The electronic version of this file/report should have the file name:

Type of document.Spill Number.Year-Month.File *Year-Year* or Report name.pdf

letter._____._____-_____.File spillfile.pdf

report.hw915002.1998-05-06.GROUNDWATER MONITORING PLAN.pdf

Project Site numbers will be proceeded by the following:

Municipal Brownfields - b
Superfund - hw
Spills - sp
ERP - e
VCP - v
BCP - c

non-releasable - put .nf.pdf
Example: letter.sp9875693.1998-01.Filespillfile.nf.pdf

Harding Lawson Associates

Engineering and Environmental Services

Groundwater Monitoring Plan
AlliedSignal, Inc.
Buffalo Research Laboratory
Permit No. NYD000632315

Prepared for

AlliedSignal, Inc.
Buffalo Research Laboratory
20 Peabody Street
Buffalo, New York 14210

HLA Project No. 40509.2

Eric Reisinger
Project Geologist

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May 6, 1998

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1.0 INTRODUCTION

This Groundwater Monitoring Plan (GMP) has been prepared by Harding Lawson Associates (HLA) under contract to AlliedSignal, Inc. (AlliedSignal) to satisfy one of the Corrective Action requirements of the Resource Conservation and Recovery Act (RCRA) Part B Permit (Permit No, NYD000632315) for the AlliedSignal Buffalo Research Laboratory (facility) in Buffalo, New York (Figure 1). Groundwater monitoring is one of the Corrective Actions required by the New York State Department of Environmental Conservation (NYSDEC); the Corrective Action requirements are described in the NYSDEC correspondence to AlliedSignal entitled "Module III, Corrective Action Requirements for Solid Waste Management Units and Areas of Concern"[1]. The following sections of this chapter discuss the facility, a chronological summary of the project, and the objective of the GMP.

1.1 SITE DESCRIPTION

The facility is located at 20 Peabody Street in Buffalo, New York, and occupies approximately 13 acres (Figure 2). The facility became operational in the mid 1950s and currently conducts advanced research and development on a variety of organic and inorganic chemicals. The laboratory and operations areas are situated on approximately 10 acres located at the northwest corner of Elk and Peabody streets. A 3-acre parking lot is located across Peabody Street to the east. The facility is bounded to the north and south by Perry and Elk Streets, respectively. Walter Street borders the facility to the east, and railroad tracks owned by Consolidated Railroad border the facility to the west.

1.2 PROJECT HISTORY

On October 19, 1992, the New York State Department of Environmental Conservation (NYSDEC) issued a RCRA Part B Permit (Permit) for the facility in accordance with Section 6 of the New York Codes, Rules and Regulations (6 NYCRR) Article 27, Title 9. Under the conditions of the Permit, the facility can operate a covered and diked pad for the storage of up to 8,800 gallons of containerized hazardous waste. The facility's Hazardous Waste Container Storage Area has been defined as a solid waste management unit (SWMU) consistent with the permit requirements.

Module II of the permit addresses the corrective action requirements for the SWMU and areas of concern (AOCs) identified by the NYSDEC. In accordance with the terms of the permit, corrective action is required, when necessary, to protect human health and environment from releases or potential releases of hazardous wastes and constituents from such units.

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[1] New York State Department of Environmental Conservation, March 9, 1998, "Module III, Corrective Action Requirements for Solid Waste Management Units and Areas of Concern," correspondence to AlliedSignal.

In accordance with the Permit requirements (Module III A.2), a RCRA Facility Assessment[2] (RFA) was completed by Remcor in 1993 to determine if a release of hazardous constituents had occurred from any of four facility areas identified by the NYSDEC and U.S. Environmental Protection Agency (EPA). These areas include the following:

- One RCRA SWMU - The Hazardous Waste Container Storage Area for which the RCRA Part B Permit was issued
- Three AOCs:
  - AOC-1 - Storm Sewer System
  - AOC-2 - Activated Carbon System
  - AOC-3 - Drum Storage Area

The SWMU is located east of the Pilot Plant and north of Building 514. AOC-1 (storm sewer system) consists of storm water manholes located in the southeast and southwest portions of the facility as well as the sump in Building 513. AOC-2, the activated carbon system, is located at the southeast corner of the Pilot Plant. The Drum Storage Area (AOC-3) is located along the site's western boundary west of the Pilot Plant. The locations of the SWMU and AOCs are shown on Figure 2.

The findings of the RFA indicated the presence of certain hazardous constituents at low concentrations but above background in media samples collected and analyzed from the facility. EPA and NYSDEC concluded[3] that an RFI was required pursuant to the Part B Permit (Module III A.2). Samples collected in the RFI were tested for constituents of interest, which were determined based on the results of the RFA and the historic activities at the facility.

The Part B Permit identified seven Project Tasks to be implemented pursuant to completion of an RFI. These tasks included:

- Task I Description of Current Conditions
- Task II Pre-Investigation Evaluation of Corrective Measures Technologies
- Task III RFI Management Plans
- Task IV Facility Investigation (RFI Work Plan)
- Task V Investigation Analysis
- Task VI Laboratory and Bench-Scale Studies
- Task VII Reporting

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[2] Remcor, Inc., August 11, 1993, "Report, Field Sampling and Analysis Activities, RCRA Facility Assessment, AlliedSignal, Inc., Buffalo, New York," prepared for AlliedSignal, Inc. Buffalo, New York.

[3] New York State Department of Environmental Conservation, Bureau of Western Hazardous Waste Programs, and U.S. Environmental Protection Agency Region II, December 7, 1993, "Notification to Conduct a RCRA Facility Investigation (RFI)," correspondence to AlliedSignal, Inc.

The Current Conditions Report (CCR)[4], completed as Project Task I, was submitted to NYSDEC and EPA Region II on March 7, 1994. The Pre-Investigation Evaluation of Corrective Measure Technologies[5], Project Task II, was submitted concurrent with the RFI Work Plan[6]. The RFI Work Plan satisfied the requirements of Tasks III, IV, and V of the permit.

The RFI Report [7], Project Task VII, was submitted to the NYSDEC and EPA on May 18, 1995. The NYSDEC and EPA reviewed the report and issued comments in a letter dated August 25, 1995[8]. HLA responded to the NYSDEC comments in a letter dated December 19, 1995[9]. NYSDEC reviewed HLA's response to comments and approved supplemental sampling activities in a letter dated January 22, 1996[10]. HLA prepared a Supplemental Sampling and Analysis Plan[11] to conduct additional sampling in accordance with the NYSDEC comments. The supplemental sampling was completed and a letter report[12], presenting the finding of the supplemental sampling and finalizing the RFI report, was submitted to the NYSDEC on August 6, 1996. NYSDEC reviewed the results of the supplemental sampling and concluded, in a letter dated September 12, 1996[13], that a Corrective Measures Study (CMS) should be completed in accordance with the requirements of Module III Condition E.9. (a) of the RCRA Permit.

The RFI concluded the only Constituent of Concern (COC) at the facility which required further action was arsenic in surface soil. As a result, a CMS was completed by HLA in December 1997 to evaluate several potential remedial alternatives with respect to arsenic in on-site soils. The CMS Report[14] presented the evaluation of the following remedial alternatives:

- No action (based on a site-specific risk-assessment)
- Excavation and disposal
- Containment by placement of top soil

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4 Remcor, Inc., March 7, 1994," Current Conditions Report, AlliedSignal Inc., Buffalo Research Laboratory," AlliedSignal, Inc., Buffalo, New York.

5 Remcor, Inc., April 6, 1994, "Pre-Investigation Evaluation of Corrective Measures Technologies, AlliedSignal, Inc., Buffalo Research Laboratory," AlliedSignal, Inc., Buffalo, New York.

6 Remcor, Inc., April 6, 1994, "RCRA Facility Investigation Work Plan, AlliedSignal, Inc., Buffalo Research Laboratory,", AlliedSignal, Inc., Buffalo, New York.

7 Remcor, Inc., "RCRA Facility Investigation Report, AlliedSignal, Inc. Buffalo Research Laboratory," AlliedSignal, Inc., Buffalo, New York.

8 New York State Department of Environmental Conservation, August 25, 1995, NYSDEC Comments, RCRA Facility Investigation Report, AlliedSignal, Inc., Buffalo Research Laboratory," correspondence to AlliedSignal, Inc. Buffalo, New York.

9 Harding Lawson Associates, December 19, 1995. "Response to NYSDEC Comments, RCRA Facility Investigation Report, AlliedSignal Inc., Buffalo Research Laboratory," correspondence to NYSDEC.

10 New York State Department of Environmental Conservation, January 22, 1996, "RCRA Facility Investigation Report - Comment Response," correspondence to AlliedSignal.

11 Harding Lawson Associates. March 8, 1996. "Supplemental Sampling and Analysis Plan, RCRA Facility Investigation, AlliedSignal, Inc. Buffalo Research Laboratory," prepared for AlliedSignal Inc., Buffalo, New York.

12 Harding Lawson Associates, August 6, 1996. "Completion of Supplemental Sampling and Analysis, RCRA Facility Investigation - AlliedSignal Inc. Buffalo Research Laboratory," correspondence to NYSDEC prepared for AlliedSignal, Inc., Buffalo, New York.

13 New York State Department of Environmental Conservation, September 12, 1996, "Supplemental Sampling and Analysis - RCRA Facility Investigation ," correspondence to AlliedSignal, Inc. Buffalo, New York.

14 Harding Lawson Associates, December 8, 1997, "Corrective Measures Study, AlliedSignal, Inc., Buffalo Research Laboratory," prepared for AlliedSignal, Inc.

- Containment by placement of asphalt pavement
- Isolation through installation of a fence

Based on the findings of the risk assessment, and the fact that the facility is an industrial site that will remain industrial for the foreseeable future, HLA recommended a no action remedial alternative be implemented.

The NYSDEC reviewed the CMS and determined elevated concentrations of arsenic exist in soils at the facility. However, the NYSDEC concurred in its latest submittal, "the contamination currently does not pose a threat to human health and the environment". To "ensure long-term protection of human health and the environment" the NYSDEC has required the implementation of several Final Corrective Measures at the facility. Preparation of a GMP was included among these requirements.

1.3 PLAN OBJECTIVE

The objective of the GMP is to address the protocols associated with the annual groundwater monitoring of site wells MW-3 and MW-5 as required by the NYSDEC. Annual groundwater monitoring is required to confirm that arsenic concentrations in on-site soils do not impact groundwater beneath the site. Annual groundwater monitoring will also provide a means to monitor for concentrations of barium. Barium is included based on previously detected, low levels in groundwater samples from the site.

1.4 LIMITATIONS

This plan has been prepared based on the results of the previously completed RCRA investigations described above in Section 1.2, and on the conditions of the facility's RCRA permit and associated modules. This plan is based on the assumption that site conditions remain as they were at the time the investigations were performed. This plan has been prepared expressly for use by AlliedSignal and its agents and shall not be used by any other party without HLA's written consent.

1.5 TRIGGERS FOR PLAN REVIEW AND REVISION

HLA will include a review of the GMP requirements in the Annual Groundwater Monitoring Report. The objective of the GMP (confirmation that soils impacted by arsenic do not impact groundwater beneath the facility) will be reviewed with respect to the data generated during the completion of the GMP tasks. Groundwater analytical data and flow direction will be evaluated in the Annual Groundwater Monitoring report. If arsenic is detected in concentrations greater than NYSDEC action levels in samples collected from either well, the plan will be reviewed by HLA and recommendations will be presented for NYSDEC review. This plan will also be reviewed after three years (from the date of this plan) to determine whether additional monitoring is required.

2.0 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples will be collected from Monitoring Wells MW-3 and MW-5 (Figure 3) on an annual basis. Well MW-3 was selected as a sampling location based on historical analytical results. Well MW-5 was selected because it is the most downgradient monitoring well at the facility. Following receipt of the sampling analytical results, an Annual Groundwater Monitoring Report will be prepared and submitted to NYSDEC.

The following paragraphs describe the sampling and analytical procedures to be employed during annual groundwater monitoring events. As required by the Module III Correction Action Requirements, "sample collection and analyses shall be performed using the practices and protocols in the facility's NYSDEC Approved Sampling and Analysis Plan (ASAP) or NYSDEC's RCRA Quality Assurance Project Plan (QAPP) Guidance." These plans are included in the GMP as Appendixes A and B, respectively.

2.1 WELL INSPECTION

The following wells will be visually inspected during the completion of annual monitoring events: MW-2, MW-3, MW-5, MW-8, and MW-10 (Figure 3). Items which will be inspected include the following:

- protective covers (steel flush mount covers or steel casing)
- well locks
- water tight locking caps
- cement pads
- flush mount wells will be examined for cracking in the asphalt around the well.

Any observed well damage will be documented in the project field book and the project manager will be notified. The project manager will ensure that any damage to the wells is discussed in the Annual Report. In addition to completing visual inspections, water levels will be measured in these wells in accordance with Section 2.4 of this plan.

HLA has recommended that Monitoring Wells MW-1, MW-4, MW-6, MW-7, and MW-9 (Figure 3) be abandoned in accordance with industry standards based on an analysis of historical analytical data and the potential for further damage by routine facility operations (e.g., snow plows, truck traffic). It is assumed abandonment activities will be completed prior to initiating the GMP and visual inspections of the monitoring wells to be closed are not necessary as part of the GMP.

2.2 WATER LEVEL MEASUREMENT

As required by the NYSDEC in the Module III Corrective Action Requirements For Solid Waste Management Units and Areas of Concern, the static depth to water will be measured from the marked top-of polyvinyl chloride (PVC) casing for each well on site. The resulting groundwater surface elevation data will be plotted on a facility figure and a potentiometric surface map will be prepared. The potentiometric surface map will be submitted with the Annual Groundwater Monitoring Report.

The static depth to water will be measured from the marked top-of PVC casing to the nearest 0.01 foot using an electronic measuring device. These levels will be recorded in the project field book and tabulated in the Annual Groundwater Monitoring Report. In wells requiring sampling, the depth to water will also be used to calculate the purge volume required. The following table shows the measuring point elevations for wells of concern.

Well Identification	Measuring Point Elevation
MW-2	587.32
MW-3	587.55
MW-5	583.47
MW-8	587.94
MW-10	587.85

Although they are anticipated to be removed prior to initiation of the annual monitoring, the following table summarizes the measuring point elevations for wells MW-1, MW-4, MW-6, MW-7, and M-9.

Well Identification	Measuring Point Elevation
MW-1	585.69
MW-4	583.87
MW-6	585.22
MW-7	585.42
MW-9	584.48

2.3 WELL PURGING

Prior to sampling, Monitoring Wells MW-3 and MW-5 will be purged of a minimum of three times the volume of water present in each well at the time of sampling (i.e., well volume). Static depth to water and well dimensions will be used to calculate a well volume. Copies of the well construction diagrams for Monitoring Wells MW-3 and MW-5 are provided as Appendix C. The following table identifies the well dimensions required for calculating the well volume and the estimated well volume at each well.

Well Identification	Well Diameter (inches)	Approximate Well Depth (Ft-TOC)	Approximate Water Level (Ft-TOC)	Approximate Well Volume (gallons)
MW-3	2	18.65	5.25	2.2
MW-5	2	16.60	4.75	2.0

Note: "Ft-TOC" indicates feet below marked top-of PVC casing.

A minimum of three well volumes of water will be removed using a submersible pump, centrifugal pump, or bottom-filling stainless steel bailer. The temperature, pH, and specific conductance of the purge water will be monitored during purging. These parameters will be recorded following completion of the removal of each well volume. Purging will be considered complete when each of the field parameters has stabilized within 10 percent for three consecutive well volumes and the turbidity is less than 50 nephlometric turbidity units in accordance with the Approved RFI Work Plan.

All purge water generated during sampling activities will be staged on site in a labeled container (polyethylene tank or 55-gallon drum) until proper disposal is arranged based on the analytical results.

2.4 GROUNDWATER SAMPLE COLLECTION AND HANDLING

Following purging activities, groundwater sampling will be initiated within two hours. Groundwater samples will be collected using either a stainless-steel bottom filling bailer or a centrifugal pump and polyethylene tubing in accordance with the RFI Work Plan. If a centrifugal pump is used, a new section of polyethylene tubing will be used at each well.

Based on current requirements, the sample for arsenic and barium analysis will not be filtered prior to preservation. Immediately following collection, the sample bottles will be appropriate preserved and placed in a cooler and chilled to approximately 4 degrees Centigrade. The cooler and samples will then be prepared for

shipment (via overnight courier) or delivery to the subcontracted analytical laboratory. In preparation for shipment, each sample will be logged onto Chain-of-Custody and Request-for-Analysis forms. Copies of these forms are included as Appendix D.

2.4.1 Sample Labeling

In accordance with practices established during the completion of the RFI, each groundwater sample will be identified using the following convention:

- Samples will be initialized with the prefix "HAB," HLA AlliedSignal Buffalo
- The sample location will be identified next, MW-3
- The final code will identify the sample collection date by identifying the month and year
- Quality assurance/quality control samples will be identified as follows:
  - D = duplicate
  - MS = matrix spike
  - MSD = matrix spike duplicate
  - EB = equipment blank

Examples of this convention are as follows:

- HAB-MW3-0698 = Sample collected from MW-3 in June 1998
- HAB-MW3-0698D = Duplicate sample collected from MW-3 in June 1998
- HAB-EB-0698 = Equipment blank collected in June 1998

2.5 ANALYTICAL PROGRAM

Groundwater samples will be collected from Monitoring Wells MW-3 and MW-5 and submitted for laboratory analysis of the following parameters:

- Total arsenic - EPA[15] 7060
- Total barium - EPA 6010

Additional analyses include the determination of field pH, specific conductance, turbidity, and temperature. The results of these field analyses will be included in the Annual Groundwater Monitoring Report. Laboratory data from annual groundwater monitoring will not undergo formal validation.

[15] U.S. Environmental Protection Agency, 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020.

2.6 REPORTING AND DOCUMENTATION

In accordance with the specifications of Module III, an Annual Groundwater Monitoring Report will be submitted to the NYSDEC within 60 days of the completion of sampling. The following information will be presented in the report:

- Summary of well conditions based on visual inspection
- Summary and discussion of groundwater analytical results
- Discussion of groundwater flow direction across the site accompanied by a potentiometric surface contour map
- Tabular presentation of analytical results and potentiometric surface elevation data
- Proposal for GMP modifications based on the above findings

A hard copy of the report will be submitted as well as an electronic digital copy in a format compatible with the NYSDEC computer system. In accordance with Module III, acceptable digital formats include DOS 5.0, 3.5-inch, 1.4 mg floppy disk, ASCII delimited format, or database file format.

3.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Several QA/QC samples will be prepared for the aqueous samples in order to evaluate potential impacts on sample quality during field sampling or during analysis. The specific type of samples to be collected includes duplicates, matrix spike, matrix spike duplicates, and equipment blanks.

One of each type of sample listed above will be collected on an annual basis and submitted for analysis in accordance with the RFI Work Plan. The analyses required for each type of sample is summarized in the table below:

Sample Type	Arsenic and Barium
Duplicate	X
Matrix Spike	X
Equipment Blank	X

4.0 MONITORING SCHEDULE

The GMP will be initiated within 60 days of plan approval by the NYSDEC. Annual monitoring should be conducted during the period of June through September of each year when the weather in Buffalo is moderate. NYSDEC will be notified of each annual monitoring event at least four weeks prior to sampling.

An Annual Groundwater Monitoring Report, as detailed in Chapter 2.0, will be submitted to the NYSDEC within 60 days of sampling. Assuming sampling is completed in the middle of August each year, the Annual Groundwater Monitoring Report will be submitted to NYSDEC in October.

5.0 HEALTH AND SAFETY REQUIREMENTS

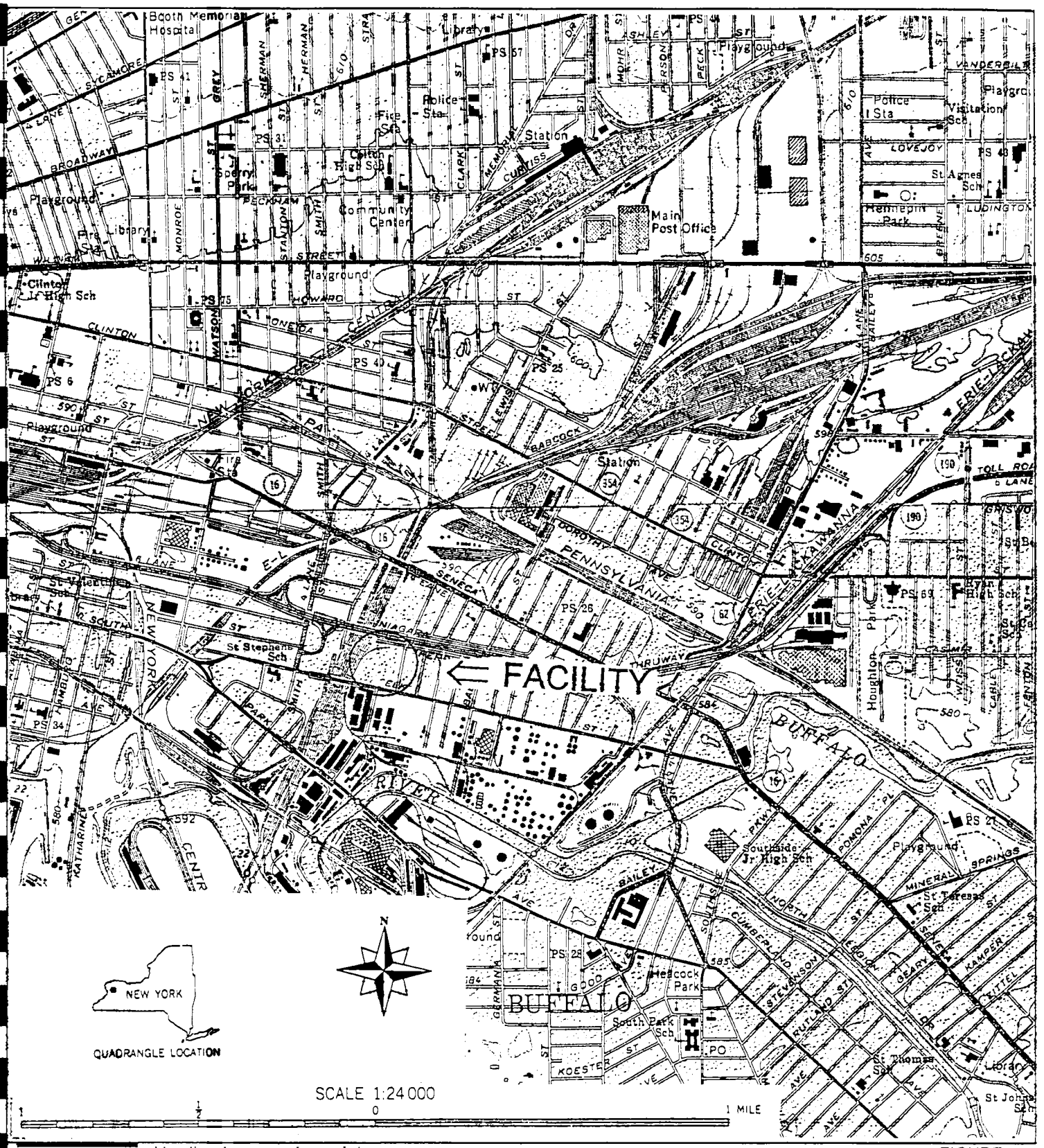
Annual groundwater sampling activities will be completed in accordance with the approved RFI Health and Safety Plan (HASP). In general, personnel will perform all site work in Modified Level D personal protective equipment (PPE) to comply with the health and safety requirements of the HASP as well as the facility. Modified Level D PPE is defined as follows:

- Hard hat
- Safety glasses
- Steel toe and shank work boots
- Latex gloves
- Work clothes or coveralls

Specific hazards personnel should avoid include the following:

- slips, trips and falls
- facility vehicular traffic
- electrical hazards associated with the use of a generator
- employ proper lifting techniques when moving generator between well locations
- heat/cold stress
- potential contaminants in groundwater

A copy of the site-specific HASP will accompany sampling personnel during completion of the annual monitoring.



