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Work Plan
Phase 1, Task 4 Field Investigation

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LIST OF ACRONYMS

ABW	Air Base Wing
AFSC	Air Force Systems Command
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CF	Chloroform
CLP	Contract Laboratory Program
CTC	Carbon Tetrachloride
DCA	1,2-Dichloroethane
DCE	1,1-Dichloroethylene
DQO	Data Quality Objective
EM	Office of Environmental Managment, 2750 ABW
EMO	Environmental Management Operations
EMR	Environmental Management Restoration Branch
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
HSC	Health and Safety Coordinator
HSP	Health and Safety Plan
IT	International Technology Corporation
ITAS	International Technology Analytical Services
MCL	Maximum Contaminant Level
MRWF	Mad River Well Field

LIST OF ACRONYMS (continued)

OEPA	Ohio Environmental Protection Agency
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness
PCE	Perchloroethylene
POL	Petroleum, Oils, and Lubricants
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RSD	Relative Standard Deviation
SAP	Sampling and Analysis Plan
SAS	Special Analytical Services
TCA	1,1,1-Trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WPAFB	Wright-Patterson Air Force Base

1.0 INTRODUCTION

In April 1990 Wright-Patterson Air Force Base (WPAFB) initiated an investigation to evaluate a potential CERCLA removal action to prevent, to the extent practicable, the migration of ground-water contamination in the Mad River Valley Aquifer within and across WPAFB boundaries. The action will be based on a Focused Feasibility Study with an Action Memorandum serving as a decision document that is subject to approval by the Ohio Environmental Protection Agency.

The first phase (Phase I) of this effort involves an investigation of ground-water contamination migrating across the southwest boundary of Area C and across Springfield Pike adjacent to Area B. Task 4 of Phase I is a field investigation to collect sufficient additional information to evaluate removal alternatives. The field investigation will provide information in the following specific areas of study:

- Water-level data which will be used to permit calibration of the ground-water flow model to a unique time in history.
- Ground-water quality data which will be used to characterize the current chemical conditions of ground water.

This work plan has been developed by International Technology Corporation (IT) for the field investigation of ground-water contamination at WPAFB Dayton, Ohio. The work plan has been prepared in accordance with EPA Guidance for Conducting

Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, October, 1988.

The Work Plan provides a description of the current situation based on available information, and presents the rationale and scope of the technical services necessary to achieve the study objectives. A project schedule is also included.

Two other documents have been prepared for submittal concurrent with this Work Plan which provide additional information on the proposed investigation activities. These include:

- Sampling and Analysis Plan (SAP) - The SAP consists of two parts: (1) a QAPP and (2) the Field Sampling Plan (FSP) that provides guidance for all field work by defining in detail the sampling and data-gathering methods to be used for this project. The Quality Assurance Project Plan (QAPP) is a comprehensive statement of the Quality Assurance practices to be implemented for the WPAFB investigation.

- Health and Safety Plan (HSP) - A presentation of general and site-specific health and safety requirements. Provides an assessment of on-site physical and chemical hazards, including a determination of permissible exposure limits and an estimate of potential employee exposure to hazards and related protection requirements.

2.0 SITE BACKGROUND

2.1 Background

Wright-Patterson Air Force Base (WPAFB) is located in the southwestern portion of the State of Ohio, approximately 60 miles north and east of the city of Cincinnati (Figure 2-1). The base consists of some 8,500 acres of land, divided into an active air field (Patterson Field) and an inactive air field (Wright Field). The base is divided into four areas: 1) Area A, containing Air Force Logistics Command Headquarters, the Foreign Technology Division of Air Force Systems Command (AFSC), and a number of other administrative and warehouse facilities; 2) Area B, containing the Aeronautical Systems Division of AFSC, the Air Force Institute of Technology, various AFSC laboratories and the Air Force Museum; 3) Area C, containing the 4950th Test Wing (AFSC), the 906th Tactical Fighter Wing (Ohio ANG), the main Petroleum, Oils and Lubricants (POL) storage areas and other facilities related to the operation of aircraft and the administration of base personnel; and 4) Kittyhawk Center, which contains the Commissary, Main Exchange, Base Theater, and other recreational facilities. Figure 2-2 provides a map of the base.

