilate selected equipment. Several lathes, drill press, extrusion press, extrusion tooling racks, etc. are located in the western portion of the building. Much of the equipment has been wrapped in plastic.

Table A-2 - Building Descriptions (Continued)

Building	Owner	Built	Description
RF-6 Butler Building (Continued)	DOE	1964	A local ventilation system consisting of ductwork, HEPA filter, and blower serves several pieces of equipment. The eastern portion contains unoccupied offices and laboratory facilities. These rooms contain walls constructed of wood studs and drywall and an 8 foot ceiling of ceiling tile covered with fiberglass batt insulation. Either carpet or tile covers the concrete floor in these rooms. An equipment storeroom is located in the northeast corner of the building. A small, approximately 17 feet by 11 feet, pre-fabricated office for Health and Safety technicians is located along the north wall. A sump which collects liquids from the floor drains in RF-6 building and pumps these liquids to the wastewater treatment facility is located along the north wall near the entrance to the enclosed ramp.
Enclosed Ramp	DOE	1964 1969 (enclosed)	The enclosed ramp connects the RF-6 Butler Building and the Main Plant Buildings. The enclosure is a pre-engineered type metal structure with a thick concrete floor and insulated walls and roof. An emergency generator is located along the west wall. A 6-inch fire water and 6-inch storm sewer line run under the concrete ramp.
Locker Rooms, Foreman's Offices	RMI	1979 (woman's locker room) 1983 foreman's office	The women's locker rooms and foreman's offices are connected to the south wall of the low bay area in the main plant adjacent to the engineering offices, men's locker rooms, and new lunchroom which are considered part of the main plant building. The construction is concrete block walls with bar joists supporting an original metal deck roof of built up asphalt and gravel. A second membrane roof has been installed over the original roof. Interior walls are wood paneling and drywall. Floor tile covers the concrete floor. The foreman's offices are similar in construction. These areas are still used by RMI personnel. The HP Technician's offices, locker rooms, and lunchroom are maintained as radiologically "clean" areas.
Enclosed Truck Ramp	RMI (ramp) DOE (enclosure)	1962 (ramp) 1981 (enclosure)	The truck ramp is constructed of concrete. The enclosure is a pre-engineered metal structure. An 8-inch cast iron drain pipe runs under the floor of the dock area and is suspected to be contaminated. Large floor drains are located along the north wall.

Table A-2 - Building Descriptions (Continued)

Building	Owner	Built	Description
Dock Area	RMI	1962 1965 (enclosed)	An 8-inch cast iron drain pipe runs under the floor of the dock area.
Emergency Equipment Storage Building	DOE	1987	The Emergency Equipment Storage Building is a light metal structure mounted on a 4-inch concrete slab.
RCRA Storage Building	RMI	1957	The RCRA Storage Building is 20 feet by 40 feet with 13 foot eaves and is constructed of steel angle, sheet metal siding and a roof with wood purlin. The original building had a dirt floor. A reinforced concrete floor was added at a later date.
Billet Storage Warehouse	RMI	1984	The Billet (Northeast) Storage Warehouse Building is a pre-engineered metal structure with a concrete slab floor and insulated walls. The roof is pitched metal with 14 foot eaves and 6-inch fiberglass batt insulation. This area was used for the storage of incoming and outgoing depleted and enriched uranium materials. Currently the area is used for extrusion tooling and drum storage. A grit blast enclosure has been installed in the northwest corner of the building.

Table A-2 - Building Descriptions (Continued)

Building	Owner	Built	Description
Main Plant Building (High and Low Bays)	RMI	1957	There is a high bay area (288 feet by 53 feet with 47 foot eaves) and a low bay area (170 feet by 50 feet with 30-foot eaves). The men's locker rooms, new lunchroom, HP Technician's offices, gauge room, and water heater room are adjacent to the low bay area. Two bridge cranes, one each 5-ton and 10-ton, travel the entire length of the high bay. A 3-ton bridge crane travels the length of the low bay. Reinforced concrete foundations and footings were installed in the floor of the building in 1961 and 1962 to accommodate the extrusion press. There are concrete structures which were sand filled and covered over during this construction. There is a metal plate-covered trench system, used as a waste drain, which extends to a basement sump area. A utility tunnel runs under the floor. The building structure is steel I-beam columns and rafters with metal purlin. Exterior walls are corrugated sheet steel coated with a paint/asbestos composite ("Galbestos"). Interior walls of the building are thin sheet metal coated with a strippable coating. Insulation is sandwiched between the Galbestos and the interior sheet metal. The lower five feet of the walls are masonry.
Main Plant Building (High and Low Bays) (Continued)	RMI	1957	The original roof is a metal deck covered with a rubber, tar, and gravel build up. The original roof was removed and a second membrane roof has been added over the corrugated metal roof decking. The equipment within this building includes a 3,850-ton Loewy extrusion press, transfer table, conveyors, pickling tanks, miscellaneous furnaces, and an abrasive saw. A boiler room is located in a basement area in the western end of the high bay area.
Runout Table Filter Building	DOE	1988	The Runout Table Filter Building is a pre-engineered insulated metal building, 45 feet by 20 feet, with 24-foot eaves. The building is connected to the main plant building, tool crib room, and saw filter building. The building houses four (4) dust collectors, and one high efficiency particulate air (HEPA) filter bank (Stack 3A). An electrical duct bank runs underneath the floor. The northwest end of the building opens into the Saw Filter Building.