Harding Lawson Associates
Engineering and Environmental Services
700 North Bell Avenue
Pittsburgh, Pennsylvania 15106
412-279-6661

SITE LOCATION MAP

BUFFALO RESEARCH LABORATORY
ALLIEDSIGNAL, INC.
BUFFALO, NEW YORK

FIGURE
1

DRAWN	JOB NUMBER	APPROVED	DRAWING NUMBER	DATE	REVISED DATE
LVH	40509.1		40509A01	4/14/98	

PERRY STREET

STORAGE BLDG. 504

ROOT NEAL & CO.

CONSOLIDATED RAILROAD

SOLID WASTE MANAGEMENT UNIT
HAZARDOUS WASTE CONTAINER
STORAGE AREA

NORTH GATE

SHIPPING & RECEIVING BLDG. 513

SOLVENT STORAGE BLDG. 515

RAW MATERIALS STORAGE PAD

OFFICES

PILOT PLANT BLDG. 515

DIKED AREA

BLDG. 515

DIKED AREA

OFFICES

DEVELOPMENT LABORATORY BLDG. 514

BLDG. 516

AOC-2 ACTIVATED CARBON SYSTEM

AOC-3 DRUM STAGING AREA

SUB-STATION

MECH./ ELEC. SHOP BLDG. 517

TRUCK DELIVERY PAD

MECHANICAL/ELECTRICAL CHEMICALS BLDG. 512

COMPRESSOR STATION

FIRE PUMP BLDG. 509

AOC-1(SW) SOUTHWEST STORM WATER SEWER MANHOLE

COMPUTER BUILDING AND CAFETERIA BLDG. 510

AOC-1(SE) SOUTHEAST STORM WATER SEWER MANHOLE

RESEARCH BLDG. 511

ENTRANCE

SIDEWALK

SIDEWALK

PEABODY STREET

GATE

PARKING LOT

GATE

WALTER STREET

ELK STREET

BUFFALO COLOR CORPORATION

BASED ON A TOPOGRAPHIC MAP OF A PORTION OF ALLIEDSIGNAL INC.
DATED 02/26/96 PREPARED BY McINTOSH & McINTOSH, P.C.

120'
80'
40'
0'
20'
40'
60'

N

KEY:

○ = MANHOLE LOCATION
AOC-1 = AREA OF CONCERN
= GRASSY AREA
= GRAVEL AREA
= CONCRETE AREA
= ASPHALT PAVEMENT AREA

HLA

Harding Lawson Associates
Engineering and
Environmental Services

Site Plan
AlliedSignal Inc.
Buffalo Research Laboratory
Buffalo, New York 14210

FIGURE
2

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
EWS	40509,2		05/06/98	

PERRY STREET

STORAGE BLDG. 504

MW-10

ROOT NEAL & CO.

SOLID WASTE MANAGEMENT UNIT
HAZARDOUS WASTE CONTAINER
STORAGE AREA

MW-6

NORTH GATE

MW-1

SHIPPING & RECEIVING BLDG. 513

SOLVENT STORAGE BLDG. 515

OFFICES

PILOT PLANT BLDG. 515

DIKED AREA

MW-2

RAW MATERIALS STORAGE PAD

AOC-3 DRUM STAGING AREA

MW-7

MW-3

BLDG. 515

OFFICES

DEVELOPMENT LABORATORY BLDG. 514

BLDG. 516

DIKED AREA

MW-8

MW-9

AOC-2 ACTIVATED CARBON SYSTEM

CONSOLIDATED RAILROAD

MECH./ ELEC. SHOP BLDG. 517

SUB-STATION

TRUCK DELIVERY PAD

MECHANICAL/ELECTRICAL CHEMICALS BLDG. 512

COMPRESSOR STATION

FIRE PUMP BLDG. 509

MW-4

AOC-1(SW) SOUTHWEST STORM WATER SEWER MANHOLE

COMPUTER BUILDING AND CAFETERIA BLDG. 510

MW-5

AOC-1(SE) SOUTHEAST STORM WATER SEWER MANHOLE

RESEARCH BLDG. 511

SIDEWALK

ENTRANCE

PEABODY STREET

GATE

PARKING LOT

GATE

WALTER STREET

SIDEWALK

ELK STREET

BUFFALO COLOR CORPORATION

BASED ON A TOPOGRAPHIC MAP OF A PORTION OF ALLIEDSIGNAL INC.
DATED 02/26/96 PREPARED BY McINTOSH & McINTOSH, P.C.

120' 80' 40' 0' 20' 40' 60'

N

KEY:

- = MONITORING WELL LOCATION TO BE SAMPLED ON ANNUAL BASIS
- = MONITORING WELL LOCATION WATER LEVEL TO BE MEASURED ON ANNUAL BASIS
- = MONITORING WELL LOCATION PROPOSED TO BE ABANDONED
- = MANHOLE LOCATION
- AOC-1 = AREA OF CONCERN
- = GRASSY AREA
- = GRAVEL AREA
- = CONCRETE AREA
- = ASPHALT PAVEMENT AREA

HLA

Harding Lawson Associates
Engineering and
Environmental Services

Groundwater Monitoring Plan
Monitoring Well Locations
AlliedSignal Inc. – Buffalo Research Laboratory
Buffalo, New York 14210

FIGURE 3

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
EWS	40509,2		04/17/98	

APPENDIX A

NYSDEC Approved Sampling and Analysis Plan (ASAP)

RCRA FACILITY INVESTIGATION
WORK PLAN

AlliedSignal Inc.
BUFFALO RESEARCH LABORATORY

1.0 INTRODUCTION

This document has been prepared by Remcor, Inc. (Remcor) under contract to AlliedSignal Inc. (AlliedSignal) to satisfy the requirements of the Resource Conservation and Recovery Act (RCRA) Permit (No. NYD00632315) for the AlliedSignal Buffalo Research Laboratory (facility) in Buffalo, New York (Figure 1-1).

In accordance with the Permit requirements, a RCRA Facility Assessment (RFA) was implemented in 1993 to determine the presence of a release or threatened release of hazardous constituents from one or more of four areas. These four areas, identified by the New York State Department of Environmental Conservation (NYSDEC) and U.S. Environmental Protection Agency (EPA), include:

- A RCRA Solid Waste Management Unit (SWMU), the Hazardous Waste Container Storage Area for which the RCRA Part B Permit was issued
- Three areas of concern (AOCs) not directly regulated by the RCRA Part B Permit:
  - AOC-1 - Storm Sewer System
  - AOC-2 - Activated Carbon System
  - AOC-3 - Drum Storage Area.

The locations of the SWMU and AOCs are shown in Figure 1-2.

The findings of the RFA[1] indicated the presence of hazardous constituents at concentrations above background. EPA and NYSDEC concluded,[2] therefore, that an RFI was required pursuant to the RCRA Permit.

The Permit identifies seven Project Tasks to be implemented pursuant to completion of an RFI. These tasks include:

- Task I - Description of Current Conditions
- Task II - Pre-Investigation Evaluation of Corrective Measure Technologies
- Task III - RFI Management Plans
- Task IV - Facility Investigation (RFI Work Plan)
- Task V - Investigation Analysis
- Task VI - Laboratory and Bench-Scale Studies
- Task VII - Reporting.

The Current Conditions Report (CCR),[3] completed as Project Task I was submitted to NYSDEC and EPA Region II on March 7, 1994. The Pre-Investigation Evaluation of Corrective Measure Technologies,[4] Project Task II, is submitted under separate cover concurrent with the submittal of this document.

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[1] Remcor, Inc., August 11, 1993, "Report, Field Sampling and Analysis Activities, RCRA Facility Assessment, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

[2] New York State Department of Environmental Conservation, Bureau of Western Hazardous Waste Programs, and U.S. Environmental Protection Agency Region II, December 7, 1993, "Notification to Conduct a RCRA Facility Investigation (RFI)," correspondence to AlliedSignal Inc.

[3] Remcor, Inc., March 7, 1994, "Current Conditions Report, AlliedSignal Inc., Buffalo Research Laboratory," AlliedSignal Inc., Buffalo, New York.

[4] Remcor, Inc., April 6, 1994, "Pre-Investigation Evaluation of Corrective Measures Technologies, AlliedSignal Inc., Buffalo Research Laboratory," AlliedSignal Inc., Buffalo, New York.

This document was prepared to meet the requirements of Project Tasks III and IV as defined in the Permit and in accordance with RCRA Facility Investigation Guidance.[5] The RFI Work Plan is presented in the following chapters. The RFI Management Plans are included as appendices to this document. In accordance with the Permit, these plans include:

- Project Management Plan (Appendix A)
- Data Management Plan (Appendix B)
- Quality Assurance Project Plan (QAPjP) (Appendix C)
- Health and Safety Plan (Appendix D)
- Community Relations Plan (Appendix E).

The seven key objectives to be addressed through the implementation of the RFI Work Plan are as follows:

- Characterization of the facility environmental setting
- Characterization and delineation of potential source areas
- Identification and characterization of constituents of interest (COIs)[6]
- Identification, characterization and delineation of impacted areas/media
- Identification of potential receptors
- Qualitative HEA to aid in assessing the need for a Corrective Measures Study (CMS).

The purpose of addressing these objectives and the general tasks (RFI Tasks 1 through 6), which have been identified to support these efforts, are discussed in the following chapter, Chapter 2.0. These tasks do not address additional investigation of AOC-2, the Activated

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[5] U.S. Environmental Protection Agency, May 1989, "RCRA Facility Investigation Guidance, Interim Final," Vols. I - IV, EPA 530/SW-89-031.

[6] COIs include all detected constituents; constituents of concern (COCs) include a subset of the COIs for which the reported concentrations exceed applicable state and/or federal screening levels. The COC list will be generated during the performance of the Potential Receptor Identification and Health and Environment Assessment (HEA), RFI Task 6.

Carbon System. The only detected constituents in samples collected from this area was xylenes at an estimated concentration of 5 micrograms per kilogram (μg/kg). Due to the detection of only one constituent and the low reported concentration,[7] additional evaluation under RCRA is not warranted.

Chapters 3.0 through 5.0 address Project Tasks V through VII, Investigation Analysis, Laboratory and Bench-Scale Studies, and Reporting, respectively. The anticipated schedule for implementation of the RFI is addressed in Chapter 6.0.

[7] The recommended soil cleanup objective for xylenes is 1,200 μg/kg (240 times the reported value), as published in the revised TAGM 4046 (New York State Department of Environmental Conservation, January 24, 1994, "Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels," HWR-94-4046 [TAGM 4046]).

2.0 SCOPE OF WORK

The RFI project approach is discussed in the following section, Section 2.1. The specific tasks (RFI Tasks) to be performed to meet the RFI objectives, pursuant to the Permit requirements, include:

- Task 1 - Data Search and Compilation
- Task 2 - Soils Investigation
- Task 3 - Hydrogeologic Investigation
- Task 4 - Storm Sewer Water Discharge Investigation
- Task 5 - Analytical Program
- Task 6 - Identification of Potential Receptors and HEA.

The applicability of these tasks to the project objectives and the scope of each task are addressed in Sections 2.2 through 2.7. The work scope for each task is technically focused to meet the project objectives and to address the information required pursuant to the RCRA Permit. In general, it is not currently anticipated that the work scopes will be significantly modified in the field based on conditions encountered. If warranted by field conditions or preliminary analytical results, however, the number and locations of the media samples and/or the sample analytical program may be modified to optimize achievement of project objectives.

Field and analytical tasks will be performed in accordance with the procedures specified in Appendix C, the QAPjP, and Appendix D, the Health and Safety Plan (HASP).

Investigation Analysis and RFI reporting requirements (Project Tasks V and VII identified in the RCRA Permit), which address data evaluation, interpretation, and presentation, are discussed in Chapters 3.0 and 5.0.

2.1 TECHNICAL APPROACH

The applicability of the seven RFI objectives to the overall project are discussed in the following subsections. The tasks selected to meet these objectives are also briefly identified. Table 2-1 presents a summary of the six RFI objectives and the applicable RFI tasks.

2.1.1 Environmental Setting Characterization

The environmental setting of the facility has a bearing on the potential migration of constituents of interest (media, direction, rate) and identification of potential receptors. Several elements of the field program will generate information to supplement the existing information (presented in the CCR). These elements are as follows:

- Precipitation, evapotranspiration, and wind direction and velocity data will be used to evaluate potential migration pathways and potential rates of migration (Task 1)
- The locations of local and regional surface water bodies will be used to determine the potential for impact from facility-related constituents (if any) and identify potential receptors (Task 1)
- Subsurface soils and bedrock information (geotechnical properties and classification) will be used to characterize and define the geologic materials encountered and evaluate potential migration pathways and rates (Tasks 2 and 5)
- Shallow ground water quality data for background locations will be used to evaluate potential upgradient sources of COIs or unimpacted water quality (Task 3b)
- Hydraulic conductivity data will be used to evaluate hydrogeologic conditions, including ground water flow velocities, and evaluate potential migration pathways (Task 3c)
- Ground water elevation data will be used to evaluate the magnitude and direction of hydraulic gradients and to evaluate potential migration pathways and flow directions (Task 3c).

2.1.2 Source Characterization and Delineation

The potential sources of releases of facility-related COIs to the environment had been identified as the SWMU, AOC-1, and AOC-3. Design and usage of the SWMU and AOCs were

identified in the CCR. Additional characteristics to be addressed through implementation of the RFI include the physical nature of the environmental media immediately proximate to the SWMU and AOCs, i.e., surface and subsurface conditions, as these media may act as sources or avenues for COI migration from the SWMU and AOCs to the environment. COIs present at the source must also be identified because the characteristics of these constituents will influence potential migration pathways and receptors.

Delineation of the source area, which may include the unit and/or adjacent soil, will be used to evaluate future potential migration to other media or expansion of the source, and the scope of potential corrective measures, if any.

As shown in Table 2-1, RFI Tasks 1 through 6 will each contribute data and information to support a more complete characterization of potential constituent source areas and SWMU- or AOC-specific COIs, and the delineation of the potential source areas/media.

2.1.3 COI Identification and Characterization

Identification and characterization of COIs are necessary to evaluate the potential for migration, the magnitude of impact relative to state and federal regulations, and the subsequent evaluation of the need for implementation of corrective measures.

Several COIs were identified during the implementation of the RFA (the analytical program addressed only volatile organic compounds [VOCs]). These constituents include:

- Acetone
- Benzene
- Chlorobenzene
- Chloroform
- Chlorofluorocarbon-113 and 141
- 1,1-Dichloroethane
- Methylene chloride
- Methyl isobutyl ketone[8]

[8] Methyl isobutyl ketone, a.k.a. 4-methyl-2-pentanone.

- Toluene
- Tetrachloroethene
- 1,1,1-Trichloroethane
- Trichloroethene
- Xylenes

and several VOC tentatively identified compounds (TICs).

The RFI analytical program has been increased in scope to include analysis for Target Compound List (TCL) VOCs,[9] the RCRA metals,[10] and cyanide. Additional VOC COIs may be identified in this manner; it is anticipated that a majority of the inorganics will be detected in the RFI samples, as they are naturally occurring.

The selection of these analytical parameters is based on the classification and constituent lists for hazardous wastes generated by the facility (Table 2-2).

Characterization of the COIs will be performed through a review of existing literature during implementation of Task 1. These characteristics will play a role in identifying potential constituent migration pathways and rates. The characteristics of these COIs will also impact the identification of potential receptors (Task 6).

2.1.4 Impacted Area Identification, Characterization, and Delineation

Identification, characterization, and delineation of impact from potential releases of COIs from the facility will drive the scope of potential corrective measures, if any.

Based on the current information on facility conditions and operations, the potential for COI impact is believed to be limited to the immediate proximity of the SWMU and AOCs and

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[9] TICs will not be evaluated or reported for the VOCs as these constituents are not regulated, i.e., there are no guidelines for acceptable concentrations.

[10] The RCRA metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

within the surface and shallow subsurface soils. The soil and ground water sampling and analysis (Tasks 2, 3b, and 5b) are designed to address both the characterization and delineation of both the sources and impacted areas. Implementation of these tasks will result in the identification and delineation of impact, characterization of the impacted media, and identification of COIs. If, based on the Investigation Analysis (Task 7), the impacted areas are not sufficiently delineated, a Phase II RFI Work Plan may be prepared and implemented.

2.1.5 Potential Receptors Identification and Health and Environment Assessment

The objective of this aspect of the RFI is to identify potential receptors of environmental media impacted by releases of COIs from the SWMU or AOIs. Preliminary identification of potential receptors was performed and presented in the CCR. Potential receptors include:

- Facility workers
- Downwind residents.

These receptors were identified based on our current understanding of facility conditions, COIs, surface and ground water flow and usage, and local land use and zoning. This understanding assumes no ground water usage, and treatment by the Buffalo Sewer Authority (BSA) of facility surface water runoff and other facility-related discharges to the storm sewer system prior to discharge to the Niagara River.

Surface soils are a current exposure pathway. Consequently, the collection of sufficient surface soil data (0 to 2 feet below ground surface [ft-bgs]) is critical. This information will be reevaluated during the RFI, via the development of a conceptual site model, to confirm the limitation of receptors to workers and residents.

As part of the RFI, the reported COI concentrations will be compared to applicable screening levels. COIs that are present at concentrations in excess of these levels will be classified as constituents of concern (COCs) (Task 6). An evaluation of the need for a CMS will be performed based on the COC concentrations relative to health risk-based values during the HEA (Task 6).

2.1.6 Corrective Measures Study Determination

Upon compilation of the RFI data, a determination of the need for a CMS will be performed. If the reported concentrations of COIs exceed screening levels (i.e., COCs) and the results of the qualitative HEA indicate potential adverse affects via the COCs, a CMS may be performed. If the qualitative HEA indicates no need for a CMS but reported COC concentrations exceed the screening levels, a CMS focusing on "hot spots" only may be performed.

Each of the project tasks will aid in addressing this project objective.

2.2 TASK 1 - DATA SEARCH AND COMPILATION

A significant amount of data and information on the facility/operations, etc., was compiled as part of the CCR. This information has been used to aid in the scoping of the RFI and will be used and presented in the RFI Report. The information to be collected and compiled during the RFI, and the existing information, will be used to evaluate current and future potential conditions and provide a basis/structure for evaluating the meaning of the RFI data.

Additional publicly available information to be collected and compiled during the RFI includes:

- Screening levels
- BSA discharge requirements
- Local ground water quality
- Residential population distribution
- Identification of manmade structures/facilities, which may impact ground water flow
- Confirmation of predominant wind direction
- Evaporation/precipitation data

- Storm water runoff (flow) for the facility
- Local air quality.

Implementation of this task will also include a review of existing literature and public information.

2.3 TASK 2 - SOILS INVESTIGATION

The characteristics of the surface and subsurface soils within and adjacent to the units will be evaluated to:

- Classify soil types and properties and depth to saturated materials
- Characterize the nature and delineate the extent of source areas, if a release is identified
- Identify the potential presence of COIs within/adjacent to the units
- Identify unit specific COIs, delineate the lateral and vertical extent of impacted media
- Assess soil properties that may impact potential constituent migration and/or potential corrective measures.

The chemical analytical data will also be compared with screening levels in conjunction with the HEA to determine the potential need for a CMS.

2.3.1 Investigation Scope

Twelve soil borings will be advanced proximate to the SWMU, AOC-1, and AOC-3. The proposed locations, which are shown in Figure 2-1, were selected to provide sufficient and appropriate areal coverage to support potential delineation of potential sources/impact.

Nine of these borings (well borings) will be completed as shallow ground water monitoring wells. These borings include:

- SWMU - MW-1, MW-2, and MW-3
- AOC-1 - MW-4 and MW-5
- AOC-3 - MW-6, MW-7, and MW-8.

Well Boring MW-9 will be completed to the top of the bedrock surface (anticipated to be approximately 60 ft-bgs) and will be backfilled to allow installation of a shallow upgradient monitoring well to be constructed. The additional depth will permit the identification of the underlying soil stratigraphy and, it is assumed, confirm the presence of the fine-grained lacustrine sediments and glacial (till) deposits. These units are thought to act as aquitards/ aquicludes that would act to prevent downward vertical ground water flow and potential downward migration of facility-related COIs.

Three shallow borings will be used only for the collection of soil sample collection. These test borings include SB-1 and SB-2 proximate to AOC-3 and SB-3 proximate to the SWMU.

Technical requirements for borehole completion and sample collection are provided below. Remcor's Standard Operating Procedures (SOPs), which are included as Attachment C.2 to the QAPjP, Appendix C, have been referenced to provide detailed information for project tasks. All field activities will be recorded in the field logbooks in accordance with SOP 3.11.1.

Detailed analytical requirements are addressed under Task 5, Section 2.6. Sample and analytical quality assurance measures are addressed in the QAPjP, Appendix C.

2.3.2 Soil Boring Completion

Boreholes will be advanced using hollow-stem augers (SOP 3.1.1). Well borings will be advanced with nominal 6-inch inside diameter (I.D.) augers; test borings will be advanced with nominal 3- or 4-inch I.D. augers. The test borings will be advanced to the uppermost saturated interval (water table), which is anticipated to be encountered within approximately 10 feet of the ground surface. Boreholes that are not to be completed as monitoring wells will

be grouted to ground surface using a cement and bentonite slurry; a cement cap will be placed at the surface.

The drill cuttings will be spread on the ground surface adjacent to the boreholes or in an area designated by AlliedSignal. Cuttings through the asphalt pavement will be placed on adjacent grassy areas; the asphalt will be disposed of as solid waste. Reseeding of grassy areas and patching of asphalt covered areas may be required.

The drilling rig and all downhole equipment will be decontaminated using a high-pressure steam-cleaner between each borehole location. The resultant decontamination water will be contained on site in polyethylene storage tanks. At the conclusion of the field investigation, composite water samples will be collected for analysis (Task 5 - Laboratory Program, Section 2.6). If the water meets the facility discharge requirements established under the Buffalo Pollution Discharge Elimination System (BPDES),[11] the water will be discharged directly to one or more of the facility outfalls to the BSA. If these requirements are not met, an alternative disposal will be selected in accordance with local, state, and federal requirements.

2.3.3 Surface and Subsurface Soil Sampling

A summary of the test and well borings to be completed, the anticipated depths, sample intervals, and analytical parameters are presented in Table 2-3. The sample collection methods and equipment decontamination procedures are discussed in the following subsections.