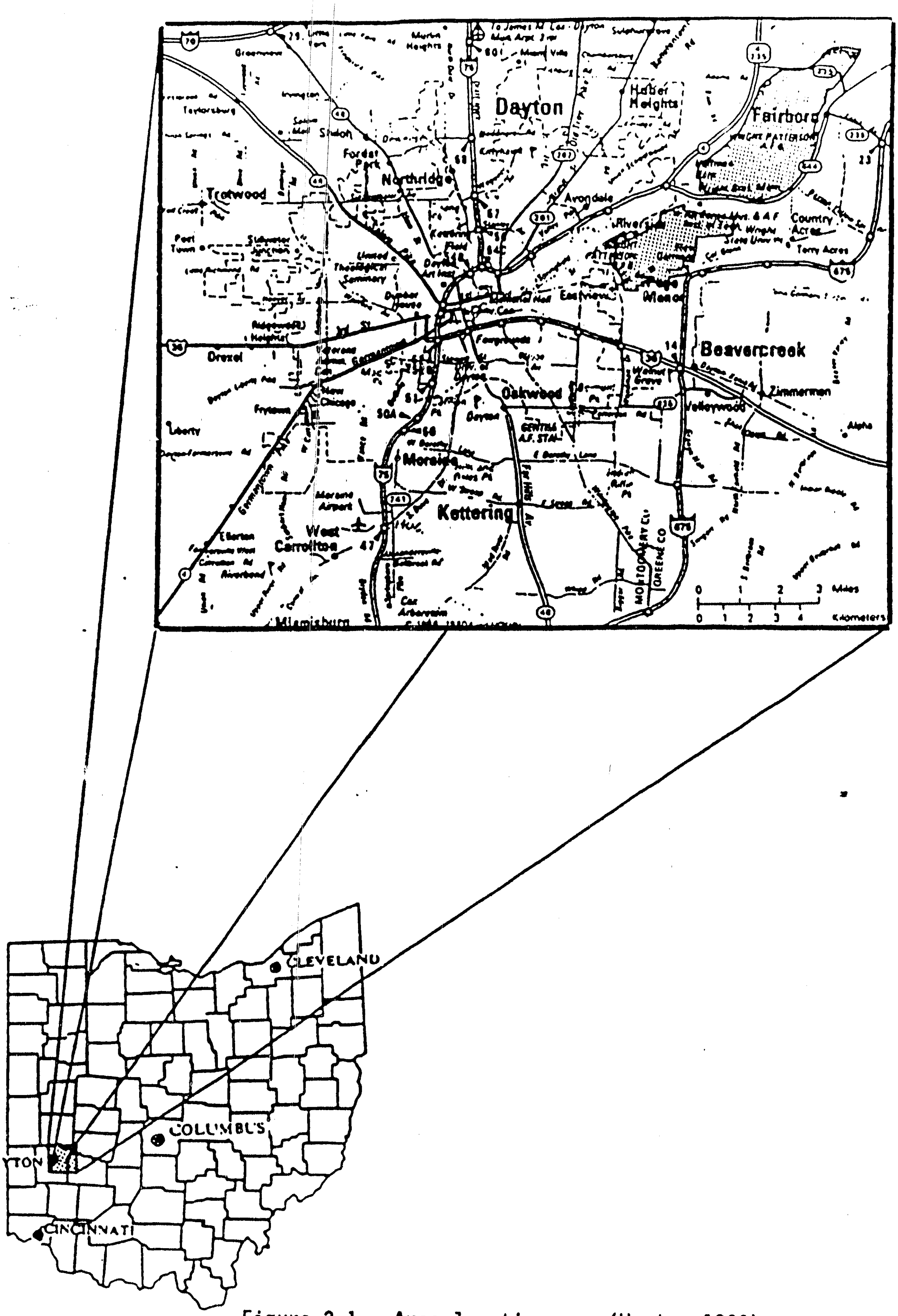


Figure 2-1. Area location map (Weston 1989)