Table A-2 - Building Descriptions (Continued)

Building	Owner	Built	Description
Saw Filter Building	DOE	1986	The Saw Filter Building structure is a pre-engineered metal lean-to type building with the eave height varying from 16 feet at the main plant wall to 14 feet at the north end. Equipment in this building includes a moisture separator, dust collector, and filter housing which exhausts through a 2,000 CFM blower and 10-inch stack (Stack 4A).
Tool Crib	DOE	1982	The Tool Crib Building is a pre-engineered building with insulated walls. This building contains shelving and extrusion tooling.
Die Head Filter Building	DOE	1987	The Die Head Filter Building is a pre-engineered metal building with several windows, two double doors, and a concrete floor. Three exterior walls are standard construction with 24-foot eaves. The fourth wall connects to the main plant building. The building contains a cyclone separator, six (6) pulse jet dust collectors., three (3) HEPA filter banks, an 18,000 CFM blower and a 30-inch stack (Stack 1A). An electrical duct bank runs under the floor.
Switchgear Room (Adjacent to Main Plant)	RMI	1957	The 1,000 KVA Switchgear room building is a concrete block building with concrete floor connected to the main plant building. This building houses various switchgear and transformers. Many of the underground electrical ducts underneath the floor of the main plant and filter buildings emanate from the electrical substation building.
Air Compressor Room	RMI	1961	The Air Compressor Room is concrete block building with concrete floor. The building is 14 feet by 18.7 feet and houses a 100 hp air compressor.
Wastewater Treatment Plant	DOE	1988	The Wastewater Treatment Plant is a pre-engineered metal building. The building contains a modern wastewater treatment system including a filter press, five large fiberglass tanks, pumping and piping systems, metal access platforms and an overhead crane. Eaves are 28 feet above the finished floor.

Table A-2 - Building Descriptions (Continued)

Building	Owner	Built	Description
RF-3 Butler Building	DOE	1962 1986 (addition)	The RF-3 Butler Building is a 65 feet by 40 feet, pre-engineered metal building with 24-foot eaves. The floor has a T-shaped drainage trench. Waste oxidation equipment and a bridge crane are located along the south wall. Drum sampling and transfer stations are located along the north wall. An addition, 24 feet by 40 feet, was constructed of similar materials to house a blower and HEPA filter system for the oxidation equipment.
ES&H Office Building	RMI	1950's	The ES&H office buildings have walls constructed of wood studs and drywall and an 8 foot ceiling of ceiling tile. Either carpet or tile covers the concrete floor. The ES&H building is outside previous production areas and maintained as a radiological "clean" area.
Guardhouse	RMI	1962 1985 (addition)	The Guardhouse Building is constructed of concrete block with concrete floor. An addition houses lockers, a restroom and miscellaneous storage. The roof is covered by a rubber, tar, and gravel build-up. The Guardhouse is outside previous production areas and maintained as a radiological "clean" area.
Sewage Disposal Plant	RMI	(before processing began)	The Sewage Disposal Plant is a pre-engineered metal building with a gravel floor. The building covers a buried effluent collection and treatment tank.
Modular Offices	DOE	1991	The Modular Offices Complex is a series of 9 - 12' x 60' boxes connected side-by-each and the Modular Lab Complex is likewise a series of 6 units. The exterior is T1-11 plywood siding. The interior walls are drywall or wallboard. Floors are covered with carpet or tile. All contaminated soil was removed from the area prior to trailer installation. The Modular Offices are outside previous production areas and maintained as a radiological "clean" area.
Modular Lab	DOE	1991	The Modular Lab consists of two double wide trailers connected along the centerline. The exterior walls are corrugated sheet metal. Interior walls are drywall or wallboard. Floors are covered with carpet or tile. All contaminated soil was removed from the area prior to trailer installation. The Modular Lab is outside previous production areas and maintained as a radiological "clean" area.

Table A-3 - Existing Stack Locations

Stack No.	Building	Operation
1	Die Head Filter Building	Extrusion Press (Past Use)
3	Runout Table Filter Building	Cooling Table
4	Saw Filter Building	Abrasive Saw
5	RF-3	Uranium Oxidation (Past Use)
6	RF-6 Building	Acid Pickling
7	West End Main Plant	Acid Pickling
8	RF-6 Building	Lathe Exhaust
9	RF-6 Building Addition	Resin Dip Tank
Not Numbered	RF-6 Building	Laboratory Extrusion Press
Not Numbered	RF-6 Building	Laboratory Cut Off Saw
1	Main Plant (Extrusion Press)	Decontamination Facility (Current Use)
5	RF-3	Decontamination Facility (Current Use)
Not Numbered	NE Billet Storage	Sandblast Facility

Source: *Draft 1991 Annual Environmental Report for RMI Titanium Company Extrusion Plant, Ashtabula, Ohio*, RMI 1992.