2.3.3.1 Sample Collection

Soil samples will be collected continuously, using a two-foot split-barrel sampler (SOPs 3.1.2 and 3.4.2) from the ground surface to the uppermost saturated interval in the test and well borings. The samples will be collected in advance of the lead auger so that undisturbed

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[11] BPDES requirements per Permit No. 94-01-BU001 for the AlliedSignal Buffalo Research Laboratory Outfalls 1, 2, and 3.

samples may be retrieved. Split-barrel samples will be collected from the deep well boring, MW-9, at five-foot intervals from the interface between the unsaturated and saturated soils to the top of bedrock (anticipated to be approximately 60 ft-bgs). Well borings will be advanced approximately eight feet below the uppermost saturated interval; one sample will be collected at the base of the borehole and one mid-way between the saturated/unsaturated interface. The saturated samples collected from the deep boring and the well borings will not be submitted for laboratory analysis.

Following sample retrieval, the split-barrels will be opened and immediately screened for the presence of VOCs using a photoionization detector (PID) (SOPs 3.4.4 and 3.8.2). The soils will be classified in accordance with the Soil Conservation System (SCS)[12] and American Society for Testing and Materials (ASTM).[13] Soil color will be classified according the Munsell® Soil Color Charts (Munsell).[14] Additional pertinent information: discoloration, odor, mottling, etc., will also be reported as defined in SOP 3.1.5. All information will be recorded in the field logbooks in accordance with SOP 3.11.1.

This information will be used to identify subsurface conditions that may affect ground water flow, temporal changes in ground water levels, constituent migration, and to determine the need for a CMS.

Samples collected from the ground surface (0 to 2 ft-bgs) and immediately above the uppermost saturated zone (anticipated to be 8 to 10 ft-bgs) will be placed in prelabeled, laboratory-prepared sample jars and placed in sample coolers (iced to approximately 4 degrees Celsius [°C]) for subsequent shipment to the analytical laboratory. Chain-of-custody protocols will

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[12] Soil Conservation Service, U.S. Department of Agriculture, March 1967, "Supplement to Soil Classification System."

[13] American Society for Testing and Materials, "Standard Practice for Description and Identification of Soils (Visual-Manual) Procedure," ASTM D-2488.

[14] Kollmorgen Instruments Corporation, 1992, "Munsell® Soil Color Charts."

be adhered to at all times (SOP 3.9.5). Sample handling, preservation, and shipping are addressed in SOPs 3.9.2 and 3.9.3.

Additional samples may be submitted for analysis if the presence of COIs is suspected on the basis of discoloration of the sample or PID results. Samples not selected for chemical laboratory analyses will also be placed in prelabeled glass sample jars. These samples will be used for subsequent evaluation of subsurface soil types, and identification of representative unsaturated and saturated soil types that are encountered at the facility. Select samples that are representative of facility conditions will be submitted for grain-size distribution.

During borehole advancement, an attempt will be made to collect undisturbed samples of unsaturated soils in thin-walled tubes (Shelby tubes) (SOP 3.4.2) from a maximum of two locations. As these materials are believed to be granular, with little cohesive materials present, it is not certain that such attempts will be successful. Shelby tubes will also be collected from one interval each in both the lacustrine and till deposits that are anticipated to be encountered in the deep well boring (MW-9). The thin-walled tube samples will be submitted for analysis of various geotechnical parameters.

2.3.3.2 Sample Equipment Decontamination

Split-barrel samplers will be decontaminated between each sample interval using the following decontamination protocols:

- Wash and scrub with low phosphate detergent
- Rinse with potable water
- Rinse with 10 percent nitric acid (HNO_3)
- Rinse with potable water
- Rinse with hexane
- Rinse with distilled water
- Air dry.

If equipment use is not immediate, the split-barrels will be wrapped in aluminum foil for storage/transport.

Other steps in the decontamination process are identified in SOP 3.10.2. Decontamination water will be contained and handled with the drilling decontamination water.

2.3.4 Soil Analytical Program

A detailed discussion of the chemical and geotechnical analytical programs are provided in Section 2.6 and in the QAPjP, Appendix C. The following subsections identify the soil parameters for which testing is to be performed. A summary of the samples and analyses is presented in Table 2-3.

2.3.4.1 Chemical Analyses

The chemical analytical samples will each be analyzed for the following parameters in order to identify potential source areas, extent of source and impacted areas, and the identification of constituents if interest, if any:

- TCL VOCs
- RCRA metals
- Cyanide.

In preparation for analysis, the moisture content of each soil sample will also be determined.

A maximum of five samples, representative of different soil types, will also be identified for analysis of cation exchange capacity (CEC) and total organic carbon. These data will be used to evaluate the ability of the soil materials in limiting/promoting/controlling potential migration of the COIs.

2.3.4.2 Geotechnical Analyses

Geotechnical data will be used evaluate potential constituent migration pathways and rates, and provide data that may impact the selection of potential corrective measures, if any.

A maximum of five samples, representative of facility soils types, will be submitted for grain-size analyses. A maximum of four thin-walled tube samples will be tested for relative

permeability, wet density, moisture content, specific gravity, and plasticity. The specific gravity and density data will then be used to calculate soil porosity, and the specific gravity data will be used to estimated storage capacity. If tube sample collection is not successful, bulk samples of representative materials will be used to determine relative permeabilities; density cannot be determined from bulk samples.

2.4 TASK 3 - HYDROGEOLOGIC INVESTIGATION

Shallow ground water quality underlying the facility will be evaluated, regardless of the absence of local ground water usage, pursuant to RFI requirements. The purpose of the investigation is to:

- Identify potential sources of ground water impact, if any, from the facility or upgradient sources
- Determine the presence/absence of COIs in ground water
- Delineate the lateral and vertical extent of impacted ground water
- Determine constituent distribution in impacted ground water
- Determine the rate and direction of ground water flow
- Evaluate COI concentrations in ground water versus permissible concentrations as established under various state and federal guidelines to identify COCs
- Evaluate the potential migration rate and direction of COIs in ground water.

Because there is currently no direct exposure route to human receptors via ground water, the ground water data will not as a means of evaluating potential impact on human health.

2.4.1 Investigation Scope

Shallow ground water monitoring wells will be installed at nine locations (MW-1 through MW-9) within or proximate to the three units. The well locations, shown in Figure 2-1, were selected to provide sufficient areal coverage proximate to each unit. Due to the distribution of the units, the well placement will also allow for an evaluation of facility-wide

ground water quality. Monitoring Well MW-9 will be installed within the deep boring (Section 2.3.1), which is hydraulically upgradient of the operational areas of the facility. The borehole will be backfilled prior to installation and the well installed to monitor water table conditions. Water quality in this location will be indicative of upgradient, off-site shallow ground water quality conditions.

The physical characteristics of the saturated materials will be addressed via the implementation of the Soils Investigation (Task 2). Aquifer characterization will be addressed via the performance of in-situ hydraulic conductivity tests for select wells.

Ground water samples will be collected from each of the well locations and submitted for analysis of TCL VOCs, RCRA metals, and cyanide.

Based on the presence of two units classified as aquicludes (lacustrine and glaciofluvial) that underlie the water-bearing alluvium at the facility, there is most likely only limited hydraulic communication between the alluvium and these units, i.e., limited potential for downward vertical head. The absence of surface water bodies proximate to the facility, conversely, limits the potential for a significant upward vertical head. Consequently, this task will not investigate vertical ground water flow potential.

The absence of significant water-bearing units, presence of aquicludes, the lack of ground water usage in the area, and the depth to bedrock eliminate the need for any additional characterization of the underlying bedrock with regard to stratigraphy and structure.

2.4.2 Subtask 3a - Monitoring Well Installation

The specifications for the three key steps to the successful installation of monitoring wells, construction, development, and surveying, are addressed in the following subsections.

2.4.2.1 Well Construction

The well borings will be advanced to approximately eight feet below the uppermost saturated interval using nominal 6-inch I.D. hollow-stem augers. General construction information is presented in SOP 3.2.1; the project-specific construction requirements are presented herein.

The wells will be constructed of nominal 2-inch diameter, threaded and flush-jointed Schedule 40 polyvinyl chloride (PVC) riser and 0.01-inch machine slot screen (10-foot lengths). The base of the well screen will be capped with a threaded bottom cap and placed at the base of the borehole.

A silica sand filter pack will be installed in the annular space between the screen and borehole wall to a minimum of 2 feet above the screened interval; a finer-grained sand filter, approximately 1 foot in thickness, will be placed above the coarser sand. A minimum 2-foot thick bentonite slurry seal will be placed above the fine sand.

The remaining annular space will be filled to near-grade with a cement/bentonite slurry. Neat cement will be used to complete the borehole at grade and to construct a protective pad at the surface. The protective pad will be constructed as appropriate to its facility location, i.e., where necessary the pad will be flush with the ground. Each well will be completed with a standing locking protective steel casing or locking protective cap (flush-mounts).

2.4.2.2 Well Development

Each of the wells will be developed, a minimum of 24-hours after completion, to remove materials (fines, etc.) that may have entered the borehole during construction and to promote hydraulic communication with the water-bearing zone. Well development is addressed in SOP 3.2.4. Due to the anticipated presence of fines, development methods may require low-volume submersible pumps, hand-pumps and bailers may also be used. Development will be considered complete when a minimum of three well volumes of water have been removed, pH, specific conductance, and temperature have stabilized ($\pm$10 percent for two consecutive

volumes). To the extent practicable, an attempt will be made to attain turbidity levels of less than 50 nephelometric units (NTUs).

Development water will be contained on site in polyvinyl tanks.[15]

2.4.2.3 Well Survey

To facilitate the appropriate location of the wells and borings on facility maps, accurate delineation of potential subsurface impacts, and determination of ground water elevations and flow directions, a survey of well and boring locations and elevations will be performed by a licensed surveyor.

The survey will be tied to a nearby United States Geologic Survey (USGS) benchmark. The ground surface elevation of each test and well boring will be determined, as will the elevation of the marked top-of-(PVC)casing (TOC) for each monitoring well (SOP 3.1.8). The locations of each sample location will also be surveyed. The survey will be completed to an accuracy of 0.1 and 0.01 foot for the locations and elevations, respectively.

The following additional locations will also be surveyed:

- Four corners of the SWMU
- AOC-1 (SW) ground surface and invert of pipe
- AOC-1 (SE) ground surface and invert of pipe
- Ground surface and invert of pipe at the two off-site sewer sampling locations.

[15] Purge water, produced during the ground water sampling task, will be combined with the development water. A grab sample of the purge and development water will be collected following completion of ground water sampling and submitted for analysis of parameters specified in the facilities' BPDES permit. If the data indicate that all detected constituents are present at concentrations below the limits established in the permit, the water will be discharged to the BSA; if the concentrations exceed these limits, the water will be disposed off site in accordance with applicable regulations.

2.4.2.4 Abandonment of Existing Observation Well

Existing Observation Well B-4, located in the grassy area west of Root Neal Company, will be abandoned as it serves no purpose in the evaluation of facility operations or potential impacts. Initially, the well cover will be removed and attempt made to pull the well from the borehole using the drilling rig. If successful, the resultant annular space will be back-filled with a cement/bentonite slurry. If pulling of the well is not successful, the well will be overdrilled with a six-inch or larger diameter hollow-stem auger to the bottom of the well. The well riser and screen will then be pulled; as the augers are removed the borehole will be permitted to collapse into the hole. If necessary, a cement/bentonite slurry and a cement cap will be used to complete the backfilling of this borehole.

2.4.3 Subtask 3b - Ground Water Quality Evaluation

Ground water samples will be collected from each of the facility monitoring wells and submitted for analysis of potential facility-related constituents. The resultant data will be used to evaluate upgradient water quality (i.e., potential impact on water quality from upgradient sources) and water quality as potentially impacted by the SWMU, AOC-1, or AOC-3.

2.4.3.1 Ground Water Sampling

Ground water samples will be collected from each of the proposed shallow monitoring well locations, MW-1 through MW-9. The sampling task will be implemented a minimum of two weeks after completion of well development to allow for stabilization of the wells.

In general, the sampling tasks includes the following steps:

- Water-level measurement and calculation of well volume
- Purging of a minimum of three well volumes from each well
- Sample collection
- Sample preservation, packaging and shipping.

Sample purging and collection are addressed in SOP 3.5.5; sample preservation and handling and packaging and shipping are addressed in SOPs 3.9.2 and 3.9.3, respectively. Chain-of-custody protocols will be adhered to at all times (SOP 3.9.5).

Well purging and sampling will be performed using submersible pumps or bottom-filling stainless steel bailers. The pumps and bailers will be decontaminated between each location using the decontamination procedures identified in Section 2.3.3.2; however, no solvents will be used in decontamination of the pumps. Decontamination water from this task will be contained and handled with the drilling and soil sampling decontamination water.

2.4.3.2 Ground Water Analytical Program

Ground water samples will be collected from each of the proposed well locations and submitted for laboratory analysis of select chemical parameters. A summary of the samples and analytical parameters is presented in Table 2-3. The samples will each be analyzed for the following parameters, and in the following order: TCL VOCs, RCRA metals, and cyanide.

Additional analyses will include the determination of field pH, specific conductance, and temperature (SOP 3.5.3) and laboratory determination of pH and specific conductance.

2.4.4 Subtask 3c - Aquifer Characterization

Several activities will be implemented to generated data and information on the facility subsurface, particularly the saturated materials. The data and information will be used to evaluate ground water flow patterns and velocities. The data may also be used to evaluate the potential for and rate of movement of the migration of COIs. Because the initial mode of transport from the SWMU and AOCs is via unsaturated materials, the vertical and horizontal permeabilities of these unsaturated soils/fill will also be determined through in-situ testing.

2.4.4.1 Water-Level Measurements

The static depth to water will be measured from the marked TOC for each facility monitoring well at various times during the investigation. These data will be used directly to

determine ground water flow directions and gradients. The data will also be used in conjunction with the permeability test (Section 2.4.4.2) data and geotechnical data (to determine porosity) to calculate horizontal ground water flow velocity.

Water-level measurement protocols are contained in the ground water sample collection (SOP 3.5.5).

2.4.4.2 In-Situ Permeability Tests

In-situ permeability tests will be performed during this investigation to estimate horizontal permeabilities in the saturated zone. These tests will be performed for each ground water monitoring well following ground water sample collection.

In-situ tests will be performed in accordance with the protocols presented in SOP 3.3.4. In general, these procedures require the measurement of the static water level, removal of a slug of water (which significantly changes the head), and continuous monitoring of the water levels until static conditions are again achieved. Water-level monitoring will be performed by using a downhole pressure transducer and data recorder/logger (SOP 3.3.4). The resultant data will then be reduced following Hvorslev[16] and/or Bouwer and Rice[17] to determine the hydraulic conductivity value for each well.

As stated previously, the hydraulic conductivity data will be used in conjunction with water-level gradients and porosity values to calculate horizontal ground water flow velocity and evaluate potential migration of constituents via ground water.

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[16] Hvorslev, M.J., 1951, "Time Lag and Soil Permeability in Ground Water Observations," U.S. Army Corps of Engineers, Waterways Experiment Station, Bulletin 36, Vicksburg, Mississippi, 50 pp.

[17] Bouwer, H. and R.C. Rice, 1976, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells," Water Resources Research, Vol. 12, No. 3.

2.5 TASK 4 - STORM SEWER WATER DISCHARGE INVESTIGATION

The storm sewer system (AOC-1) may act as a potential migration pathway for storm water impacted by the facility or treated process wastewater (AOC-2) and as a potential source to underlying/adjacent subsurface soils and ground water through potential openings in the lines.

2.5.1 Investigation Scope

Samples of water and sediments present in the storm sewer will be collected and submitted for analysis of potential facility-related constituents. Samples will also be collected from the storm sewer manholes immediately upgradient of the facility and submitted for laboratory analysis of facility-related constituents to identify potential off-site sources of these constituents, if any.

2.5.2 Sample Collection

Storm water and sediment samples will be collected from the southeast and southwest storm sewer manholes (Figure 2-1) and two off-site manhole locations. The off-site manholes will be identified following attainment of sewer line drawings from the City of Buffalo. The nearest upflow manhole locations will be selected for sample collection and analysis. Sample collection protocols are presented in SOPs 3.6.2 and 3.6.3. Following collection, the samples will be placed immediately in coolers chilled to approximately 4°C. Subsequent sample handling, preservation and shipping are addressed in SOPs 3.9.2 and 3.9.3. Chain-of-custody protocols will be adhered to at all times (SOP 3.9.5).

2.5.3 Storm Sewer Analytical Program

The water and sediment samples will be submitted for analysis of TCL VOCs, RCRA metals, and cyanide. pH and specific conductance will also be recorded for the water samples both in the field and laboratory. A summary of the samples and analyses is presented in Table 2-3.

2.6 TASK 5 - ANALYTICAL PROGRAM

Samples of surface and subsurface soils, ground water, and water and sediment samples from the storm sewer system will be collected during implementation of the RFI. In general, all the collected samples will be submitted for chemical analyses; select soil samples will also be submitted for geotechnical analyses. The chemical analytical program for all media samples are addressed in Subsection 2.6.1 and the geotechnical analytical program is presented in Subsection 2.6.2.

2.6.1 Subtask 5a - Chemical Analyses

The EPA Data Quality Objective (DQO) Level III for this project.[18] This DQO is generally used to provide data for site characterizations, environmental monitoring and support of engineering studies. The analyses for this project will be performed in accordance with:

- U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, Third Edition, as updated and revised.
- U.S. Environmental Protection Agency, 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020.

2.6.1.1 Sample Analytical Parameters

All soil and aqueous water samples will be analyzed for TCL VOCs and select inorganics. The listed wastes generated at this facility, and the hazardous constituents for which they are listed, are presented in Table 2-2. As shown in this table, the hazardous constituents are limited to a small group of VOCs and nine inorganics.[19]

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[18] U.S. Environmental Protection Agency, March 1987, "Data Quality Objectives for Remedial Response Actions," Vol. 1 - Development Process, EPA 540/G-87/003A.

[19] The TCL VOC analytical method will generate results for numerous VOCs in addition to those present in the facilities' listed wastes. Consequently, the full TCL VOC results will be reported. Inorganic analytical methods are typically unique for each constituent.

Moisture content will be determined for all soil samples in preparation for chemical analysis. Select soil samples (maximum of five) will be analyzed for CEC and total organic carbon content. Ground water and storm water discharge samples will be field tested for pH, specific conductance, and temperature. Laboratory analysis of aqueous samples will also include testing for pH and specific conductance.

The analytical program (samples, parameters) is summarized in Table 2-3; the analytical methods and detection limits are presented in Table 2-4.

2.6.1.2 Quality Control Sample Analytical Parameters

Several quality control (QC) samples will be prepared for the soil and aqueous samples in order to evaluate potential impacts on sample quality during field sampling or during analysis. A summary of these samples is presented in Table 2-3. Preparation, labeling and handling of these samples is addressed in the QAPjP, Appendix C.

For 1 in 10 matrix samples, a matrix duplicate will be prepared. The analytical program for the matrix duplicate will be identical to the sample matrix program.

For 1 in 10 matrix samples, a rinsate (equipment) blank will be prepared to evaluate the effectiveness of the field decontamination procedures. These blanks will be analyzed for the full parameter list for the applicable media.

For 1 in 10 matrix samples, for each parameter, a matrix spike (MS) and matrix spike duplicate (MSD) will be prepared. The MS and MSD will be submitted for the identical analytical program as the matrix sample for which they were prepared.

A laboratory-prepared trip blank will accompany the sample bottles in transit to the field (to the extent practicable), to the various sample locations, and back to the laboratory with each shipment of samples for VOC analysis.[20] The trip blanks will be analyzed only for the TCL VOCs.

2.6.2 Subtask 5b - Geotechnical Analyses

The geotechnical testing to be conducted for the RFI will provide quantitative data with which to evaluate the porosity and vertical permeability of the subsurface soils samples. The geotechnical testing of thin-walled samples will be conducted in accordance with the following methods:

- Grain-Size Distribution - ASTM D-422 - "Standard Method for Particle-Size Analysis of Soils."
- Permeability - ASTM D-2434 - "Standard Test Method for Permeability of Granular Soils (Constant Head)," or U.S. Army Corps of Engineers Engineering Manual EM 1110-2-1906, Appendix VII, "Permeability Tests."
- Wet Density - ASTM D-2166 - "Standard Test Method for Unconfined Compressive Strength of Cohesive Soil."
- Moisture Content - ASTM D-2216 - "Standard Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil-Aggregate Mixtures."[21]
- Specific Gravity - ASTM D-854 - "Standard Test Method for Specific Gravity of Soils."
- Plasticity Index - ASTM D-4318 - "Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils."

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[20] To the extent practicable, all VOC samples collected on any one date will be shipped in a single sample cooler, thereby limiting the number of required trip blanks to one per sampling day.

[21] The analyses for moisture content will also be performed by the chemical analytical laboratory for all samples to be analyzed for chemical parameters.

2.7 TASK 6 - POTENTIAL RECEPTOR IDENTIFICATION AND HEALTH AND ENVIRONMENT ASSESSMENT

2.7.1 Potential Receptors Identification

Potential receptors are identified on the basis of the media impacted by facility operations and the relationship of the facility with human populations. Based on the current understanding of facility conditions, potential receptors to impacted facility media have been identified as discussed below. Confirmatory evaluation of these receptors will be performed during the RFI based on newly generated data and other information.

There are four potentially impacted facility media: surface soil, subsurface soil, ground water and storm sewer water. Typically, potential receptors may include:

- Facility workers
- Trespassers
- Residents
- Construction workers.

Because the facility is currently active, and is anticipated to continue as an active facility, future exposure scenarios have not been considered in the identification of potential receptors.

Surface soils constitute the only media for which there is currently a potential for receptor exposure. There are no current potential receptors to impacted subsurface soils. Such exposure would require excavation of the overlying soils or via subgrade structures, i.e., basements. Ground water is not used as a water supply source for either potable or non-potable (industrial) use. Consequently, there are no potential receptors to impacted ground water. There are no surface water bodies proximate to the facility that could receive impacted storm or surface water runoff, or ground water discharge, hence, there are no potential receptors to impacted surface water.

The presence of buildings along the outer boundaries of the facility and a security fence, access to the facility is restricted. Entrance to the facility is limited to the administrative lobby in the Main Research Building and the north gate, which is controlled by a security guard. Consequently, there is no potential for exposure to facility surface soils by trespassers.

Although there are no facility residents, the potential exists for migration of COIs from impacted surface soil to downwind residents. Therefore, downwind residents are considered as potential receptors.

There are no ongoing construction projects at the facility. Consequently, construction workers are not considered as potential receptors.

2.7.2 Identification of Constituents of Concern

Following the receipt of all chemical analytical data, the reported concentrations of detected COIs will be evaluated against applicable state and federal guidelines. Those COIs with concentrations in excess of these guidelines will be classified as COCs.

2.7.3 Health and Environment Assessment

A qualitative HEA will be performed during the RFI to evaluate potential impacts to human health and the environment. The HEA will consider the impact of the COC on potential receptors and ecological conditions.

Based on the current understanding of facility conditions, surface soils pose the only current means of human health exposure to impacted media. There are two potential receptor populations, site workers and downwind residents. The potential routes of exposure via the surface soils are inhalation, ingestion, and dermal contact. Each of these issues will be re-evaluated upon completion of data compilation (Task 1), receipt of the chemical analytical data generated during the RFI, and selection of COCs.

Subsequently, the potential impact of the COCs on on-site workers via ingestion, inhalation, or dermal contact of impacted surface soils and downwind residents via inhalation of surface soils will be assessed. The assessment will include a comparison of the reported COC concentrations versus screening levels.

Because the facility is 100 percent maintained and access for wildlife is limited by fencing and location, the potential for nesting, feeding, etc., of habitat is prohibited. Consequently, there is little potential for ecological impact from facility-related constituents.