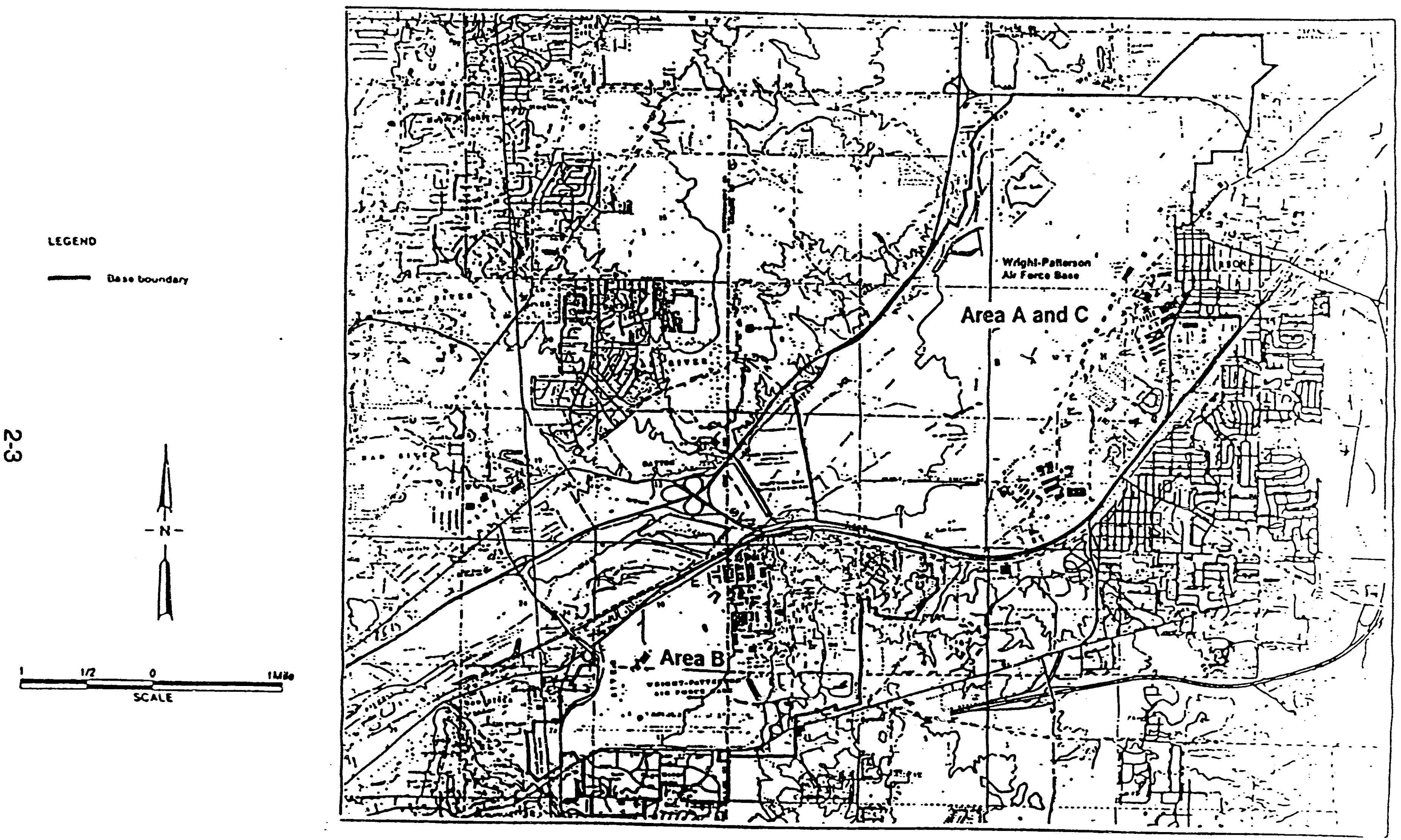


Figure 2-2. Wright-Patterson Air Force Base map (Weston 1985)

The base has been in continuous operation since before World War II and has been the scene of numerous activities including flight operations and maintenance, research and development, prototype fabrication, and other industrial operations.

2.2 Current Site Description

Most of the ground water on WPAFB either occurs from or flows into the Mad River Valley aquifer. Potential receptors of ground-water contamination in this aquifer include the 17 water-supply wells that serve the base, the city of Fairborn's Fairfield Park wells, the city of Dayton's Mad River Well Field (MRWF), and a few single-user wells.

All surface water drainage from the base eventually flows into the Mad River, or percolates into the underlying water table known as the Mad River Valley Aquifer. There are at least 11 surface water discharge points from the base, although most surface water probably exits the base boundary via Hebble Creek. Natural drainage has been substantially altered over the years through the construction of storm drainage systems. Many of these storm drainage systems empty either directly into the Mad River or, indirectly into the Mad River via Hebble Creek.

Ground-water contamination has been found in the production wells providing drinking water for Areas A and C of the base and in the well providing drinking water for the caretaker's cottage near Huffman Dam. Ground-water contaminants (primarily volatile organic compounds - VOCs) also have been detected in the production wells serving Area B. VOCs have also been quantified in samples taken from the production wells on the northeast corner of the Rohrer's Island section of the MRWF.

During May and June 1990, the City of Dayton conducted field screening for VOCs and total petroleum hydrocarbons (TPH) of groundwater samples. The sampling was done upgradient from the Rohrer's Island Well Field near Huffman Dam and along the southwestern boundary of Area C. Monitoring wells were installed at some of the sampling locations (HD10 through HD14) based upon the field screening data. The data on Table 2-1, as of August 16, 1990, were generated during this sampling effort.