APPENDIX B

GENERAL PROCEDURES

APPENDIX B

GENERAL PROCEDURES

Tables B-1 through B-3 identify the field, analytical, quality assurance and administrative procedure applicable to the site characterization efforts. The Quality Assurance Officer shall maintain a list of all approved procedures and will update this list as new procedures are written and approved.

B.1 Field Procedures

Field activities consist primarily of all the activities necessary to collect a sample and transfer the sample to the laboratory or to measure properties such as surface contamination levels in the field. Key field procedures applicable to characterization efforts are listed in Table B-1.

B.2 Analytical Procedures

All on-site or off-site laboratory analyses shall be performed in accordance with written and approved standard operating procedures and analytical methods. Table B-2 lists the analytical methods to be used for the various analyses required.

B.3 Quality Assurance/Administrative Procedures

Quality Assurance procedures provide assurance that the data collected will meet the project objectives. Administrative procedures provide a standard method to conduct administrative tasks such as document approval, procurement, document control, etc. Table B-3 lists the applicable quality assurance and administrative procedures.

Table B-1 - Current and Proposed Field Procedures

Subject	Current Procedure Number	Procedure Type
Surface Soil Sampling	RMI-L-156	Field Sampling
Subsurface Soil Sampling	Proposed	Field Sampling
Groundwater Sampling	RMI-L-138	Field Sampling
Verify radiation and surface contamination instruments performance is within approved limits prior to use.	RMI-L-60	Health Physics Procedures
Provide instructions for the calibration and maintenance of radiation and surface contamination measuring instruments.	RMI-L-60	Health Physics Procedures
Building Surface Survey	Proposed	Field Sampling
Conducting surface contamination surveys	RMI-L-60	Health Physics Procedures
Issuing Radiological Work Permits	RMI-L-155	Health Physics Procedures
Receipt, storage and shipment of samples by the RMI laboratory	RMI-L-138	Laboratory Procedures
Decontamination of sampling equipment	Proposed	Field Sampling
Sample Numbering, Labeling and Sealing	RMI-L-138	Laboratory Procedures
Field Activity Documentation	Proposed	Field Sampling
Disposal of Drill Cuttings and Groundwater	Proposed	Field Sampling
Walkover Radiation Survey	RMI-L-149	Field Sampling

Table B-2 - Applicable Analytical Methods

Analyte	Analytical Method
Radiological Contaminants	
Gross Alpha	gas flow proportional counter; laboratory specific procedure
Gross Beta	gas flow proportional counter; laboratory specific procedure
Total Uranium	kinetic phosphorescence analysis or equal; laboratory specific procedure
Isotopic Uranium (U-238, U-235, U-234)	alpha or gamma spectroscopy; laboratory specific procedure
Thorium 232	alpha spectroscopy; laboratory specific procedure
Technetium 99	liquid scintillation; laboratory specific procedure
Isotopic Plutonium (Pu-238, Pu-239, Pu-240)	alpha spectroscopy; laboratory specific procedure
RCRA Hazardous Contaminants	
Volatiles	SW-846, Method 8240
Semi-Volatiles	SW-846, Method 8270
Pesticides	SW-846, Method 8080
Herbicides	SW-846, Method 8150
As, Ba, Cd, Cr, Pb, Se, Ag	SW-846, Method 6010 *
Mercury	SW-846, Method 7471 *
Cyanide (Total)	SW-846, Method 9010
Sulfides (Reactive S)	SW-846, Method 9030
Polychlorinated Biphenyls (PCBs)	SW-846, Method 8080
Asbestos	40 CFR Part 763, Subpart E, Appendix A
Toxicity Characteristic Leaching Procedure	SW-846, Method 1311 (40 CFR 261.24)
Ignitability	SW-846, Method 1010 or 1020
Corrosivity	SW-846, Method 9040
Free Liquids	SW-846, Method 9095
Particle Size	ASTM-D-422
Percent Moisture	ASTM-D2974-87

Note: * For groundwater analyses: *US EPA Methods of Analysis for Water and Wastes* Method 200.7 (As,Ba,Cd,Cr, Pb, Ag), Method 270.2 (Se), Method 245.1 (Hg)

Table B-3 - Current and Proposed Quality Assurance/Administrative Procedures

Subject	Current Procedure Number	Procedure Type
Data validation of inorganic analyses	Proposed	Quality Assurance
Data validation of organic analyses	Proposed	Quality Assurance
Document control	RMI-L-116	Administrative
Audits	RMI-L-120	Quality Assurance
Nonconformances	RMI-L-122	Quality Assurance
Document review and approval	RMI-L-112	Administrative
Unusual occurrence reporting	RMI-L-117	Quality Assurance
Equipment and services procurement	RMI-L-127	Administrative
Corrective actions	RMI-L-128	Quality Assurance
Contract laboratory evaluation	RMI-L-154	Quality Assurance
Laboratory Services Procurement	RMI-L-159	Quality Assurance
Operational readiness reviews	RMI-L-161	Quality Assurance
QA surveillances	RMI-L-166	Quality Assurance
Audit personnel qualification	RMI-L-169	Quality Assurance