3.0 INVESTIGATION ANALYSIS

Project Task V requires an analysis of the investigation data and information. This task will be addressed via RFI Task 7, which includes an analysis of the data generated during the RFI and compilation of screening levels. The information generated during this task will be incorporated into the RFI Report (RFI Task 9).

3.1 DATA ANALYSIS

The quality and quantity of data and information generated during the RFI are believed to be adequate to define the extent of impact from potential facility releases of hazardous constituents on environmental media, identify the source of the release, identify potential migration pathways, identify potential receptors, identify the COCs, and evaluate potential impacts to human health and the environment as a result of exposure to these COCs.

The data and information generated during the RFI will be presented in the RFI Report. The data analysis, inclusive of the evaluation of the quality and quantity of data and interpretation of the data and information, will also be included in the RFI Report.

If it is determined that the data and/or information are inadequate to meet these expectations, AlliedSignal may elect to perform limited additional study to fulfill identified "Data Gaps." Examples of insufficient data quantity would include incomplete delineation of impacted media, e.g., the lateral extent of impacted subsurface soils is not defined. Additional study to address such a deficiency would include the completion of additional subsurface drilling or test pits and soil sample collection for chemical analyses.

Data quality deficiencies may result from matrix interference (resulting in rejection of constituent concentration data or elevated detection limits), lack of correlation between duplicate samples, or other data discrepancies. Deficiencies in data quality would most likely be addressed by recollection of samples and/or physical data.

3.2 MEDIA PROTECTION STANDARDS

Media protection standards applicable to the facility will be identified and compiled during this task. These standards will be used as a means of determining the need for a CMS based on reported constituent concentrations in excess of these standards. Alternatively, facility-specific standards may also be developed by AlliedSignal.

4.0 LABORATORY AND BENCH-SCALE STUDIES

The RFA data and the Pre-investigation Evaluation of Corrective Measures Technologies have indicated that no laboratory or bench-scale testing is required to evaluate the effectiveness of the potential remedial technologies that are anticipated at this time for the facility. If it becomes clear during the RFI that the conditions at the facility are dramatically different than those indicated by the RFA, the inclusion of bench-scale testing samples will be considered.

5.0 PROJECT REPORTING

The Permit, Module III, Condition E identifies reporting requirements pursuant to Project Task VII, Progress and RFI reports. The requirements for each report are addressed in Sections 5.1 and 5.3; Section 5.2 addresses the preparation of Technical Memoranda for select field investigation tasks.

5.1 SUBTASK 9a - PROGRESS REPORTS

Progress reports will be submitted to NYSDEC/EPA each calendar month, beginning with the first month following the approval of this Work Plan, and in accordance with the Permit requirements.

The progress reports will address, at a minimum, the following items:

- Description of work-in-progress and an estimate of the percentage of the RFI completed
- Summation of new findings during the reporting period
- Summation of changes or modification to the approved RFI Work Plan during the reporting period
- Summation of problems of technical or scheduling nature for the reporting period; and associated rectifying actions taken
- Changes in project personnel for reporting period
- Summation of contacts with representatives of the community, public interest groups, or agencies for the reporting period
- Copies of daily field reports, inspection reports, monitoring data, and analytical data generated during the reporting period
- Projected work for the subsequent reporting period.

The reports will also include the identification and summary of written correspondence and written/spoken communications pertinent to the project. Telephone memoranda, if any, will be attached to the progress reports.

5.2 TASK 9b - TECHNICAL MEMORANDA

Upon completion of each of the field tasks, a technical memorandum will be prepared. The field tasks include:

- Soil Investigation
- Storm Sewer Discharge Investigation
- Hydrogeologic Investigation:
  - Well Installation
  - Ground Water Quality Evaluation
  - Aquifer Characterization.

The memoranda will document the work performed and identify adjustments/modification to the approved work plans (based on field conditions [or other] encountered). All field data will be presented in the memoranda. Each memorandum will be included in an appendix to the RFI Report and the information briefly summarized within the RFI text.

5.3 TASK 9c - RFI REPORT

All data and information generated throughout the duration of the RFI will be compiled and evaluated in the RFI Report pursuant to the requirements of Project Tasks V and VII. The report will characterize the facility, summarize the data collected, and present an interpretation of the findings.

A draft RFI Report will be submitted to the agencies for review and comment in accordance with the schedule established in the Permit. A final RFI Report, incorporating the Agencies' comments, will be submitted to the EPA and NYSDEC Project Coordinators within 30 calendar days of receipt of their comments.

The findings and conclusions of the remedial investigation will be presented in the form of text, tables, and figures. The text will provide information on facility information, methods of investigation, investigation results, investigation analysis including data interpretation and data sufficiency, comparison of media standards with chemical analytical results, potential receptor identification and an HEA, and determination of the need for a CMS.

The text and figure presentations will include, but not be limited to, the following:

- Tabular Information:
  - Summary of sample media, samples collected and analyses performed
  - Summary of soil chemical analytical data
  - Summary of soil geotechnical data
  - Summary of ground water analytical data
  - Summary of aquifer characterization data
  - Summary of storm sewer sediment and water analytical data
  - Field testing data
  - Well construction details
  - Summary of screening levels
- Graphical Presentation:
  - Site map
  - Sample location maps
  - Ground water elevation contours and flow maps
  - Isoconcentration maps, if appropriate, for soil and ground water
  - Geologic cross sections (including lithologies and water elevations, and, if appropriate, distribution of select constituents in subsurface media).

These methods of data presentation will be used to support the conclusions of the report with regard to facility environmental conditions, source characterization, COI and COC identification and characterization, delineation of impacted media, identification of potential receptors and in support of the CMS.

Additional information that will be presented as appendices to the RFI Report will, at a minimum, include:

- Chemical analytical results
- Geotechnical results
- Calculations
- Daily field activity reports
- Well development sheets
- Soil, sediment and ground water collection forms
- Equipment calibration results
- Boring logs and monitoring well construction diagrams.
- Technical memoranda.

6.0 PROJECT SCHEDULE

The anticipated project schedule, based on the current RFI Scope of Work, is presented as Figure 6-1. As shown in this figure, the schedule for completion of the RFI, from Work Plan approval through submittal of the draft RFI Report to NYSDEC and EPA, is approximately six months.

Task 1, Data Compilation and Review, will commence immediately upon RFI Work Plan approval and continue as data and information are generated. The potential receptors identification and HEA and investigation analyses, Tasks 6 and 7, will be initiated during the field investigation. Tasks 1, 6, and 7 will continue into preparation of the RFI Report (Task 9c).

The field investigation tasks (Tasks 2, 3, and 4) will be initiated within approximately 30 days of receipt of RFI Work Plan approval by NYSDEC and EPA. The field tasks will be completed, through aquifer characterization, within six weeks of initiation of the field program.

The analytical program (Task 5) will be initiated immediately following startup of the field tasks. Assuming a four-week turnaround time for analytical results, the analytical program will be complete within approximately ten weeks of the field investigation initiation and four weeks after completion of the ground water sample collection.

It is currently not anticipated that laboratory or bench-scale studies will be applicable to potential corrective measures for the facility, if any. Consequently, no time is allotted in the schedule for this potential task.

Progress reports will be prepared and submitted to NYSDEC/EPA each month following approval of the RFI Work Plan and continuing to the submittal of the draft RFI Report. Technical memoranda are scheduled for submittal within approximately four weeks of receipt of

all task analytical data. Memoranda will be prepared for the Soils, Hydrogeologic, and Storm Sewer Discharge investigations only.

The preliminary draft of the RFI Report will be submitted to AlliedSignal for review and comment within approximately five months of Work Plan approval and within seven weeks of receipt of all laboratory analytical data. Following a review period of approximately two weeks and a revision period of two weeks, the draft RFI Report will be submitted to NYSDEC/EPA within approximately 11 weeks of receipt of analytical data and 7 months or 27 weeks of Work Plan approval.

Any changes to the current work scope may require an extension to this anticipated schedule. Any extension to the schedule will be agreed to by AlliedSignal, the Prime Contractor, and NYSDEC/EPA at the time of modification, etc., to this RFI Work Plan.

TABLE 2-1
RFI OBJECTIVES AND RELATED RFI TASKS
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

RFI OBJECTIVE	RELATED RFI TASKS
ENVIRONMENTAL SETTING CHARACTERIZATION	Task 1 – Data Search and Compilation Task 2 – Soils Investigation Task 3 – Hydrogeologic Investigation Subtask 3b – Ground Water Quality Evaluation Subtask 3c – Aquifer Characterization Task 5 – Analytical Program Subtask 5b – Geotechnical Analyses
SOURCE AREA CHARACTERIZATION AND DELINEATION	Task 1 – Data Search and Compilation Task 2 – Soils Investigation Task 3 – Hydrogeologic Investigation Subtask 3b – Ground Water Quality Evaluation Subtask 3c – Aquifer Characterization Task 4 – Storm Sewer Discharge Investigation Task 5 – Analytical Program Subtask 5a – Chemical Analyses Subtask 5b – Geotechnical Analyses
COI IDENTIFICATION AND CHARACTERIZATION	Task 1 – Data Search and Compilation Task 2 – Soils Investigation Task 3 – Hydrogeologic Investigation Subtask 3b – Ground Water Quality Evaluation Task 4 – Storm Sewer Discharge Investigation Task 5 – Analytical Program Subtask 5a – Chemical Analyses
IMPACTED AREA IDENTIFICATION, CHARACTERIZATION, AND DELINEATION	Task 2 – Soils Investigation Task 3 – Hydrogeologic Investigation Subtask 3b – Ground Water Quality Evaluation Subtask 3c – Aquifer Characterization Task 5 – Analytical Program Subtask 5a – Chemical Analyses Subtask 5b – Geotechnical Analyses
POTENTIAL RECEPTOR IDENTIFICATION AND HEALTH AND ENVIRONMENT ASSESSMENT	Task 1 – Data Search and Compilation Task 2 – Soils Investigation Task 3 – Hydrogeologic Investigation Subtask 3b – Ground Water Quality Evaluation Subtask 3c – Aquifer Characterization Task 4 – Storm Sewer Discharge Investigation Task 5 – Analytical Program Subtask 5a – Chemical Analyses Subtask 5b – Geotechnical Analyses Task 6 – Potential Receptor Identification and Health and Environment Assessment
CORRECTIVE MEASURES STUDY DETERMINATION	Task 1 – Data Search and Compilation Task 2 – Soils Investigation Task 3 – Hydrogeologic Investigation Subtask 3b – Ground Water Quality Evaluation Subtask 3c – Aquifer Characterization Task 4 – Storm Sewer Discharge Investigation Task 5 – Analytical Program Subtask 5a – Chemical Analyses Subtask 5b – Geotechnical Analyses Task 6 – Potential Receptor Identification and Health and Environment Assessment

TABLE 2-2
CLASSIFICATION AND DESCRIPTION OF GENERATED HAZARDOUS WASTES
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

EPA HAZARDOUS WASTE NO. (a)	DESCRIPTION	HAZARDOUS CONSTITUENTS FOR WHICH LISTED	PHYSICAL STATE
F-001	Spent degreasing solvents	Tetrachloroethene, methylene chloride, trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons	Liquid
F-002	Spent halogenated solvents	Tetrachloroethene, methylene chloride, trichloroethene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane	Liquid
F-003	Spent non-halogenated solvents	Not identified	Liquid
F-004	Spent non-halogenated solvents	Cresols and cresylic acid, nitrobenzene	Liquid
F-005	Spent non-halogenated solvents	Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine	Liquid
F-007	Spent plating batch solutions	Cyanide (salts)	Liquid
F-008	Plating bath sludges	Cyanide (salts)	Liquid
F-009	Spent stripping and cleaning bath solutions	Cyanide (salts)	Liquid
D-001	Ignitable	No constituents specified	Liquid
D-002	Corrosive	No constituents specified	Liquid-Solid
D-003	Reactive	No constituents specified	Liquid-Solid
D-004	Ethanol containing arsenic oxide	Arsenic	Liquid
D-005	Barium wastes (greater than 100 mg/l)	Barium	Liquid-Solid
D-006	Cadmium wastes (greater than 1 mg/l)	Cadmium	Liquid-Solid
D-007	Chromium wastes (greater than 5 mg/l)	Chromium	Liquid-Solid
D-008	Lead wastes (greater than 5 mg/l)	Lead	Liquid-Solid
D-009	Mercury wastes (greater than 0.2 mg/l)	Mercury	Liquid-Solid
D-010	Selenium wastes (greater than 1 mg/l)	Selenium	Liquid-Solid
D-011	Silver wastes (greater than 5 mg/l)	Silver	Liquid-Solid

NOTES:
(a) Classifications per 40 Code of Federal Regulations 261.

TABLE 2-3
SAMPLE AND ANALYTICAL SUMMARY
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

SAMPLE LOCATION	SAMPLE IDENTIFICATION	SAMPLE INTERVAL (a)	SAMPLE MEDIA	PARAMETERS										
				TCL VOCs (b)	INORGANICS (c)	pH (d)	SPECIFIC CONDUCTANCE (d)	TEMPERATURE (d)	CATION EXCHANGE CAPACITY (e)	TOTAL ORGANIC CARBON (e)	MOISTURE CONTENT	GRAIN SIZE (f)	THIN-WALLED TUBES (g)
SOILS INVESTIGATION													
SB-1	BRL-SB1-0002	0-2	SOIL	1	1	- (h)	-	-	-	-	1	1	-
	BRL-SB1-0810	**8-10**	**SOIL**	**1**	**1**	-	-	-	**1**	1	1	-	-
SB-2	BRL-SB2-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-SB2-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	1
SB-3	BRL-SB3-0002	0-2	SOIL	1	1	-	-	-	-	-	1	1	-
	BRL-SB3-0810	8-10	SOIL	1	1	-	-	-	1	1	1	-	-
MW-1	BRL-MW1-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW1-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-2	BRL-MW2-0002	0-2	SOIL	1	1	-	-	-	-	-	1	1	-
	BRL-MW2-0810	8-10	SOIL	1	1	-	-	-	1	1	1	-	-
MW-3	BRL-MW3-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW3-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-4	BRL-MW4-0002	0-2	SOIL	1	1	-	-	-	1	1	1	-	-
	BRL-MW4-0810	8-10	SOIL	1	1	-	-	-	-	-	1	1	-
MW-5	BRL-MW5-0002	0-2	SOIL	1	1	-	-	-	1	1	1	-	-
	BRL-MW5-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	1
MW-6	BRL-MW6-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW6-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-7	BRL-MW7-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW7-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-8	BRL-MW8-0002	0-2	SOIL	1	1	-	-	-	-	-	1	1	-
	BRL-MW8-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-9	BRL-MW9-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW9-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW9-3032	30-32	SOIL	-	-	-	-	-	-	-	-	-	1
	BRL-MW9-5052	50-52	SOIL	-	-	-	-	-	-	-	-	-	1
TOTAL SOIL MATRIX SAMPLES				24	24	0	0	0	5	5	24	5	4
QUALITY CONTROL SAMPLES													
DUPLICATES (i)			SOIL	3	3	-	-	-	1	1	3	-	-
EQUIPMENT BLANKS (j)			AQUEOUS	3	3	-	-	-	-	-	-	-	-
MS/MSDs (k)			SOIL	6	6	-	-	-	-	-	-	-	-
TRIP BLANKS (l)			AQUEOUS	5	-	-	-	-	-	-	-	-	-
TOTAL SOIL INVESTIGATION SAMPLES				41	38	0	0	0	6	6	27	5	4
HYDROGEOLOGIC INVESTIGATION													
MW-1	BRL-MW1-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-2	BRL-MW2-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-3	BRL-MW3-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-4	BRL-MW4-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-5	BRL-MW5-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-6	BRL-MW6-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-7	BRL-MW7-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-8	BRL-MW8-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-9	BRL-MW9-0894	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
TOTAL MATRIX SAMPLES				9	9	9	9	9	0	0	0	0	0
QUALITY CONTROL SAMPLES													
DUPLICATES			AQUEOUS	1	1	1	1	1	-	-	-	-	-
EQUIPMENT BLANKS			AQUEOUS	1	1	-	-	-	-	-	-	-	-
MS/MSDs			AQUEOUS	2	2	-	-	-	-	-	-	-	-
TRIP BLANKS			AQUEOUS	2	-	-	-	-	-	-	-	-	-
TOTAL HYDROGEOLOGIC INVESTIGATION SAMPLES				15	13	10	10	10	0	0	0	0	0

TABLE 2-3
(CONTINUED)

SAMPLE LOCATION	SAMPLE IDENTIFICATION	SAMPLE INTERVAL	SAMPLE MEDIA	PARAMETERS: TCL VOCs	INORGANICS	pH	SPECIFIC CONDUCTANCE	TEMPERATURE	CATION EXCHANGE CAPACITY	TOTAL ORGANIC CARBON	MOISTURE CONTENT	GRAIN SIZE	THIN-WALLED TUBES
STORM SEWER DISCHARGE INVESTIGATION													
SOUTHEAST MANHOLE	BRL-SW-SE-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-SE-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
SOUTHWEST MANHOLE	BRL-SW-SW-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-SW-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
OFF-SITE MANHOLE	BRL-SW-OSE-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-OSE-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
OFF-SITE MANHOLE	BRL-SW-OSW-694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-OSW-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
TOTAL MATRIX SAMPLES				8	8	4	4	4	0	0	0	0	0
QUALITY CONTROL SAMPLES													
DUPLICATES (AQUEOUS)			AQUEOUS	1	1	1	1	1	-	-	-	-	-
DUPLICATES (SOLID)			SOLID	1	1	-	-	-	-	-	-	-	-
EQUIPMENT BLANKS (AQUEOUS)			AQUEOUS	1	1	-	-	-	-	-	-	-	-
EQUIPMENT BLANKS (SOLID)			AQUEOUS	1	1	-	-	-	-	-	-	-	-
MS/MSDs (AQUEOUS)			AQUEOUS	2	2	-	-	-	-	-	-	-	-
MS/MSDs (SOLID)			SOLID	2	2	-	-	-	-	-	-	-	-
TRIP BLANKS (AQUEOUS)			AQUEOUS	1	-	-	-	-	-	-	-	-	-
TRIP BLANKS (SOLID)			AQUEOUS	1	-	-	-	-	-	-	-	-	-
TOTAL STORM SEWER DISCHARGE INVESTIGATION SAMPLES				18	18	5	5	5	0	0	0	0	0

NOTES:

(a) Sample intervals presented in feet below ground surface (ft-bgs).

(b) "TCL VOCs" indicates target compound list volatile organic compounds.

(c) The inorganics include: cyanide (total), arsenic, barium, cadmium, chromium (total), lead, mercury, selenium and silver.

(d) pH and specific conductance will be recorded both in the field and the analytical laboratory for ground water and surface water samples. Temperature will be recorded in the field only.

(e) A maximum of five samples representative of identified soil types will be collected for cation exchange capacity and total organic carbon. The sample locations indicated in this table do not necessarily represent the final sample locations.

(f) A maximum of five samples representative of identified soil types will be collected for grain size analysis. The sample locations indicated in this table do not necessarily represent the final sample locations.

(g) A maximum of four samples representative of fine-grained zones of soils encountered during the drilling program will be collected using thin-walled tubes. These samples will be submitted for geotechnical analysis of wet density, moisture content, plasticity index, permeability and specific gravity.

(h) "-" indicates not applicable.

(i) A duplicate will be collected for one in 10 matrix samples and submitted for chemical analysis of the matrix parameter list.

(j) An equipment blank will be prepared for one in 10 matrix samples using the decontaminated sample collection equipment. These blanks will be submitted for analysis of VOCs and the inorganics only.

(k) "MS/MSDs" indicates matrix spike and matrix spike duplicates. One MS and one MSD will be prepared for one in 10 matrix samples and submitted for analysis of VOCs and the inorganics only.

(l) Trip blanks will be prepared for each shipment of samples that are to be analyzed for VOCs; the trip blanks will only be analyzed for VOCs only.

ANALYTICAL PARAMETERS, METHODS AND QUANTITATION LIMITS
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

PARAMETERS	CAS NUMBER	ANALYTICAL METHOD	METHOD DETECTION LIMITS AQUEOUS (ug/l) (a)	METHOD DETECTION LIMITS SOIL (ug/kg)
VOLATILE ORGANIC COMPOUNDS				
Chloromethane	74-87-3	SW-846 8240 (b)	2.3	7.0
Bromomethane	74-83-9	SW-846 8240	2.4	7.0
Vinyl Chloride	75-01-4	SW-846 8240	2.9	9.0
Chloroethane	75-00-3	SW-846 8240	2.3	6.0
Methylene Chloride	75-09-2	SW-846 8240	0.3	2.0
Acetone	67-64-1	SW-846 8240	1	3,000
Carbon Disulfide	75-15-0	SW-846 8240	1	3,000
1,1-Dichloroethene	75-35-4	SW-846 8240	0.4	2.0
1,1-Dichloroethane	75-34-3	SW-846 8240	0.5	3.0
1,2-Dichloroethene (total)	540-59-0	SW-846 8240	0.4 (c)	2.0 (c)
Chloroform	67-66-3	SW-846 8240	0.4	2.0
1,2-Dichloroethane	107-06-2	SW-846 8240	0.4	2.0
2-Butanone	78-93-3	SW-846 8240	1	3,000
1,1,1-Trichloroethane	71-55-6	SW-846 8240	0.4	3.0
Carbon Tetrachloride	56-23-5	SW-846 8240	0.3	2.0
Bromodichloromethane	75-27-4	SW-846 8240	0.4	2.0
1,2-Dichloropropane	78-87-5	SW-846 8240	1	3,000
cis-1,3-Dichloropropene	10061-01-5	SW-846 8240	0.7	3.5
Trichloroethene	79-01-6	SW-846 8240	0.3	2.0
Dibromochloromethane	124-48-1	SW-846 8240	1	3,000
1,1,2-Trichloroethane	79-00-5	SW-846 8240	0.6	3.0
Benzene	71-43-2	SW-846 8240	0.2	1.0
trans-1,3-Dichloropropene	10061-02-6	SW-846 8240	1.1	6.0
Bromoform	75-25-2	SW-846 8240	0.3	2.0
4-Methyl-2-Pentanone	108-10-1	SW-846 8240	1	3,000
2-Hexanone	591-78-6	SW-846 8240	1	3,000
Tetrachloroethene	127-18-4	SW-846 8240	0.2	1.0
Toluene	108-88-3	SW-846 8240	0.4	2.0
1,1,2,2-Tetrachloroethane	79-34-5	SW-846 8240	0.4	2.0
Chlorobenzene	108-90-7	SW-846 8240	0.6	3.0
Ethylbenzene	100-41-4	SW-846 8240	0.4	2.0
Styrene	100-42-5	SW-846 8240	0.4	2.0
Xylenes (total)	1330-20-7	SW-846 8240	0.4/0.5 (d)	2.0 (d)
INORGANICS			(mg/l)	(mg/kg)
Arsenic	- (e)	EPA 7060 (f)	0.002	0.5
Barium	-	EPA 6010	0.001	0.2
Cadmium	-	EPA 6010	0.002	0.2
Chromium (total)	-	EPA 6010	0.004	5
Lead	-	EPA 6010	0.02	10
Mercury	-	EPA 7471	0.0001	0.05
Selenium	-	EPA 7740	0.002	0.2
Silver	-	EPA 6010	0.01	0.5
Cyanide (total)	-	EPA 9011/9012	0.0002	0.01
MISCELLANEOUS				
pH (at 20 degrees Celsius) (g)	-	EPA 9040	-	-
Specific Conductivity (umhos/cm) (g)	-	EPA 9050	5	-
Temperature (degrees Celsius) (h)	-	-	-	-
Cation Exchange Capacity (mg/kg)	-	EPA 9080	-	50
Total Organic Carbon (mg/kg)	-	ASTM D-3176 (i)	-	100
GEOTECHNICAL				
Grain Size Distribution	-	ASTM D-422	-	-
Permeability	-	ASTM D-2434	-	-
Wet Density	-	ASTM D-2188	-	-
Moisture Content (j)	-	ASTM D-2216	-	-
Specific Gravity	-	ASTM D-854	-	-
Plasticity Index	-	ASTM D-4318	-	-

NOTES:

(a) "ug/l" and "mg/l" indicate micro and milligrams per liter; "ug/kg" and ug/l" indicate micro and milligrams per kilogram. "umhos/cm" indicats micro ohms per centimeter.

(b) U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Chemical/Physical Methods," SW-846, 3rd edition as updated and revised.

(c) The detection limits the cis- and trans-1,2-dichloroethene isomers are both 0.4 ug/l and 2.0 ug/kg for aqueous and solid samples, respectively.

(d) The aqueous detection limit for the o-xylene isomer is 0.4 ug/l and the aqueous detection limit for the m- & p-xylene isomers is 0.5 ug/l.

(e) "-" indicates not applicable.

(f) U.S. Environmental Protection Agency, 1983, "Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020.

(g) pH and specific conductivity will be recorded both in the field and the laboratory.

(h) Temperature will be recorded only in the field.

(i) "ASTM" indicates American Society for Testing and Materials methods.

(j) Moisture content will be determined for each of the chemical and thin-walled tube samples.

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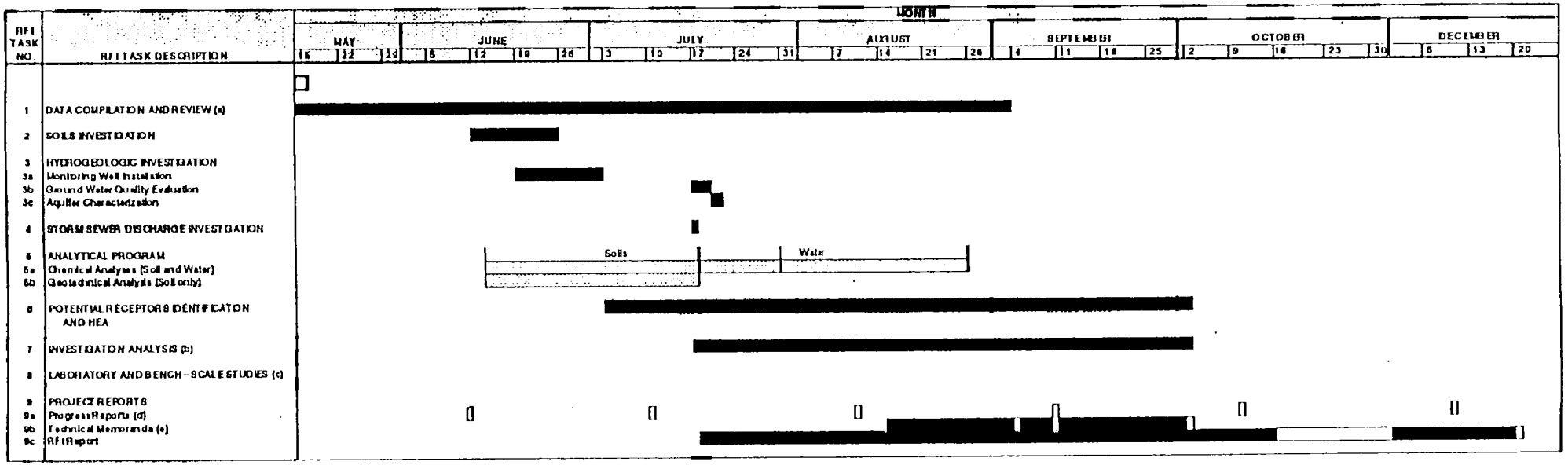
FIGURE 6-1
ANTICIPATED PROJECT SCHEDULE
BUFFALO RESEARCH LABORATORY
AlliedSignal INC., BUFFALO, NEW YORK



NOTES:

(a) RFI Tasks 1 through 6 reflect the requirements of Project Task IV, as defined in the Permit, Module III, Condition E.
(b) RFI Task 7 reflects the requirements of Project Task V, as defined in the Permit, Module III, Condition E.
(c) Based on the Pre-Investigation Evaluation of Corrective Measure Technologies, Project Task VI, as defined in the Permit, Module III, Condition E, laboratory or bench-scale studies are not necessary for the identified potential corrective measures.
(d) RFI Tasks 9a and 9c reflect the requirements of Project Task VII, as defined in the Permit, Module III, Condition E.
(e) Technical Memoranda will be submitted within approximately 2 weeks of receipt of the laboratory data (where appropriate); the submittal dates shown indicate submittals for the Soils Investigation, the Storm Sewer Discharge Investigation, and the Hydrogeologic Investigation and Data Validation.

LEGEND

- NYSDEC/EPA APPROVALS
- ACTIVE TASK
- LABORATORY ANALYSIS
- ALLIEDSIGNAL REVIEW
- SUBMITTALS TO NYSDEC/EPA

:22078

LIST OF REFERENCES

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APPENDIX B

NYSDEC's RCRA Quality Assurance Project Plan (QAPP) Guidance)

DRAFT
APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

BUFFALO RESEARCH LABORATORY
BUFFALO, NEW YORK

prepared for

AlliedSignal Inc.
BUFFALO RESEARCH LABORATORY
BUFFALO, NEW YORK

APRIL 6, 1994

PROJECT NO. 92149

REMCOR, INC.
PITTSBURGH, PENNSYLVANIA

Prime Contractor Project Manager

William R. Hanavan
Supervisor, Safety, Environmental
& Health Services
Buffalo Research Laboratory

Prime Contractor Corporate Quality
Assurance Officer

:22666

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

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APPENDIX C
QUALITY ASSURANCE PROJECT PLAN

C.1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) has been prepared for the Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI) to be conducted at the AlliedSignal Inc. (AlliedSignal) Buffalo Research Laboratory in Buffalo, New York.

Contained within this RFI Work Plan[1] appendix are specific field and laboratory procedures to be followed during the RFI to document and ensure the appropriateness, accuracy, and validity of the data generated. The RFI will be performed to fulfill specific U.S. Environmental Protection Agency (EPA) requirements in accordance with the facilities' RCRA Part B Permit (No. NYD000632315) (RCRA Permit). The work scope addresses four areas in the facility that are potential sources of releases or threatened releases of hazardous constituents. These areas include:

- A RCRA Solid Waste Management Unit (SWMU), the Hazardous Waste Container Storage Area for which the RCRA Permit was issued
- Three areas of concern (AOCs) not regulated directly by the RCRA Permit:
  - AOC-1 - Storm Sewer System
  - AOC-2 - Activated Carbon System[2]
  - AOC-3 - Drum Storage Area.

The locations of the SWMU and AOCs are shown in Figure C-1.

---

[1] Remcor, Inc., April 6, 1994, "RCRA Facility Investigation Work Plan, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

[2] As discussed in the RFI Work Plan, this AOC will not be evaluated during the RFI.

This QAPjP has been prepared in accordance with the following guidelines:

- U.S. Environmental Protection Agency, May 1989, "Interim Final RFI Guidance," EPA 530/SW-89-031.
- U.S. Environmental Protection Agency, February 1983, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," EPA 600/4-83-004 (QAMS 005/80).
- New York State Department of Environmental Conservation, March 22, 1991, "Technical and Administrative Guidance Memorandum: Quality Assurance Project Plan," No. 3014 (TAGM 3014).

To comply with the requirements set forth in QAMS 005/80, the QAPjP considers and addresses 16 required items. A summary of these items and the location in the document in which the items are addressed are included as Attachment C.1 of this document.

The following issues, which typically correspond to these required items, are addressed in the subsequent chapters as noted:

- Chapter C.2.0 - Project Description
- Chapter C.3.0 - Project Organization and Responsibility
- Chapter C.4.0 - Quality Assurance Objectives
- Chapter C.5.0 - Field Measurements and Sample Collection
- Chapter C.6.0 - Sample Labeling, Handling, and Custody
- Chapter C.7.0 - Equipment Decontamination
- Chapter C.8.0 - Recordkeeping and Documentation
- Chapters C.9.0 through C.14.0 - Laboratory and Field Analytical Requirements
- Chapter C.15.0 - Corrective Action
- Chapter C.16.0 - Quality Assurance Reporting.

C.2.0 PROJECT DESCRIPTION

The RFI Work Plan will be implemented to confirm information collected during a RCRA Facility Assessment (RFA) conducted at the facility in 1993.[3]

The technical objectives of the RFI include:

- Characterization of the environmental setting of the facility
- Identification of facility-related constituents of interest (COIs)[4]
- Confirmation of the sources of COIs, if any
- Delineation of the extent of the COIs
- Identification of potential receptors
- Identification of constituents of concern (COCs)[5]
- Assessment of impact of COCs on (human) health and the environment.

The attainment of these objectives and the results of the RFI will be adequate to support the determination for the need for a Corrective Measures Study (CMS).

The RFI objectives will be met through implementation of the proposed work scope comprised of seven key tasks:

- Task 1 - Data Search and Compilation
- Task 2 - Soils Investigation
- Task 3 - Hydrogeologic Investigation
- Task 4 - Storm Sewer Discharge Investigation

---

[3] Remcor, Inc., August 11, 1993, "Report, Field Sampling and Analysis Activities, RCRA Facility Assessment, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

[4] Constituents of interest (COIs) are facility-related constituents that are detected in one or more of the sample media.

[5] Constituents of concern (COCs) are COIs that are present at concentrations in excess of applicable screening levels.

- Task 5 - Analytical Program
- Task 6 - Potential Receptors Identification and (Human) Health and Environment Assessment (HEA).

Subsequent to completion of these tasks, an analyses of the investigation is to be performed (Task 7). The results and conclusions generated during these activities will be presented in the RFI Report (Task 9).

Task 8, if necessary, will address the performance of a laboratory or bench-scale testing. Based on current information, i.e., Current Conditions Report (CCR)[6] and Pre-Investigation Evaluation of Corrective Measures (PIECM),[7] such testing is not appropriate.

The RFI Work Plan specifically defines test locations, sample media, laboratory analyses, and evaluation and assessment procedures required to fulfill RFI objectives for Tasks 1 through 9. A brief description of each of these activities is provided in the following sections.

C.2.1 TASK 1 - DATA SEARCH AND COMPILATION

A significant amount of data and information on the facility/operations, etc., was compiled as part of the CCR. This information has been used to aid in the scoping of the RFI and will be used and presented in the RFI Report. The information to be collected and compiled during the RFI, and the existing information, will be used to evaluate current and future potential conditions and provide a basis/structure for evaluating the meaning of the RFI data.

---

[6] Remcor, Inc., March 7, 1994, "Current Conditions Report, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

[7] Remcor, Inc., April 6, 1994, "Pre-Investigation Evaluation of Corrective Measures, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York."

Additional information to be collected and compiled during the RFI includes:

- Screening levels
- Buffalo Sewer Authority (BSA) discharge requirements
- Local ground water quality
- Residential population distribution
- Identification of manmade structures/facilities, which may impact ground water flow
- Confirmation of predominant wind direction
- Evaporation/precipitation data
- Storm water runoff (flow) for the facility
- Local air quality.

Implementation of this task will also include a review of existing literature and public information. The QAPjP does not address data search and compilation due to the nature of this task.

C.2.2 TASK 2 - SOILS INVESTIGATION

The work scope for this task includes drilling and surface and subsurface soil sample collection for laboratory analysis of chemical and geotechnical parameters. The characteristics of the surface and subsurface soils within and adjacent to the areas will be evaluated to:

- Classify soil types and properties and depth to saturated materials
- Characterize the nature and delineate the extent of source areas, if a release is identified
- Identify the potential presence of COIs within/adjacent to the areas
- Identify unit specific COIs, delineate the lateral and vertical extent of impacted media

- Assess soil properties that may impact potential constituent migration and/or potential corrective measures
- Identify unit-specific COCs.

The COCs will be evaluated to determine potential receptors and the potential impact of the COCs on these receptors. The results of these evaluations will be used to determine the need for a CMS.

Data generated during this task are subsequently addressed by this QAPjP.

C.2.3 TASK 3 - HYDROGEOLOGIC INVESTIGATION

Shallow ground water quality underlying the facility will be evaluated, regardless of the absence of local ground water usage, pursuant to RFI requirements. The purpose of the investigation is to:

- Identify potential sources of ground water impact, if any, from the facility or upgradient sources
- Determine the presence/absence of COIs in ground water, if any
- Delineate the lateral and vertical extent of impacted ground water, if any
- Determine constituent distribution in impacted ground water
- Determine the rate and direction of ground water flow
- Identify ground water COCs
- Evaluate the potential migration rate and direction of COIs/COCs in ground water.

Because there is no current exposure pathway via ground water usage, potential ground water receptors will not be identified nor will an assessment of the impact of ground water on health and the environment be performed.

The subtasks proposed for implementation include:

- Monitoring well construction, development, and survey
- Ground water sampling (for laboratory analyses)
- Aquifer characterization.

During this investigation, the existing facility observation well, B-4 (shown in Figure C-1), will also be abandoned.

Data generated during this task are subsequently addressed by this QAPjP.

C.2.4 TASK 4 - STORM SEWER DISCHARGE INVESTIGATION

The work scope for this task includes the collection of on-site and upflow off-site sewer water and sediment samples for laboratory analysis. The storm sewer system (AOC-1) may act as a potential migration pathway for storm water impacted by the facility or treated process wastewater (AOC-2) and as a potential source to underlying/adjacent subsurface soils and ground water through potential openings in the lines.

The objectives of this task include:

- Identification of potential current COIs in the storm sewer water
- Identification of potential past and current COIs in storm sewer sediments
- Identification of facility-related COIs at upflow locations (i.e., identify potential off-site sources)
- Determine potential for impact via potential seepage of COIs via the storm sewer system on facility soils and ground water
- Evaluate COI concentrations in storm sewer water versus the discharge limits established in the Buffalo Pollution Discharge Elimination System (BPDES) permit for the facility discharges (i.e., a constituent concentration that is below the BPDES permit limit is neither a COI nor candidate COC).

The results will be used to determine the need for potential corrective measures to meet the discharge requirements and/or to limit potential seepage of impacted water on the subsurface soils and ground water.

Data generated during this task are subsequently addressed by this QAPjP.

C.2.5 TASK 5 - ANALYTICAL PROGRAM

Samples of surface and subsurface soils, ground water, and water and sediment samples from the storm sewer system will be collected during implementation of the RFI. Selected samples (as defined in the RFI Work Plan and in Chapter C.5.0 of this QAPjP) will be submitted for chemical analyses; select soil samples will also be submitted for geotechnical analyses. The analytical program for all media samples are addressed in detail in Chapter C.5.0.

The chemical analyses will be performed in accordance with:

- U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, as updated and revised.
- U.S. Environmental Protection Agency, February 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020.

All soil and aqueous water samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) and select inorganics. The chemical parameters were selected on the basis of listed hazardous wastes generated by the facility and the hazardous constituents for which they were listed.

Several quality control (QC) samples will be prepared for the soil and aqueous samples in order to evaluate potential impacts on sample quality during field sampling or during analysis. These samples are identified and discussed in Chapter C.12.0.

Geotechnical analyses will be performed in accordance with American Society for Testing and Materials (ASTM) methods. The geotechnical parameters and methods are also specified in Chapter C.12.0.

C.2.6 TASK 6 - POTENTIAL RECEPTOR IDENTIFICATION AND HEALTH AND ENVIRONMENT ASSESSMENT

Potential receptors are identified on the basis of the media impacted by facility operations and the relationship of the facility with human populations. Due to the nature of the potential receptor identification, the quantitative QA procedures presented herein are not applicable. Consequently, this task is not addressed subsequently in the QAPjP.

A qualitative HEA will be performed during the RFI to evaluate potential impacts to human health and the environment. The HEA will consider the impact of the COCs, if any, on potential receptors and ecological conditions. Similar to the potential receptor identification, this activity is not addressed subsequently in this document.

C.2.7 TASK 7 - DATA ANALYSIS

The quality and quantity of data and information to be generated during the RFI are believed to be adequate to define the extent of impact from potential facility releases of hazardous constituents on environmental media, identify the source of the release, identify potential migration pathways, identify potential receptors, identify the COCs, and evaluate potential impacts to human health and the environment as a result of exposure to these COCs.

Due to the nature of this activity, it not subsequently addressed in the QAPjP.

C.2.8 TASK 8 - LABORATORY AND BENCH-SCALE TESTING

Based on the CCR and PIECM information, laboratory and bench-scale testing will not be required for potential corrective actions. If it should become necessary for such testing, an addendum to the QAPjP will be prepared.

C.2.9 TASK 9 - REPORTING

Three reporting activities will be performed during the RFI: monthly progress reports, technical memoranda, and the RFI Report.

Monthly progress reports will be prepared for NYSDEC and EPA by the Prime Contractor. The purpose of these reports is to permit continuing evaluation of the project progress (schedule/technical), analytical and other information generated during the RFI, and encourage ongoing communication between AlliedSignal and NYSDEC and EPA concerning on-site conditions and project goals.

Technical reports will be generated for the Soils, Hydrogeologic, and Storm Sewer Discharge investigations. The reports will include a summary of field activities and present the field and analytical data. These documents will subsequently appended to the RFI Report.

A report of findings for the RFI will be prepared for submittal to NYSDEC and EPA at the conclusion of the project. The document will summarize all existing facility data and information (facility background, operations, and environmental conditions). Analysis of this information will be used to develop conclusions on facility conditions, potential impact on health and the environment, and need for corrective action.

The QAPjP is not applicable to these tasks, therefore, the tasks are not addressed subsequently.

C.3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

AlliedSignal will have overall responsibility for compliance with the requirements of the Permit and management of the Prime Contractor's activities. The Prime Contractor will be responsible for implementation of all phases of the RFI. Those tasks not performed by the Prime Contractor will be completed by a subcontractor under the direct supervision of the Prime Contractor. The Prime Contractor will also provide QA/QC for field activities and project deliverables. Deliverables will be issued to AlliedSignal by the Prime Contractor for submittal to NYSDEC and EPA.

The organizational structure of the RFI is shown in Figure C-2.[8] The management, technical, and QA/QC responsibilities of the key project personnel are summarized as follows:

- Prime Contractor Project Manager:
  - Assist the AlliedSignal Project Coordinator in project planning
  - Attend major review and planning meetings between NYSDEC and EPA
  - Coordinate project technical activities
  - Provide technical guidance
  - Establish project records
  - Review all project reports and correspondence
  - Manage the project budget and schedule
- Prime Contractor Project Geologist (Site Manager):
  - Organize and schedule field and lab subcontractor activities
  - Establish project records
  - Supervise subcontractor activities
  - Participate in project meetings with AlliedSignal and NYSDEC and EPA
  - Review all project reports

[8] This figure identifies Remcor, Inc. (Remcor) and Remcor personnel as the Prime Contractor/personnel.

- Prime Contractor QA/QC Officer:
  - Schedule and perform systems and performance audits
  - Initiate corrective action, as necessary for QA compliance
  - Overview laboratory data corrective action, as necessary for QA compliance
  - Coordinate analytical data validation and review
  - Review laboratory QA/QC
  - Review all site documentation
- Subcontractor Project Managers:
  - Ensure resources are available on an as-required basis
  - Coordinate laboratory analyses and chain of custody
  - Oversee review of data
  - Direct implementation of corrective actions required as a result of data review, internal audits, or external audits
  - Oversee preparation of analytical reports
  - Approve final analytical reports prior to submission to the Prime Contractor
- Analytical Laboratory QA/QC Officer:
  - Overview laboratory QA and QC
  - Overview QA/QC documentation
  - Investigate project-related nonconformances and verify resolution of such problems, as necessary
- Laboratory Group Leaders:
  - Schedule daily work assignments and ensure that technicians understand project requirements
  - Perform daily data review; verify that project requirements have been met; resolve QC deficiencies
  - Review data reports for technical accuracy
- Analytical Laboratory Sample Custodian
  - Receive and inspect sample containers
  - Record the condition of sample containers
  - Sign appropriate documents

- Verify chain of custodies
- Notify laboratory project manager of sample receipt and inspection
- Assign a unique laboratory identification number correlated to the Prime Contractor's, and enter each into the sample receiving log
- Initiate transfer of samples to locked sample storage.

Primary responsibility for data quality rests with the Prime Contractor's QA/QC Officer. Ultimate responsibility for project quality lies with the Prime Contractor's Project Manager. Independent QA will be provided by the analytical laboratory's Project Manager and QA/QC Officer prior to release of data and/or reports to the Prime Contractor.

C.4.0 QUALITY ASSURANCE OBJECTIVES

The overall QA objective for this RFI is to provide procedures which, when followed properly, will assure that all decisions based on chemical field and laboratory data generated during this investigation are technically sound, statistically valid, and properly documented. Specific procedures, presented in other sections of this QAPjP, are to be utilized for sampling (Chapter C.5.0), laboratory analyses (Chapter C.9.0), and data reporting and data validation (Chapter C.11.0). The primary purpose of this section is to define statistical acceptance criteria for chemical data generated by the chemical analytical laboratory.

Due to the varying nature of the data required, there are several applicable levels of data quality for the RFI. A primary component of data quality is selection of the appropriate analytical level for the intended data use. Data quality objective (DQO) levels[9] are as follows:

- Level I - Field screening or analysis using portable instruments. Results are often not compound-specific and not quantitative, but are available in real-time.
- Level II - Field analysis using more sophisticated portable analytical instruments; in some cases, the instruments may be set up in a mobile laboratory on site. There is a wide range in the quality of data that can be generated that is dependent on the use of suitable calibration standards, reference materials and sample preparation equipment. Results are available in real-time or several hours.
- Level III - All analyses are performed in an off-site analytical laboratory. Level III analyses may or may not use Contract Laboratory Program (CLP) procedures, but do not usually utilize the validation or documentation procedures required of CLP Level IV analyses. The laboratory may or may not be a CLP laboratory.
- Level IV - CLP routine analytical services. All analyses are performed in an off-site CLP analytical laboratory following CLP protocols. Level IV is characterized by rigorous QA/QC protocols and documentation.

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[9] U.S. Environmental Protection Agency, March 1987, "Data Quality Objectives for Remedial Response Activities," EPA 540/G-87/003A.

- Level V - Analysis by nonstandard methods. All analyses are performed in and off-site laboratory that may or may not be a CLP laboratory. Method development or method modification may be required for specific constituents or detection limits. CLP special analytical services are Level V.

For this project, samples will be submitted for Level III chemical analysis by an off-site, New York state-approved analytical laboratory. Field measurement and analysis will be performed at DQO Level I.

Each of these levels are characterized by statistically based criteria expressed in terms of:

- Precision
- Accuracy
- Representativeness
- Completeness
- Comparability.

These parameters are discussed in the following five sections. Details concerning the evaluation of data precision, accuracy, and completeness are also described in the following sections. The presented information is to be used as a guideline in the overall evaluation of field and laboratory data. Data precision, accuracy, and completeness will be calculated in accordance with the procedures specified in the applicable method referenced.

C.4.1 PRECISION

Precision is defined as an estimate of the reproducibility of a method and/or collection procedure. The precision of chemical analysis results will be evaluated by the analysis of replicate samples. Precision can be determined by evaluating the standard deviation of the error distribution, the coefficient of variation (CV), and the RPD between replicate (duplicate) samples. Information regarding the precision of chosen methods will be ascertained by collecting replicate samples at a frequency of 1 per 10 or fewer samples of a given matrix and analysis. If sufficient replicate data are collected, the arithmetic mean and standard deviation can be evaluated.

Precision can also be defined by the CV, which expresses the standard deviation as a percentage of the mean. Specific statistical comparison of replicate (duplicate) data from field and laboratory measurements, as a means of evaluating precision of both sample collection procedures and laboratory performance, may be accomplished by first comparing the obtained replicate (duplicate) results with the published EPA criteria for method precision. If not available for a given method, the RPD may be calculated and compared to the laboratory precision criteria. This calculated precision value may then be compared with the stated precision DQO for the analyte in question to evaluate whether the DQO has been satisfied. If not, the data should not be considered valid.

C.4.2 ACCURACY

The accuracy of a method is an estimate of the difference between the true value and the evaluated mean value. Certain QA samples, such as laboratory control samples, reagent water spike samples, QC check samples, MSs, and surrogate spike samples, all contain known concentrations and parameters prior to analysis. Throughout the analytical process, several measurements for accuracy are made. Accuracy is measured as the percent recovery (% R) of standards or MSs:

- For standards:

$$\% \ R = \frac{Result}{True \ Value} \ x \ 100\%$$

- For matrix spikes:

$$\% \ R = \frac{SSR - USR}{SA} \ x \ 100\%$$

where:

SSR = spiked sample result
USR = unspiked sample result
SA = spike added.

By comparing the percent recovery results to the known true value, it is possible to measure the accuracy of the analysis. In routine practice, the laboratory will collect the data for each of these parameters for a period of at least 30 measurements. The results of these 30 measurements will be calculated. Then, based on the desired level of confidence, two or three standard deviation ranges will be established as practical control limits. To be valid, these control limits must meet the accuracy limits specified in the appropriate EPA method for each analyte measured. If the evaluated control limits are within the range established for the analyte and method by EPA, then the evaluated range becomes the practical control limit used by the laboratory until another set of data is developed and new control limits are calculated.

Specific statistical comparison of percent recovery values reported by the laboratory as a measure of method accuracy will be compared with the published EPA criteria for the accuracy of an individual method, and if not available for a given method, to the specified DQOs. Data not meeting the DQO for accuracy will be considered invalid or unusable.

The accuracy can be measured by the analyses of equipment blanks, methods blanks, and MSs.

C.4.3 REPRESENTATIVENESS

Representativeness is a measure of the degree to which data accurately represent the sample source or an environmental condition. These elements will be controlled via the sample collection program (Chapter C.5.0).

Other factors that can affect sample representativeness include sample preservation and amount of time that lapses between collection and analysis of the sample. For this project, soil samples will require no preservation beyond chilling to 4 degrees Celsius (4°C). The applicable holding times for various parameters are identified in Chapter C.10.0. For ground water samples, each sample for VOC will be preserved to a pH of less than 2 with hydrochloric acid (HCl). Samples intended for metals analysis require preservation to pH of

less than 2 with nitric acid (HNO_3); cyanide samples will be preserved with sodium hydroxide (NaOH) to a pH of greater than 12. This information and the holding times for various parameters are also shown in Chapter C.10.0.

C.4.4 COMPLETENESS

Completeness is a measure of the amount of valid data generated, or data generated according to appropriate methodology that meets the laboratory's defined QA/QC requirements and holding times. Completeness is expressed as a percent of the overall data that were generated and is calculated as follows:

$$C = V/T \times 100\%$$

where:

C = percent completeness
V = number of measurements judged valid
T = total number of measurements.

Laboratory documentation, including QA/QC results and acceptance limits associated with the analysis of a sample batch will be used to assess the completeness of the analysis of the sample batch. The objective for the data set for the QA/QC parameters is 90 percent, where completeness is the percent of valid data of the total tests conducted.

C.4.5 COMPARABILITY

Comparability is an expression of the confidence with which one data set can be compared to a related set of data. Comparability is a qualitative function of the sampling and analysis methods to assure that one data set can be compared to another. To determine the degree of comparability of data, the selected laboratory will provide the results of performance evaluation results that have been obtained through a laboratory audit. Throughout performance of the project, comparability will be determined through the comparison of analytical data with NYSDEC/EPA split samples.

C.5.0 FIELD MEASUREMENTS AND SAMPLE COLLECTION

Data and information will be generated during implementation of all RFI field tasks. The types of data and information anticipated for each task may include:

- Field observations
- On-site field measurements
- On-site field analysis
- Off-site laboratory analysis.

Sampling procedures, observations, measurements and analysis to be performed in the field are identified and discussed in the following sections. Off-site laboratory analyses are addressed in Chapter C.9.0.

The DQOs and procedures to be followed for field observations, measurements, and analysis, and off-site analysis for each field task are identified in the following sections. A summary of the data use and DQO levels is presented in Table C-1. The anticipated number of matrix and QC laboratory samples is shown in Table C-2.

The protocols for data and information collection are typically presented in applicable Standard Operating Procedures (SOPs) (presented in Attachment C.2.). The field sample labeling, preservation, handling, and chain of custody are addressed in Chapter C.6.0, and data and information to be recorded for each task and subtask are identified in Chapter C.8.0.

C.5.1 TASK 2 - SOILS INVESTIGATION

This task includes the drilling of test and monitoring well borings and collection of surface and subsurface samples. The objective of the task is to identify the presence of hazardous constituents in the surface and subsurface soils.

DQOs are not applicable to any of the Soils Investigation activities except for field-screening of the soils with a photoionization detector (PID). The DQO for this screening is Level I.

Boreholes will be completed at 12 locations (Figure C-1). Three of the borings, SB-1, SB-2, and SB-3, are test borings that will be advanced to the surface of the uppermost saturated zone (i.e., the water table, anticipated to be 10 feet below ground surface [ft-bgs]) and subsequently backfilled to grade. Nine of the 12 borings (well borings) will be completed as shallow ground water monitoring wells: Well Borings MW-1 through MW-9. The well borings will be completed to approximately 8 feet below the water table; the boring for MW-9 will be advanced to the top of bedrock prior to backfilling to 8 feet below the water table. Monitoring wells will then be constructed within the nine well boreholes, as described in C.5.2.1.

The borings will be drilled using hollow stem auger techniques (SOP 3.1.1). Nominal 6-inch diameter augers will be used to complete the well borings; the test borings will be advanced using nominal 3- or 4-inch diameter augers.

Soil samples will be collected continuously in advance of the lead augers from the ground surface to water table (SOP 3.4.2) using split-barrel sampling techniques. The test borings will be terminated at this depth. Samples will be collected from below the water table at 5-foot centers for each of the well borings.

Upon sample retrieval, each split-barrel will be opened and screened lengthwise with a PID to evaluate the potential presence of VOCs in the soil (SOPs 3.4.4 and 3.8.2) (Level I DQO). The soil will then be classified in accordance with the Soil Conservation System[10] (SCS) and ASTM[11] soil classification systems. Additional observations will include color,[12] odor, staining, mottling, moisture, plasticity (SOP 3.1.5). The approximate depth below ground surface of the sample interval and static water depth is to be determined.

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[10] Soil Conservation Service, U.S. Department of Agriculture, March 1967, "Supplement to Soil Classification System."

[11] American Society for Testing and Materials, "Standard Practice for Description and Identification of Soils (Visual-Manual) Procedure," ASTM D-2488.

[12] Kollmorgen Instruments Corporation, 1992, "Munsell® Soil Color Charts."

Samples collected from the surface (0 to 2 ft-bgs) and immediately above the water table (8 to 10 ft-bgs) will be placed in prelabeled, laboratory-supplied sample bottles for chemical analysis.

QC samples will be prepared as directed in Chapter C.12.0.

Additional samples may be selected for laboratory analysis on the basis of field observations indicating potential impact from facility-related operations. A summary of the anticipated samples is presented in Table C-2.

A maximum of five samples, representative of facility soils, will be submitted for grain-size analysis. A maximum of two thin-walled tube samples will be collected (SOP 3.4.2) from the two locations in the unsaturated zone. Two thin-walled samples will also be collected from MW-9; one sample each will be collected from the lacustrine and till deposits. The thin-walled samples will be submitted for analysis of various geotechnical parameters (Chapter C.9.0).

C.5.2 TASK 3 - HYDROGEOLOGIC INVESTIGATION

This task includes three main subtasks:

- Well Installation, including construction, development and survey
- Ground Water Quality Evaluation
- Aquifer Characterization.

Measurements, data, and sample collection information for the applicable subtasks are addressed in the following subsections. DQO levels are applicable only to field and laboratory chemical analyses. For this task, the only analytical measurements to be performed in the field are the determination during well development and purging of pH, specific conductance, temperature, and turbidity (purging only). The DQO level for these activities is Level I.

C.5.2.1 Subtask 3a - Well Installation

Shallow monitoring wells are to be installed in accordance with SOP 3.2.1, at nine locations: MW-1 through MW-9 (Figure C-1). Various field measurements will be recorded.

The wells will be constructed of 2-inch diameter polyvinyl chloride (PVC) casing and riser (10-foot lengths of 0.01-inch slot). The screen will be installed to straddle the water table, with approximately 2 feet of the screen extending above the saturated zone. The annular space between the casing/riser and borehole wall will be backfilled simultaneous with the auger removal using a clean silica sand, bentonite seal, and bentonite/cement grout (SOP 3.2.1). Following completion of the well to the ground surface, a protective casing with a locking cap will be placed over the well.

The following measurements will be recorded to an accuracy of approximately 0.1 foot:

- Total depth of boring
- Total depth of installation
- Total depth of well from permanently marked top-of-(PVC)-casing
- Depth to top of sand packs
- Depth to top of bentonite seal
- Static water level
- Length of well screen
- Stick-up[13] of well above ground surface.

Each of the wells will be developed, a minimum of 24-hours after completion, to remove materials (fines, etc.) that may have entered the borehole during construction and to promote hydraulic communication with the water-bearing zone (SOP 3.2.4). Due to the anticipated presence of fines, development methods may require low-volume submersible pumps, hand-pumps and bailers may also be used. Development will be considered complete when a minimum of three well volumes of water have been removed, pH, specific conductance, and temperature have stabilized ($\pm$10 percent for two consecutive volumes). To the extent

[13] "Stick-up" is the difference between the ground surface and the permanently marked top-of-(PVC)-casing and can be negative (i.e., below ground surface).

practicable, an attempt will be made to attain turbidity levels of less than 50 nephelometric units (NTUs). DQO Level I is applicable to these field analyses.

The top-of-(PVC)-casing (TOC) for each well will be permanently marked on the north lip of the PVC riser. A New York state-licensed surveyor will determine the elevation of the TOC and adjacent ground elevation for each monitoring well and the ground elevation for each borehole to an accuracy of 0.01 foot. The location of each well and boring will be surveyed to an accuracy of 0.1 foot. The survey will be tied to existing facility datum or a local U.S. Geological Survey (USGS) datum. SOP 3.1.8 addresses survey procedures.

Existing Observation Well B-4 will be abandoned as it serves no purpose in the evaluation of facility operations or potential impacts. Initially, the well cover will be removed and attempt made to pull the well from the borehole using the drilling rig. If successful, the resultant annular space will be backfilled with a cement/bentonite slurry. If pulling of the well is not successful, the well will be overdrilled with a six-inch or larger diameter hollow-stem auger to the bottom of the well. The well riser and screen will then be pulled; as the augers are removed the borehole will be permitted to collapse into the hole. If necessary, a cement/ bentonite slurry and a cement cap will be used to complete the backfilling of this borehole.

C.5.2.2 Subtask 3b - Ground Water Quality Evaluation

Ground water samples will be collected from each of the monitoring well locations approximately two weeks after completion of the construction and development activities.

The initial step in this task is the measurement of the static water level and well depth (from the marked TOC). The well volume is then calculated (SOP 3.5.5). A minimum of three well volumes will be removed using a submersible pump, hand pump, or bailer. Upon removal of the third volume, an aliquot of water will be collected from field-testing of pH, specific conductance, temperature, and turbidity. SOP 3.5.3 addresses field-testing for pH, specific conductance, and temperature. Following the removal of each subsequent volume of water, these measurements will be repeated. Additional volumes are to be purged until each

of these parameters is within 10 percent for two consecutive purge volumes. DQO Level I is applicable to these field analyses.

Ground water sampling will be initiated within two hours of purging in accordance with the protocols specified in SOP 3.5.5.

C.5.2.3 Subtask 3c - Aquifer Characterization

Two activities will be performed as part of the aquifer characterization subtask: water-level measurement and in-situ permeability testing. DQOs are not applicable to either activity.

Water-level measurement will be performed periodically for each well in accordance with SOP 3.5.5. The measurement will determine the elevation of the ground water surface using the survey TOC elevation and the depth to the static water level as measured from the TOC. Three full sets of measurements will be completed, i.e., the measurements for each well will be completed on the same date.

In-situ permeability tests will be performed for a maximum of four of the nine monitoring wells. The testing will be completed in accordance with the protocols established in SOP 3.3.4. In general, the test includes the measurement of the static water level, removal of sufficient volumes of water to result in a change in the static water level of two feet, and periodic monitoring of the water level as it returns to static and the time required to return to static.

C.5.3 TASK 4 - STORM SEWER DISCHARGE INVESTIGATION

Sediment and storm sewer water samples will be collected from two on-site and two off-site locations as part of this investigation. The two on-site locations are the southeast (SE) and southwest (SW) manholes (Figure C-1) and the nearest upflow, off-site locations (to be located in the field). The water and sediment samples will be collected in accordance with SOPs 3.6.2 and 3.6.3.

Measurement of the depth to water and the approximate thickness of the sediments will be recorded to the nearest 0.1 foot. No other measurements will be required.

Field analysis will be limited to the determination of pH, specific conductance, and temperature for the water samples; the DQO is Level I.

C.6.0 SAMPLE LABELING, HANDLING, AND CUSTODY

This chapter addresses the following procedures:

- Sample labeling procedures
- Sample handling procedures
- Sample preservation and bottle requirements
- Sample shipping
- Chain-of-custody procedures.

C.6.1 SAMPLE LABELING

All samples will be given a unique sample identification label based on the sample media, or collection method, the sample location and/or interval, and other pertinent information. The sample labels will be produced by computerized methods before implementation of the field task. At a minimum, each label will identify the following:

- Client
- Sample identification label
- Sample date and time (in military time)
- Preservatives used
- Analysis requested
- Sampler's initials.

All sample and QA labels will be recorded in the field logbook for the date sampled and on the sample collection forms. The sample collection forms for soils, sediments, surface (storm sewer) water and ground water, and various other loose-leaf forms are provided in Attachment C.3.

A three-digit prefix will be used to identify the facility (BRL). The various matrix sample sources will be identified by a second code:

- "SS" - Surface soil samples
- "SB" - Subsurface soil samples
- "SE" - Storm sewer sediment samples
- "SW" - Storm sewer water samples
- "GW" - Ground water samples.

The location will be identified by a third code: MW1 through MW9 for the monitoring well/ borings; SB1 through SB3 for the test borings; and SE and SW for the on-site manholes and OSE and OSW for off-site manholes.

For soil samples, the final label code will identify the sample interval in ft-bgs. The sample collection day and month will replace the sample interval code for the sediment, surface water, and ground water samples.

The BRL prefix may be dropped by the analytical laboratory as sample control typically permits the use of less than 10 digits.

C.6.1.1 Matrix Samples

In accordance with the system defined above, the sample identifications for each matrix sample will be appear as follows:

- BRL-SS-MW6-0002 - Surface soil from MW-6
- BRL-SB-MW6-0810 - Subsurface soil (8 to 10 ft-bgs) MW-6
- BRL-SE-SE-0603 - Sediment sample from the southeast manhole on June 3
- BRL-SW-SE-0603 - Surface water sample from the southeast manhole on June 3
- BRL-SD-OSW-0603 - Sediment sample from the upflow southwest manhole on June 3
- BRL-SW-OSW-0603 - Surface water sample from the upflow southwest manhole on June 3
- BRL-GW-MW6-0603 - Ground water sample from Well MW-6 on June 3.

The anticipated RFI sample identifications are shown in the sample summary table, Table C-2.

C.6.1.2 Quality Control Samples

Several types of QC samples will be collected for each sample matrix during the RFI. These include:

- Duplicates
- Equipment (rinsate) blanks
- MS/matrix spike duplicates (MSDs)
- Trip blanks.

Duplicate sample labels will be identical to the matrix label followed by a "D". Sample label BRL-SB-MW6-0810D indicates a duplicate of the 8 to 10 ft-bgs soil sample from Well Boring MW-6.

Equipment blanks will be prepared for the split-barrel (split-spoon) samplers (SP - soil samples), ponar sampler (PS - sediment samples), and bailers (GW - ground water samples). Sewer water samples will be collected directly into the sample bottles, therefore, equipment blanks are unnecessary. The equipment blank labels will identify the client, the sample equipment, the QC sample, and the date of collection (0613). Label BRL-SP-EB-0613 indicates an equipment blank collected for a split-barrel on June 13.

MS/MSDs will be labeled identical to the matrix sample label followed by an "MS" and "MSD," respectively. The label BRL-SB-MW6-0810MS would identify the MS for the 8 to 10 ft-bgs soil sample from Well Boring MW-6.

Trip blanks labels will contain the client identification (BRL), a "TB" designating these are trip blanks, and the sample date (month and day) for the matrix sample shipment with which the trip blanks are associated.

Anticipated QC sample identifications are shown in Table C-2.

C.6.2 SAMPLE HANDLING AND PRESERVATION

All samples will be placed directly into the pre-labeled, laboratory-prepared sample bottles upon collection. The bottle requirements for each sample media and parameter are shown in Table C-3. The bottles will then be placed directly into coolers chilled to approximately 4°C (SOP 3.9.2). Sample coolers will be accompanied with chain-of-custody and request-for-analysis forms (Section C.6.3) and shipped via overnight courier to the analytical laboratory. Geotechnical samples will be hand-delivered or shipped overland to the laboratory.

Chilling is the only preservation required for the solid samples, as shown in Table C-3.

For the aqueous VOC samples, the initial aliquot of water collected will be placed in 40-milliliter (mℓ) glass vial (nearly full) and laboratory-provided HCl will be added until the proper pH (<2) is attained for preservation. A similar amount of acid will be added to the two 40-mℓ sample vials prior to collection of the matrix samples.

Laboratory-prepared HNO_3 will be added to the aqueous sample bottles in the field to ensure attainment of the appropriate pH (<2) for preservation for metals. NaOH will be used to preserve the aqueous samples intended for cyanide analysis (pH >12). The pH will be tested using pH paper or meter in a separate sample aliquot.

C.6.3 SAMPLE CHAIN OF CUSTODY

Each sample shipment will be accompanied by a chain-of-custody form. Chain-of-custody forms and the associated analytical request forms and procedures are presented in SOP 3.9.5. Example forms are presented in Attachment C.3.

The chain-of-custody forms create a legal record of sample possession. The analytical request forms provide a separate means of confirming the analysis to be performed for various samples and other pertinent information. These forms indicate the sample label, the date and time of sample collection, sampler's name(s), bottle types and numbers used, and preservation performed in the field. The samples are to remain in the custody of the sample team or

designated custodian until delivery to the laboratory. The sample custodian maintains custody of the sample to ensure their integrity has not been compromised. A sample is under custody if any of the following conditions are met:

- It is in possession of the custodian or a designated member of the sampling team
- It is in plain view, after being in possession
- It was in possession and is locked up (secured)
- It is in a designated secure area.

Upon delivery to the laboratory, the chain of custody will be transferred to the laboratory sample custodian. When the form is complete, it should indicate no lapses in sample accountability; typically, however, overnight couriers will not sign these forms. Also accompanying the chain-of-custody form will be a sample analytical request form that will detail specifically the analyses to be performed on each sample.

Copies of the chain-of-custody forms and analytical request forms will be maintained in the project records. If samples are shipped via couriers, the courier freight bills (one for each shipment) will also be maintained in the project records. All samples will be shipped in accordance with U.S. Department of Transportation regulations. Sample packaging and shipping is addressed in SOP 3.9.3.

C.7.0 DECONTAMINATION

All equipment involved in intrusive studies or sample collection must be decontaminated prior to initiation of on-site activities and prior to demobilization from the facility. The Prime Contractor's Site Manager, or his designate, will be responsible for ensuring that the decontamination is adequately performed.

The drilling rig and all downhole drilling equipment will be steam cleaned using a high-pressure power washer at the time of mobilization and demobilization. In addition, the back of the drilling rig and downhole equipment will be decontaminated between each well location.

The downhole pumps if used, will also be thoroughly steam cleaned between use in different monitoring wells during the development and sampling activities.

The soil, sediment, sewer water, and ground water sampling equipment will be steam-cleaned between sampling locations and decontaminated between samples in accordance with SOP 3.10.2. The sequence of cleaning and materials to be used are as follows:

- Wash and scrub with low phosphate detergent
- Rinse with potable water
- Rinse with 10 percent nitric acid (HNO_3)
- Rinse with potable water
- Rinse with hexane
- Rinse with distilled water
- Air dry.

The resultant decontamination water will be contained on site in polyethylene storage tanks. At the conclusion of the field investigation, composite water samples will be collected for analysis (Task 5 - Laboratory Program, RFI Work Plan, Section 2.6). If the water meets the

facility discharge requirements established under the BPDES,[14] the water will be discharged directly to one or more of the facility outfalls to the BSA. If these requirements are not met, an alternative disposal will be selected in accordance with local, state, and federal requirements.

[14] BPDES requirements per Permit No. 94-01-BU001 for the AlliedSignal Buffalo Research Laboratory Outfalls 1, 2, and 3.

C.8.0 FIELD RECORDKEEPING AND DOCUMENTATION

All data and information generated in the field will be recorded directly into bound, water-proof notebooks. Field logbook procedures are addressed in detail in SOP 3.11.1. The books will each have a control number for ease of reference of information and tracking. Each page will be numbered at the top outer corner in a sequential manner. The date and activity will be recorded at the top of each page.

Information recorded on a daily basis will include:

- On-site personnel affiliated with the RFI project
- Time of arrival and departure of RFI project personnel
- Weather conditions (sunny, cloudy, rain, snow, etc., and temperature)
- Documentation that calibration was performed for all field equipment (separate calibration sheets are to be completed for each piece of equipment, a sample form is presented in Attachment C.3)
- Field equipment (screening etc.) model and control numbers
- Documentation of decontamination procedures performed
- Summary of samples collected for chemical/physical analysis
- Summary of chain-of-custody and analytical request forms
- Summary of pertinent decisions made by the Site Manager in coordination with the AlliedSignal Project Coordinator, Prime Contractor, Project Manager, or NYSDEC or EPA representatives.

In addition, loose-leaf forms will be prepared, in the field, to document task specific information (all information on these sheets must also be recorded in the field books) as required in the applicable SOPs. The loose-leaf forms are provided in Attachment C.3.

All notebooks, loose-leaf forms, photographs, and subcontractor reports will be incorporated as part of the permanent project file.

Specific task recordkeeping and documentation is addressed in the following sections.

C.8.1 SOIL SAMPLING

Soil samples will be collected at the surface and from the subsurface from each of 12 boring locations. The Prime Contractor's Site Supervisor will be responsible for the collection of these samples from the appropriate depths and locations. The following observations will be recorded in the field logbook:

- Boring location identification
- Sample interval
- Physical description of soil (SCS, ASTM, and Munsell® color), moisture, organics, odor, and mottling
- Standard penetration test counts (blow counts)
- Staining or other signs of impact, if any
- Date and time (military time) of sample collection
- Sample identification label (if selected for analysis) and analytical parameters
- Corresponding QC sample labels and analytical parameters
- Chain-of-custody and request-for-analysis form numbers
- Prime Contractor sampler
- Static water level
- Drilling Contractor.

Select information will also be recorded in the Soil Boring Logs (Attachment C.3).

C.8.2 MONITORING WELL INSTALLATION

The data generated during well installation (including construction, development, and surveying) will be recorded in the field book and on Well Construction Logs and Well Development Sheets (Attachment C.3). The installation information (to the nearest 0.1 foot) will include:

- Total depth of boring
- Total depth of well construction and PVC manufacturer
- Total depth of well from TOC
- Length of well screen and bottom cap
- Depth to top of sand packs (filter and fine)
- Depth to top of bentonite seal
- Volume and manufacturer of materials used (sand, bentonite, cement, water)
- Stick-up of well and surface casings
- Static water level
- Prime Contractor installer
- Drilling subcontractor.

Development information will include these items:

- Static water level from TOC
- Total depth of well from TOC
- Calculated well volume
- Development equipment
- pH, specific conductance, and temperature for each volume removed
- Total volumes removed
- Handling of development water
- Developer.

The survey will be performed by a New York state-licensed surveyor. If possible, the survey will be tied to a USGS datum. The accuracy required for the survey is 0.01 foot for the elevation and 0.1 foot for the location.

The TOC for each well will be marked permanently on the northern lip of the riser. The location and elevation of the TOC will be surveyed. The ground surface for the well and test boring locations will be surveyed. The elevation information will subsequently be transcribed to the Well Construction Logs and Well Development Sheets.

In addition to the well and test boring locations, the location and elevation of the following will be surveyed:

- Four corners of the SWMU
- AOC-1 (SW) ground surface and invert of pipe
- AOC-1 (SE) ground surface and invert of pipe
- Ground surface and invert of pipe at the two off-site sewer sampling locations.

The information to be recorded for the well abandonment includes:

- Total depth of casing
- Method of abandonment (overdrilling, extraction, etc.)
- Depth of cover/backfill
- Use of grout to complete backfilling.

C.8.3 GROUND WATER SAMPLING

Ground water sampling information will be recorded in the field books, the Ground Water Purge Sheets, and the Ground Water Sample Collection Logs (Attachment C.3). Information and data to be recorded will include, at a minimum:

- Well location identification
- Total well depth
- Static water level
- Calculated well volume
- Time (military) of purging (commencing and ending) and date
- Method of purging (pump, bailer, etc.)
- Field measurements for pH, specific conductance, temperature, and turbidity
- Method of sampling (pump, bailer, etc.)
- Time (military) and date of sample collection
- Sample identification label and analytical parameters
- Corresponding QC sample labels and analytical parameters
- Chain-of-custody and request-for-analysis forms numbers
- Prime Contractor sampler(s).

C.8.4 AQUIFER CHARACTERIZATION TESTS

The characterization tests to be performed include water-level measurements and in-situ permeability tests. Data generated during this task will be collected manually (E-tape) and mechanically (pressure transducer/recorder).

All water-level measuring data will be recorded directly into a field notebook; measurements collected during the ground water sampling events and during well development and purging will also be recorded on the appropriate loose-leaf forms (Attachment C.3) and as directed in SOP 3.5.1. The data will include:

- Verification of the well identification
- Total well depth
- Depth to water measurement to 0.01 foot
- Date of measurement
- Time of measurement (military time)
- Measurement device used (equipment number)
- Prime Contractor personnel.

The pressure transducer/recorder will document the static water level, and test water levels and times. This information will be down-loaded to a computer and printed out for evaluation. Both the manual and automated data will be placed in the permanent project file.

C.8.5 STORM SEWER SAMPLING

Sediment and surface water sampling are addressed in SOPs 3.6.2 and 3.6.3. Field data for these activities are limited to the following information:

- Sample location identification
- Water level
- Sediment thickness
- Estimated flow rate
- Observations of odor and/or color
- Field measurements for water pH, specific conductance, and temperature
- Sampling equipment
- Time (military) of sample collection
- Sample identification label and analytical parameters
- Corresponding QC sample labels and analytical parameters
- Chain-of-custody and analytical request for numbers
- Prime Contractor personnel.

C.8.6 MISCELLANEOUS INFORMATION

Calibration will be performed daily for each piece of equipment to be used. The calibration will be performed as required by the manufacturer. Equipment anticipated for use include PIDs, pH and specific conductance meters, turbidimeters, and thermometers.

The equipment number will be recorded in the field logbooks by the users. The calibration information will be recorded on loose-leaf sheets (Attachment C.3).

C.8.7 CHAIN OF CUSTODY AND REQUEST FOR ANALYSIS

Each sample cooler is to contain a minimum of one completed chain-of-custody form and corresponding request for analysis form. Examples of blank forms are provided in Attachment C.3; chain-of-custody forms are also contained in SOP 3.9.5.

The samples applicable to each chain-of-custody form will be recorded in the field logbook. All other information in these forms will be recorded on the forms only. For tracking purposes, one copy of each form will be maintained by the Prime Contractor in the field until completion of that portion of the project. Thereafter, these forms will be incorporated as part of the permanent file/record.

C.9.0 ANALYTICAL PROGRAM

The analytical program includes chemical analyses for soils, ground water, sediments, and storm sewer water. Select soil samples will also be analyzed for geotechnical parameters. A summary of the anticipated samples and analytical parameters is presented in Table C-2. The analytical programs are addressed in Sections C.9.1 and C.9.2.

C.9.1 CHEMICAL ANALYTICAL PROGRAM

Chemical analysis of the soils, ground water, sediments, and storm sewer water will be performed for TCL VOCs, RCRA metals, and cyanide. The chemical analytical laboratory methods will be performed in accordance with:

- U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, as updated and revised.
- U.S. Environmental Protection Agency, February 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020.

A summary of the test parameters and analytical methods, method detection limits, and other pertinent information is summarized in Table C-3.

C.9.2 GEOTECHNICAL ANALYTICAL PROGRAM

Select soil samples will be submitted for limited geotechnical analysis in accordance with ASTM. The analyses for the five thin-walled tube samples include:

- Permeability
- Wet Density
- Moisture Content
- Specific Gravity
- Plasticity Index.

Four representative soil samples will be analyzed for grain-size distribution.

The analyses will be performed in accordance with the applicable ASTM methods identified in Table C-3.

C.10.0 ANALYTICAL PROCEDURES, CALIBRATION PROCEDURES, AND FREQUENCY

Laboratory chemical analyses will be performed by the subcontract laboratory[15] in accordance with the methods listed in Table C-3. The chemical analyses will provide Level III analytical data quality. There are no applicable DQOs for the geotechnical analyses. Instrument calibration will be performed according to the procedures and at the frequencies specified below.

C.10.1 GAS CHROMATOGRAPH AND GAS CHROMATOGRAPH/MASS SPECTROMETER ANALYSIS

Initial and continuing calibration of gas chromatograph and gas chromatograph/mass spectrometers will follow SW-846[16] requirements. Instrument tuning requirements will also follow SW-846 and the laboratory contractor protocols. A copy of the analytical laboratory's Quality Assurance Program Manual will be submitted as Attachment C.4.

C.10.2 METALS ANALYSES

Initial and continuing calibration of Inductively Coupled Plasma (ICP) and Graphite Furnace Atomic Absorption (GFAA) units will follow EPA[17] method requirements.

C.10.3 GEOTECHNICAL ANALYSES

All geotechnical testing will be performed in accordance with the appropriate ASTM or U.S. Army Corps of Engineers Engineering Manual (EM) methods by Geotechnics, Inc. Equipment calibration will be performed as also appropriate for ASTM procedures.

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[15] A laboratory has not yet been selected. Following selection of the laboratory, their Quality Assurance Program Manual will be forwarded to NYSDEC and EPA for approval.

[16] U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, as updated and revised.

[17] U.S. Environmental Protection Agency, February 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020.

C.11.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data review and evaluation will be performed by the Prime Contractor and by the analytical subcontractor. Reporting requirements for Level III protocol will consist of the following:

- Analytical results
- Duplicate, MS, and MSD results
- Surrogate recovery results
- Standard and blank results
- Date of sample collection and analysis.

Upon receipt of data from the analytical laboratory, Prime Contractor personnel will ensure that all data packages are complete. Prime Contractor personnel will be responsible for transcribing all data into tables suitable for data review.

Prime Contractor personnel will review Level III data to ascertain that the laboratory has provided the following information:

- Correct reporting units
- Documentation of acceptable MSD and surrogate recoveries
- Acceptable standard and preparation blank results
- Appropriate qualifiers of data for which results are reported below the method detection limit or for analytes that are also detected in method or preparation blanks.

Upon completion of all data review, Prime Contractor personnel will prepare summary data tables. The Prime Contractor Project Manager is responsible for ensuring that no errors are introduced in data transcription. Both the Prime Contractor Site Manager and the QA Officer will review and/or check all data tables.

C.12.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

C.12.1 FIELD QUALITY CONTROL

QC in the field will be maintained through equipment calibration, measurement reproducibility and the collection of QC samples.

C.12.1.1 Field Equipment Calibration

Precision and accuracy of field measurements will be maintained in two ways:

- Through daily calibration of each instrument per the manufacturer's procedures
- By checking the reproducibility of the measurement by obtaining and recording multiple readings.

C.12.1.1.1 Equipment Requirements

The use of the following field equipment is anticipated during the RFI, for various screening and measurement tasks:

- Electronic measuring devices (E-tapes)
- pH meter - Cole-Parmer Model 5983
- Specific conductance meter - Cole-Parmer Model 33
- Thermometer
- Turbidimeter - H.F. Scientific Model DRT-15-C
- Pressure Transducer/Data Logger In-Situ® Hermit® Model SE-1000.

C.12.1.1.2 Calibration Requirements

All equipment will be calibrated daily for each day of use, or more frequently if necessary (i.e., if instrument drift is observed). Calibration information is to be recorded on the equipment calibration forms as presented in Attachment C.3. If a piece of equipment is determined to be loosing calibration on a regular basis, the Prime Contractor or subcontractor, responsible for equipment upkeep will replace the equipment with a similar, or equivalent model, as soon as is practicable.

C.12.1.2 Field QC Samples

QC of field sampling will be maintained by collection of the following QC samples:

- Field duplicates
- Equipment blanks
- Trip blanks.

The data application and sample requirements for each are discussed below.

C.12.1.2.1 Field Duplicates

Field duplicates are used to evaluate the laboratory analytical program for reproducibility of data. One matrix duplicate will be collected for every 20 matrix samples (for soils, sediments, storm sewer water, and ground water). Samples will be analyzed for the full analytical suite (TCL VOCs, RCRA metals, and cyanide). A summary of QC samples to be collected is presented in Table C-2.

Field duplicates are collected simultaneously by splitting a sample evenly between the matrix and QC sample bottles. For instance, a ground water sample bailer would be emptied, in relatively equal volumes, into two sample bottles (one matrix and one QC). Preservation will be performed as necessary for the appropriate analysis.

C.12.1.2.2 Equipment Blanks

Equipment blank data are used to evaluate field decontamination procedures of sampling equipment. One equipment blank will be collected for 1 in 20 matrix samples for:

- Soils
- Sediments
- Storm sewer water
- Ground water.

Each blank will be submitted for analysis of TCL VOCs, RCRA metals, and cyanide.

Equipment blanks will be prepared by pouring analyte-free water, supplied by the analytical laboratory, through a decontaminated sample trowel/spoon/bailer and into the appropriate sample bottles. Preservation will be performed as necessary for the appropriate analyses.

C.12.1.2.3 Trip Blanks

Trip blanks are used to evaluate potential exterior environmental impacts and laboratory sample bottle preparation on matrix samples. Trip blanks will be prepared by the laboratory using analyte-free water, preserved, sealed, and shipped to the field with the sample bottles. The blanks will also be transported to sampling locations in the field. One trip blank will accompany each sample cooler containing samples intended for VOC analysis in transport back to the laboratory.[18] The trip blanks will only be analyzed for VOCs.

C.12.2 LABORATORY QUALITY CONTROL

Laboratory-specific procedures are provided in the laboratory subcontractor's Quality Assurance Program Manual. These procedures include:

- Calibration verification
- Analysis of QC check sample
- Calibration blank analyses
- Reagent blank analyses
- Analysis of MS and MSDs[19]
- Instrument check standard analyses
- Interference blank analyses.

[18] To the extent practicable, all samples intended for VOC analysis will be transported in one sample cooler, thereby requiring only one trip blank.

[19] MS and MSDs will be prepared in the field by collecting three times the required matrix sample volume.

C.13.0 PERFORMANCE AND SYSTEMS AUDITS

QC samples, including duplicates, MSDs, surrogates, and reagent blanks, will be used to evaluate the performance of the analytical laboratory in analyzing samples for the RFI.

Site audits may be performed by or under the direction of the Prime Contractor QA Officer to evaluate field activities including the drilling and monitoring well installation. Specific elements of each on-site audit include verification of the following:

- Adherence to sample collection, preparation, preservation, and storage procedures outlined
- Adherence to proper field measurement and calibration procedures
- Completeness and accuracy of field notebooks including documentation of times, dates, drillers' names, sampling methods, sampling locations, number of samples, sampling personnel, types of samples, field measurements, soil logs, and any problems encountered during sampling
- Completeness and accuracy of sampling chain-of-custody forms including documentation of times, dates, transaction descriptions, and signatures
- Completeness and accuracy of sample identification labels including notation of time, date, location, type of sample, personnel, preservation, and analytical procedure required
- Adherence to health and safety guidelines outlined, including wearing of proper protective clothing
- Adherence to decontamination procedures outlined.

C.14.0 PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULE

C.14.1 FIELD EQUIPMENT

Field check summary sheets will be used to identify the most recent maintenance, battery charge, and equipment condition. Routine daily maintenance procedures conducted in the field include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems
- Cleansing of the ionization chamber, lamp window, and any filters in a PID
- Storage of equipment away from the elements
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g., cracked or clogged lines or tubing or weak batteries).

Spare and replacement parts stored in the field to minimize downtime include:

- Appropriately sized batteries
- Locks
- Decontamination supplies
- Extra sample containers
- Bailer line
- Bailers
- Calibration kit, battery charger, and support equipment
- Health and safety supplies
- Tool kit.

If damaged equipment is identified, it will be replaced by the same or equivalent model within 24 hours or as soon as practicable but no later than the next scheduled monitoring event.

C.14.2 LABORATORY EQUIPMENT

Laboratory preventive maintenance procedures will be as specified in the analytical laboratory's Quality Assurance Program Manual.

C.15.0 CORRECTIVE ACTION

During the course of this RFI, the field personnel will be responsible for seeing that field instruments are functioning properly and that work progresses satisfactorily. Additionally, field personnel are responsible for the performance of routine preventive maintenance and QC procedures, thereby ensuring collection of valid field data. The analytical laboratory's preventive maintenance and QC procedures will be provided in their Quality Assurance Program Manual.

C.15.1 PRIME CONTRACTOR CORRECTIVE ACTION

Field QA activities will be reported to the Prime Contractor Project Manager and QA Officer. Problems encountered during the program affecting quality will be reported. The Project Manager/QA Officer will be responsible for initiating the corrective actions and for ensuring that the actions are taken in a timely manner and that the desired results are produced. All corrective action taken will be reported to the NYSDEC and EPA Project Coordinator as part of the monthly reports.

C.15.2 LABORATORY CORRECTIVE ACTION

An anomalous event, from sample receipt through report delivery, that is contrary to normal laboratory practice and/or the requirements of the laboratory QA Manual is an out-of-control event. The treatment of these events is outlined through the examples that follow.

C.15.2.1 Corrective Action During Check-In

The sample custodian checks the samples, field, trip, and rinsate blanks against the shipping document or field chain of custody. If discrepancies exist, the sample custodian will document them and notify the Prime Contractor Project Manager. The Prime Contractor Project Manager will then notify the Prime Contractor QA Officer and attempt to resolve the discrepancies. All communications will be documented.

C.15.2.2 Corrective Action During Analysis

Prior to and during sample analysis, the analyst monitors the analytical system to ensure that the elements crucial to producing data of acceptable quality (initial calibration, calibration verification, method blank results, results, or MS/MSD analyses, etc.) meet the specified criteria. If a criterion is not met, the analyst takes the appropriate corrective action and documents the event and the corrective actions in the analysis log. During daily data review, the group leader reviews the raw data to ensure that the corrective action taken was appropriate and sufficient. If the corrective action taken by the analyst was satisfactory, the group leader approves the data. If the corrective action was insufficient, the group leader notifies the Prime Contractor Project Manager for final corrective action decisions. The additional corrective measures are also documented on the record.

C.15.2.3 Corrective Action During Data Review

The laboratory group leader reviews data for completed analyses daily, double-checking identification and quantitation of target parameters and ensuring that QC checks are made at the appropriate frequency and that they meet the specified criteria. If a problem is found during review, the group leader indicates same in the analysis log and directs the appropriate corrective action.

C.16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Prime Contractor Project Manager, in conjunction with the Prime Contractor QA Officer, will submit to the NYSDEC and EPA summaries of all applicable QA activities. These summaries will contain the following information:

- The status and coverage of various laboratory and field QA project activities
- Data QC documentation, including assessment of accuracy, precision, completeness, representativeness, and comparability
- Significant QA problems discovered, corrective actions taken, progress and improvements, plans, and recommendations for further implementation or updating of the QAPjP
- Results of performance and system audits.

Summaries of the QA reviews will be provided as part of the monthly progress reports.

TABLE C-1
RFI DATA USAGE
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

TASK NO.	TASK DESCRIPTION	DATA QUALITY OBJECTIVE (a)	DATA USAGE
1	Data Compilation and Evaluation	NA (b)	Environmental setting, source identification, preliminary identification of constituents of interest (COIs).
2	Soils Investigation	NA	Soils classification and potential impact on COI migration, identification and delineation of impacted areas, identification of COIs, identification of constituents of concern (COCs), performance of the health and environment assessment (HEA), determination of the need for and scope of a corrective measures study (CMS).
3	Hydrogeologic Investigation	Level I (c)	Hydrogeologic conditions (hydraulic gradient, flow direction, hydraulic gradient) and potential impact on COI migration, identification/delineation of impacted areas, identification of COIs, identification of COCs, performance of the HEA, determination of the need for and scope of a CMS.
4	Storm Sewer Discharge Investigation	Level I (c)	Identification of impact in sewer water and/or sediments, identification of COIs, comparison with Buffalo Pollution Discharge Elimination System permit for facility discharges to the Buffalo Sewer Authority, determination of the need for and scope of a CMS.
5	Analytical Program		
	Chemical Analyses	Level III	Support the identification of sources and media impact, delineation of areas of impact, identification COIs and COCs, performance of the HEA, and determination of the need for and scope of a CMS.
	Geotechnical Analyses	NA	Support the evaluation of soils and hydrogeologic conditions and potential impact on COI migration, support the CMS evaluation of potentail corrective actions.
6	Potential Receptor Identification and Health and Environment Assessment (HEA)	NA	Identify potential receptors of facility-impacted media and evaluate the potential affect of facility-impacted media on health and the environment.
7	Investigation Analysis	NA	Evaluate the sufficiency of the RFI data and compare the results versus existing media standards.
8	Laboratory and Bench-Scale Testing	NA	Determine the implementability and effectiveness of identified potential corrective measures.
9	Reporting		
	Monthly Status Reports	NA	Provide the NYSDEC and EPA with an update on the status of the project.
	Technical Memoranda	NA	Provide detailed information on the soils, hydrogeologic and storm sewer discharge investigations.
	RFI Report	NA	Provide a summary of the data, information and conclusions resulting from the performance of the RFI.

NOTES:

(a) Data Quality Objective (DQO) levels as defined in: U.S. Environmental Protection Agency, March 1987, "Data Quality Objectives for Remedial Response Activities," EPA 540/G-87/003A.
U.S. Environmental Protection Agency, March 1987, "Data Quality Objectives for Remedial Response Activities," EPA 540/G-87/003A.
(b) "NA" indicates DQOs are not applicable as these task are not quantitative.
(c) The laboratory analytical data are not addressed in Tasks 2, 3 or 4, but in Task 5, Analytical Program.

TABLE C-2
SAMPLE AND ANALYTICAL SUMMARY
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

SAMPLE LOCATION	SAMPLE IDENTIFICATION	SAMPLE INTERVAL (a)	SAMPLE MEDIA	PARAMETERS									
				TCL VOCs (b)	INORGANICS (c)	pH (d)	SPECIFIC CONDUCTANCE (d)	TEMPERATURE (d)	CATION EXCHANGE CAPACITY (e)	TOTAL ORGANIC CARBON (e)	MOISTURE CONTENT	GRAIN SIZE (f)	THIN-WALLED TUBES (g)
SOILS INVESTIGATION													
SB-1	BRL-SB1-0002	0-2	SOIL	1	1	- (h)	-	-	-	-	1	1	-
	BRL-SB1-0810	8-10	SOIL	1	1	-	-	-	1	1	1	-	-
SB-2	BRL-SB2-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-SB2-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	1
SB-3	BRL-SB3-0002	0-2	SOIL	1	1	-	-	-	-	-	1	1	-
	BRL-SB3-0810	8-10	SOIL	1	1	-	-	-	1	1	1	-	-
MW-1	BRL-MW1-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW1-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-2	BRL-MW2-0002	0-2	SOIL	1	1	-	-	-	-	-	1	1	-
	BRL-MW2-0810	8-10	SOIL	1	1	-	-	-	1	1	1	-	-
MW-3	BRL-MW3-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW3-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-4	BRL-MW4-0002	0-2	SOIL	1	1	-	-	-	1	1	1	-	-
	BRL-MW4-0810	8-10	SOIL	1	1	-	-	-	-	-	1	1	-
MW-5	BRL-MW5-0002	0-2	SOIL	1	1	-	-	-	1	1	1	-	-
	BRL-MW5-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	1
MW-6	BRL-MW6-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW6-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-7	BRL-MW7-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW7-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-8	BRL-MW8-0002	0-2	SOIL	1	1	-	-	-	-	-	1	1	-
	BRL-MW8-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
MW-9	BRL-MW9-0002	0-2	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW9-0810	8-10	SOIL	1	1	-	-	-	-	-	1	-	-
	BRL-MW9-3032	30-32	SOIL	-	-	-	-	-	-	-	-	-	1
	BRL-MW9-5052	50-52	SOIL	-	-	-	-	-	-	-	-	-	1
TOTAL SOIL MATRIX SAMPLES				24	24	0	0	0	5	5	24	5	4
QUALITY CONTROL SAMPLES													
DUPLICATES (i)			SOIL	3	3	-	-	-	1	1	3	-	-
EQUIPMENT BLANKS (j)			AQUEOUS	3	3	-	-	-	-	-	-	-	-
MS/MSDs (k)			SOIL	6	6	-	-	-	-	-	-	-	-
TRIP BLANKS (l)			AQUEOUS	5	-	-	-	-	-	-	-	-	-
TOTAL SOIL INVESTIGATION SAMPLES				41	38	0	0	0	6	6	27	5	4
HYDROGEOLOGIC INVESTIGATION													
MW-1	BRL-MW1-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-2	BRL-MW2-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-3	BRL-MW3-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-4	BRL-MW4-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-5	BRL-MW5-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-6	BRL-MW6-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-7	BRL-MW7-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-8	BRL-MW8-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
MW-9	BRL-MW9-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
TOTAL MATRIX SAMPLES				9	9	9	9	9	0	0	0	0	0
QUALITY CONTROL SAMPLES													
DUPLICATES			AQUEOUS	1	1	1	1	1	-	-	-	-	-
EQUIPMENT BLANKS			AQUEOUS	1	1	-	-	-	-	-	-	-	-
MS/MSDs			AQUEOUS	2	2	-	-	-	-	-	-	-	-
TRIP BLANKS			AQUEOUS	2	-	-	-	-	-	-	-	-	-
TOTAL HYDROGEOLOGIC INVESTIGATION SAMPLES				15	13	10	1	10	0	0	0	0	0

TABLE C-2
(CONTINUED)

SAMPLE LOCATION	SAMPLE IDENTIFICATION	SAMPLE INTERVAL	SAMPLE MEDIA	PARAMETERS									
				TCL VOCs	INORGANICS	pH	SPECIFIC CONDUCTANCE	TEMPERATURE	CATION EXCHANGE CAPACITY	TOTAL ORGANIC CARBON	MOISTURE CONTENT	GRAIN SIZE	THIN-WALLED TUBES
STORM SEWER DISCHARGE INVESTIGATION													
SOUTHEAST MANHOLE	BRL-SW-SE-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-SE-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
SOUTHWEST MANHOLE	BRL-SW-SW-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-SW-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
OFF-SITE MANHOLE	BRL-SW-OSE-0694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-OSE-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
OFF-SITE MANHOLE	BRL-SW-OSW-694	-	AQUEOUS	1	1	1	1	1	-	-	-	-	-
	BRL-SD-OSW-0694	-	SOLID	1	1	-	-	-	-	-	-	-	-
TOTAL MATRIX SAMPLES				8	8	4	4	4	0	0	0	0	0
QUALITY CONTROL SAMPLES													
DUPLICATES (AQUEOUS)			AQUEOUS	1	1	1	1	1	-	-	-	-	-
DUPLICATES (SOLID)			SOLID	1	1	-	-	-	-	-	-	-	-
EQUIPMENT BLANKS (AQUEOUS)			AQUEOUS	1	1	-	-	-	-	-	-	-	-
EQUIPMENT BLANKS (SOLID)			AQUEOUS	1	1	-	-	-	-	-	-	-	-
MS/MSDs (AQUEOUS)			AQUEOUS	2	2	-	-	-	-	-	-	-	-
MS/MSDs (SOLID)			SOLID	2	2	-	-	-	-	-	-	-	-
TRIP BLANKS (AQUEOUS)			AQUEOUS	1	-	-	-	-	-	-	-	-	-
TRIP BLANKS (SOLID)			AQUEOUS	1	-	-	-	-	-	-	-	-	-
TOTAL STORM SEWER DISCHARGE INVESTIGATION SAMPLES				18	18	5	5	5	0	0	0	0	0

NOTES:

(a) Sample intervals presented in feet below ground surface (ft-bgs).

(b) "TCL VOCs" indicates target compound list volatile organic compounds.

(c) The inorganics include: cyanide (total), arsenic, barium, cadmium, chromium (total), lead, mercury, selenium and silver.

(d) pH and specific conductance will be recorded both in the field and the analytical laboratory for ground water and surface water samples. Temperature will be recorded in the field only.

(e) A maximum of five samples representative of identified soil types will be collected for cation exchange capacity and total organic carbon. The sample locations indicated in this table do not necessarily represent the final sample locations.

(f) A maximum of five samples representative of identified soil types will be collected for grain size analysis. The sample locations indicated in this table do not necessarily represent the final sample locations.

(g) A maximum of four samples representative of fine-grained zones or units encountered during the drilling program will be collected using thin-walled tubes. These samples will be submitted for geotechnical analysis of wet density, moisture content, plasticity index, permeability and specific gravity.

(h) "-" indicates not applicable.

(i) A duplicate will be collected for one in 10 matrix samples and submitted for chemical analysis of the matrix parameter list.

(j) An equipment blank will be prepared for one in 10 matrix samples using the decontaminated sample collection equipment. These blanks will be submitted for analysis of VOCs and the inorganics only.

(k) "MS/MSDs" indicates matrix spikes and matrix spike duplicates. One MS and one MSD will be prepared for one in 10 matrix samples and submitted for analysis of VOCs and the inorganics only.

(l) Trip blanks will be prepared for each shipment of samples that are to be analyzed for VOCs; the trip blanks will only be analyzed for VOCs only.

TABLE C-3
ANALYTICAL PARAMETERS, METHODS AND SAMPLING REQUIREMENTS
BUFFALO RESEARCH LABORATORY
AlliedSignal Inc., BUFFALO, NEW YORK

PARAMETERS	ANALYTICAL METHOD	AQUEOUS				SOIL			
		METHOD DETECTION LIMITS (ug/l) (a)	BOTTLE REQUIREMENTS	PRESERVATIVES	HOLDING TIMES	METHOD DETECTION LIMITS (ug/kg) (a)	BOTTLE REQUIREMENTS	PRESERVATIVES	HOLDING TIMES
VOLATILE ORGANIC COMPOUNDS	**SW-846 8240 (b)**		**Two 40 ml glass vials with teflon lids**	**Chill to 4° Celsius (C) HCL to pH<2**	**14 days**		**500 ml glass jar**	**Chill to 4°C**	**14 days**
Chloromethane		2.3				7.0			
Bromomethane		2.4				7.0			
Vinyl Chloride		2.8				8.0			
Chloroethane		2.3				8.0			
Methylene Chloride		0.3				2.0			
Acetone		1				3000			
Carbon Disulfide		1				3000			
1,1-Dichloroethene		0.4				2.0			
1,1-Dichloroethane		0.5				3.0			
1,2-Dichloroethene (total)		0.4 (c)				2.0 (c)			
Chloroform		0.4				2.0			
1,2-Dichloroethane		0.4				2.0			
2-Butanone		1				3000			
1,1,1-Trichloroethane		0.4				3.0			
Carbon Tetrachloride		0.3				2.0			
Bromodichloromethane		0.4				2.0			
1,2-Dichloropropane		1				3000			
cis-1,3-Dichloropropene		0.7				3.5			
Trichloroethene		0.3				2.0			
Dibromochloromethane		1				3000			
1,1,2-Trichloroethane		0.8				3.0			
Benzene		0.2				1.0			
trans-1,3-Dichloropropene		1.1				6.0			
Bromoform		0.3				2.0			
4-Methyl-2-Pentanone		1				3000			
2-Hexanone		1				3000			
Tetrachloroethene		0.2				1.0			
Toluene		0.4				2.0			
1,1,2,2-Tetrachloroethane		0.4				2.0			
Chlorobenzene		0.8				3.0			
Ethylbenzene		0.4				2.0			
Styrene		0.4				2.0			
Xylenes (total)		0.4/0.5 (d)				2.0 (dc)			

TABLE C-3
(CONTINUED)

PARAMETERS	ANALYTICAL METHOD	AQUEOUS				SOIL			
		METHOD DETECTION LIMITS (mg/l)	BOTTLE REQUIREMENTS	PRESERVATIVES	HOLDING TIMES	METHOD DETECTION LIMITS (mg/kg)	BOTTLE REQUIREMENTS	PRESERVATIVES	HOLDING TIMES
INORGANICS									
Arsenic	EPA 7060 (e)	0.002	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	0.5	500 ml plastic or glass	Chill to 4°C	6 mos.
Barium	EPA 6010	0.001	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	0.2	500 ml plastic or glass	Chill to 4°C	6 mos.
Cadmium	EPA 6010	0.002	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	0.2	500 ml plastic or glass	Chill to 4°C	6 mos.
Chromium (total)	EPA 6010	0.004	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	5	500 ml plastic or glass	Chill to 4°C	6 mos.
Lead	EPA 6010	0.02	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	10	500 ml plastic or glass	Chill to 4°C	6 mos.
Mercury	EPA 7471	0.0001	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	28 days	0.05	500 ml plastic or glass	Chill to 4°C	28 days
Selenium	EPA 7740	0.002	500 ml plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	0.2	500 ml plastic or glass	Chill to 4°C	6 mos.
Silver	EPA 6010	0.01	500 ml Plastic or glass	HNO_3 to pH <2 and chill to 4° C	6 mos.	0.5	500 ml plastic or glass	Chill to 4°C	6 mos.
Cyanide (total)	EPA 9011/9012	0.0002	500 ml plastic	NaOH to pH >12 and chill to 4° C	14 days	0.01	500 ml plastic	Chill to 4°C	14 days
MISCELLANEOUS									
pH (at 20 degrees Celsius)	EPA 9040	– (f)	500 ml Plastic or glass	None	Immediate	–	–	–	–
Specific Conductivity (umhos/cm)	EPA 9050	5	500 ml plastic or glass	None	28 days	–	–	–	–
Temperature (degress Celsius)	–	–	–	–	–	–	–	–	–
Cation Exchange Capacity (mg/kg)	EPA 9080	–	–	–	–	50	500 ml plastic or glass	–	6 mos.
Total Organic Carbon (mg/kg)	ASTM D-3178 (g)	–	–	–	–	100	500 ml plastic or glass	–	28 days
GEOTECHNICAL									
Grain Size Distribution	ASTM D-422	–	–	–	–	–	Grab	–	–
Permeability	ASTM D-2434	–	–	–	–	–	Thin-walled tube	–	–
Wet Density	ASTM D-2166	–	–	–	–	–	Thin-walled tube	–	–
Moisture Content (h)	ASTM D-2216	–	–	–	–	–	Thin-walled tube/grab	–	–
Specific Gravity	ASTM D-854	–	–	–	–	–	Thin-walled tube	–	–
Plasticity Index	ASTM D-4318	–	–	–	–	–	Thin-walled tube	–	–

NOTES:

(a) "ug/l" indicates micrograms per liter, "ug/kg" indicates micrograms per kilogram.

(b) U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Chemical/Physical Methods," SW-846, 3rd edition as updated and revised.

(c) The detection limits the cis- and trans-1,2-dichloroethene isomers are both 0.4 ug/l and 2.0 ug/kg for aqueous and solid samples, respectively.

(d) The aqueous detection limit for the o-xylene isomer is 0.4 ug/l and the aqueous detection limit for the m- & p-xylene isomers is 0.5 ug/l.

(e) U.S. Environmental Protection Agency, February 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020

(f) "-" indicates not applicable.

(g) "ASTM" indicates American Society for Testing and Materials methods.

(h) The analysis for moisture content will be performed for all chemical analytical samples and geotechnical samples using this method.

:22681

APPENDIX C

LIST OF REFERENCES

American Society for Testing and Materials, "Standard Practice for Description and Identification of Soils (Visual-Manual) Procedure," ASTM D-2488.

New York State Department of Environmental Conservation, March 22, 1991, "Technical and Administrative Guidance Memorandum: Quality Assurance Project Plan," No. 3014 (TAGM 3014).

Remcor, Inc., August 11, 1993, "Report, Field Sampling and Analysis Activities, RCRA Facility Assessment, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

Remcor, Inc., March 7, 1994, "Current Conditions Report, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

Remcor, Inc., April 6, 1994, "Pre-Investigation Evaluation of Corrective Measures, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York."

Remcor, Inc., April 6, 1994, "RCRA Facility Investigation Work Plan, AlliedSignal Inc., Buffalo Research Laboratory, Buffalo, New York," AlliedSignal Inc.

Soil Conservation Service, U.S. Department of Agriculture, March 1967, "Supplement to Soil Classification System."

U.S. Environmental Protection Agency, February 1983, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," EPA 600/4-83-004 (QAMS 005/80).

U.S. Environmental Protection Agency, February 1983, "Methods for Chemical Analysis of Water and Wastes," EPA 600/4-70-020.

U.S. Environmental Protection Agency, 1986, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd edition, as updated and revised.

U.S. Environmental Protection Agency, March 1987, "Data Quality Objectives for Remedial Response Activities," EPA 540/G-87/003A.

U.S. Environmental Protection Agency, May 1989, "Interim Final RFI Guidance," EPA 530/SW-89-031.

ATTACHMENT C.1

QAMS 005/80 LOCATOR

ATTACHMENT C.1

QAMS 005/80 LOCATOR[1]

	REQUIRED ITEMS	LOCATION
1.	Title Page	Title Page
2.	Table of Contents	Table of Contents
3.	Project Description	Chapter C.2.0
4.	Project Organization and Responsibility	Chapter C.3.0
5.	QA Objectives for Measurement Data in Terms of Precision, Accuracy, Completeness Representativeness, and Comparability	Chapter C.4.0, Analytical Laboratory Quality Assurance Program Manual
6.	Sampling Procedures	Chapter C.5.0
7.	Sample Custody	Chapter C.6.0
8.	Calibration Procedures and Frequency	Chapter C.10.0, Analytical Laboratory Quality Assurance Program Manual
9.	Analytical Procedures	Chapters C.9.0, C.10.0, and Analytical Laboratory Quality Assurance Program Manual
10.	Data Reduction, Validation, Reporting	Chapter C.11.0
11.	Internal Quality Control Checks	Chapter C.12.0
12.	Performance and System Audits	Chapter C.13.0
13.	Preventative Maintenance	Chapter C.14.0
14.	Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness	Chapter C.4.0
15.	Corrective Action	Chapter C.15.0
16.	QA Reports to Management	Chapter C.16.0

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[1] U.S. Environmental Protection Agency, February 1983, "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," EPA 600/4-83-004 (QAMS 005/80).

APPENDIX C

Well Construction Diagrams MW-3 and MW-5

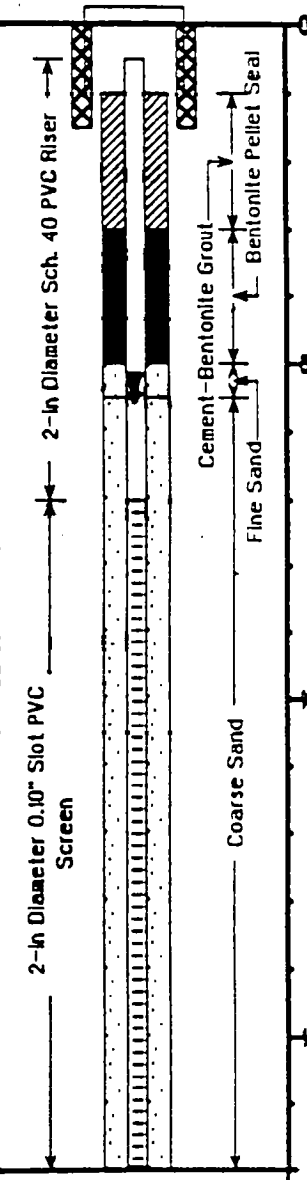
BORING/WELL NO: MW-5
PROJECT NAME: ALLIED SIGNAL
PROJECT NO.: 92148
DATE STARTED: 10/04/94
DATE COMPLETED: 10/04/94

GROUND SURF. ELEV.: 583.78
TOTAL DEPTH: 17 FT-BGS
MEAS. POINT ELEVATION: 583.47
DRILLING METHOD: 8.25 IN. I.D. HSA
DEVELOPMENT METHOD: PUMPING
BOREHOLE/WELL DIAM.: 11.25 IN. /2 IN.
WATER LEVEL: 5.48 FT-BGS
DATE TAKEN: 10/17/94

ENGINEER/GEOLOGIST: ELR
CHECKED BY:

SAMPLE NUMBER	BLOWS/6-IN	RECOVERY (FEET)	PID SCREENING (ppm)	DESCRIPTION	USCS SOIL TYPE
BRL-SS-MW5-0002	5 10 7	1	0	Concrete	
SS-2	8 5 5 3	1.5	0	Medium dense reddish gray (N5/) sand and gravel **FILL**: dry. Loose gray (5/1) sand, gravel and slag **FILL**: damp.	FILL
SS-3	2 4 8 11	1	0	Stiff light gray (7/1) interbedded **SILT, CLAY, and very fine SAND**; damp.	CL
SS-4	4 7 10 11	2	0	Very stiff light gray (7/1) interbedded **SILT, CLAY, and very fine SAND**: moist.	
BRL-SB-MW5-0810	2 4 4 3	2	0	Medium stiff light gray (7/1) interbedded **SILT, CLAY, and very fine SAND**: moist.	
SS-6	1 1 2 1	2	0	Soft gray (6/1) **CLAY**; wet.	CH
SS-7	wh 2 1 1	2	0	Soft gray (6/1) **CLAY**; wet.	

WELL DIAGRAM



BOTTOM OF BORING=17 FEET-BGS
STATIC WATER DEPTH=5.48 FT-BGS

BORING/WELL NO: MW-3
PROJECT NAME: ALLIED SIGNAL
PROJECT NO.: 92149
DATE STARTED: 09/29/94
DATE COMPLETED: 09/29/94

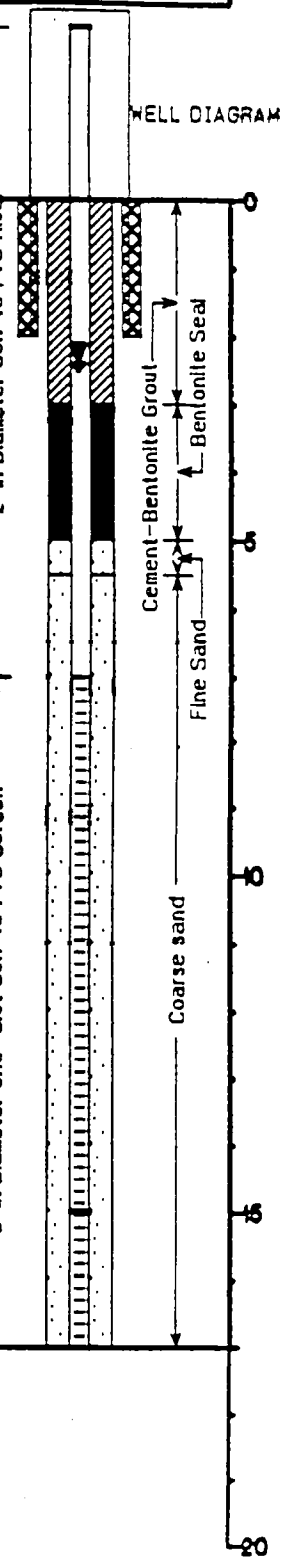
GROUND SURF. ELEV.: 585.83
TOTAL DEPTH: 17 FT-BGS
MEAS. POINT ELEVATION: 587.55
DRILLING METHOD: 8.25 IN. I.D. HSA
DEVELOPMENT METHOD: BAILER
BOREHOLE/WELL DIAM.: 11.25 IN. /2 IN.
WATER LEVEL: 2.41 FT-BGS
DATE TAKEN: 10/17/94

ENGINEER/GEOLOGIST: ELR
CHECKED BY:

SAMPLE NUMBER	BLOWS/6-IN	RECOVERY (FEET)	PID SCREENING (ppm)	DESCRIPTION	USCS SOIL TYPE
ERL-SS-MW3-0002	3 12 9 8	0.5	0	Medium dense very dark gray (N3/) sand, gravel and silt **FILL**; damp.	FILL
SS-2	4 2 1 4	1	0	Very loose very dark gray (N3/) sand, gravel and silt **FILL**; wet.	
SS-3	4 2 3 4	0	NA		
SS-4	4 5 8 10	2	0	Stiff light gray (7/1) interbedded **SILT, CLAY, and very fine SAND**; moist.	CL
ERL-SB-MW3-0810	3 5 9 14	2	0	Stiff dark reddish gray (4/4) interbedded **SILT, CLAY and very fine SAND**; moist.	
				Gray (6/1) **CLAY**; wet.	CH
SS-6	wh wh 1 2	2	0	Very soft gray (6/1) **CLAY**; wet.	

BOTTOM OF BORING=17 FEET-BGS
STATIC WATER DEPTH=2.41 FT-BGS

WELL DIAGRAM



APPENDIX D

HLA COC\RFA Forms

C/C CONTROL NO. ____

Harding Lawson Associates
700 North Bell Avenue, Suite 200
Pittsburgh, PA 15106
(412) 279-6661
Fax: (412) 279-8567

REQUEST FOR ANALYSIS

R/A CONTROL NO. 236

Project Name: _____
Project No.: _____
Project Contact: _____
Project Manager: _____
Send Lab Report to: _____

Electronic Deliverable Required Y / N
Turnaround Time: _____

Laboratory Name: _____
Laboratory Contact: _____
Laboratory Address: _____

Laboratory Phone No.: _____
Special Notes: _____

X - Denotes Laboratory Analyses Requested for Sample

SAMPLE IDENTIFICATION	SAMPLE MEDIUM	REQUSTED ANALYSES								REMARKS OR SPECIAL INSTRUCTIONS

DISTRIBUTION: White copy accompanies samples. Yellow copy - HLA

POSSIBLE HAZARDS: _____

DISPOSAL: Lab _____ Client _____

Harding Lawson Associates
700 North Bell Avenue, Suite 200
Pittsburgh, PA 15106
(412) 279-6661
Fax: (412) 279-8567

CHAIN OF CUSTODY RECORD

C/C CONTROL NO. 237

R/A CONTROL NO. _____

PROJECT NO.	PROJECT NAME:					DESCRIPTION OF CONTAINERS						
SAMPLERS:					TOTAL NUMBER OF CONTAINERS PER SAMPLE							
SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE MEDIUM	SAMPLE LOCATION								REMARKS

RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	LABORATORY RECEIPT:	DATE AND TIME:
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	SAMPLE TRACKING DATA	
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	SUBCONTRACTED LABORATORY: _____ CARRIER/AIRBILL NO.: _____ DATE SHIPPED: _____	

DISTRIBUTION: **White copy accompanies samples. Yellow copy - HLA.**

NOTE: Laboratory: Please return a copy of signed COC to HLA.

DISTRIBUTION
GROUNDWATER MONITORING PLAN
ALLIEDSIGNAL, INC.
BUFFALO RESEARCH LABORATORY

Prepared for AlliedSignal Inc.

Copy 1	Mr. William R. Hanavan AlliedSignal, Inc. 20 Peabody Street Buffalo, New York 14210
Copy 2	Mr. William E. Yanovitch AlliedSignal, Inc. 4101 Bermuda Hundred Chester, Virginia 23831
Copy 3	Mr. Timothy I. DiGiulio, P.E. NYSDEC Division Solid & Hazardous Materials Bureau of Hazardous Waste Facilities 50 Wolfe Road Albany, New York 12233-7252
Copy 4	Mr. Nelson Schnabel NYSDEC Division Solid & Hazardous Materials Bureau of Hazardous Waste Facilities 270 Michigan Avenue Buffalo, NY 14203
Copy 5	Mr. Dayne Crowley, Harding Lawson Associates
Copy 6	Mr. Eric Reisinger Harding Lawson Associates
Copy 7	Project file

Quality Assurance/Quality Control Reviewer:

Pat Pontoriero, P.G.
Principal Geologist