Table 2-1. City of Dayton Monitoring Well Data, 1990

Well Identification	Well Location	Total Well Depth (ft. BGS)	Screened Interval (ft. BGS)	Sample Depth (ft. BGS)	Contaminant Identified	Concentration (µg/l)
HD-10D	Southernmost along WPAFB fenceline.	69.5	59-69	27-32	N/A	ND
				38-43	N/A	ND
				48-53	N/A	ND
				58-63	Toluene	2
				66-71	1,1-DCE	2.5
				•	Toluene	1
HD-11	South of HD-12 along WPAFB fenceline.	81.5	71-81	20-25	1,1-DCE	3
				•	TCE	4
				•	PCE	5
				•	m,p Xylene	5
				28-33	Trans-DCE	3
				•	TCE	123
				•	Ethylbenzene	3
				38-43	Tran. DCE	6
				•	TCE	556
				48-53	Trans-DCE	4
				•	TCE	446
				•	Ethylbenzene	3
				58-63	Trans-DCE	3
				•	TCE	373
				68-73	Trans-DCE	9
				•	TCE	551
				•	Ethylbenzene	3
				78-83	Trans-DCE	9
				•	TCE	773
				•	Ethylbenzene	3
HD-12S	Northernmost along WPAFB fenceline.	24.5	14-24	18-23	PCE	105
				•	Ethylbenzene	1
HD-12M	Cluster well with HD-12S.	54.5	44-54	38-43	TCE	2
				48-53	TCE	17
				58-63	TCE	4
				68-73	TCE	3
				78-83	N/A	ND

Table 2-1. Continued

Well Identification	Well Location	Total Well Depth (ft. BGS)	Screened Interval (ft. BGS)	Sample Depth (ft. BGS)	Contaminant Identified	Concentration (µg/l)
HD-13S	South of HD-11 along WPAFB fenceline.	33	22.5-32.5	18-23	1,1-DCE	3
				"	Trans-DCE	4
				"	TCE	35
				"	Toluene	4
				"	m,p Xylene	5
				28-33	1,1-DCE	3
				"	Trans-DCE	13
				"	TCE	75
				"	m,p Xylene	7
HD-13D	Cluster well with HD-13S.	106.5	92-107	38-43	Trans-DCE	16
				"	TCE	20
				53-58	Trans-DCE	5
				"	TCE	3
				63-68	Trans-DCE	5
				"	TCE	1
				"	Ethylbenzene	1
				78-83	Trans-DCE	6
					TCE	1
				82-87	N/A	ND
				102-107	N/A	ND
HD-14S	East of HD-11.	33	22.5-32.5	18-23	Trans-DCE	3
				"	Benzene	1
				"	TCE	10
				"	Toluene	2
				"	PCE	4
				28-33	Trans-DCE	5
				38-43	Trans-DCE	3
				"	Ethylbenzene	1
				48-53	Trans-DCE	3
				"	TCE	2
				"	Ethylbenzene	2
				58-63	Trans-DCE	1
				"	TCE	1
				68-73	N/A	ND

Footnotes:
BGS = Below Ground Surface
N/A = Not applicable
ND = Not detected

3.0 INITIAL EVALUATION

3.1 Response (Removal Action) Objectives

The objective of this project is to prevent, to the extent practicable, the off-site migration of contaminated ground water from WPAFB via the Mad River Valley Aquifer. Contaminants of interest for the Phase I Task 4 field investigation are presented in Table 3-1 and include the most environmentally mobile contaminants detected at WPAFB.

Preliminary removal action alternatives applicable to public and environmental protection are presented in the following discussion.

3.2 Removal Alternatives

This section presents a brief and general discussion of the removal objectives of this study and presents potential removal action alternatives and associated technologies. This information is important to the development of the field study since it identifies minimum data requirements for the evaluation of the alternatives likely to be included in the feasibility study.

The ultimate intent is to prevent the off-site migration of contaminants from Wright-Patterson AFB. If successful, the protection of Dayton's well field would be a positive consequence. Due to the focused nature of this effort, the remedial objectives presented herein are limited to preventing contaminant migration to, or minimizing

TABLE 3-1. PRINCIPAL VOLATILE ORGANIC COMPOUNDS OF INTEREST IN GROUND-WATER AT WPAFB AND THEIR COMMON ABBREVIATIONS

Carbon Tetrachloride (CTC)

Chloroform (CF)

1,2-Dichloroethane (DCA)

1,1-Dichloroethylene (1,1 DCE)

cis 1,2-Dichloroethylene (cis 1,2 DCE)

trans 1,2-Dichloroethylene (trans 1,2 DCE)

Perchloroethylene (PCE)

1,1,1-Trichloroethane (TCA)

Trichloroethylene (TCE)

Vinyl chloride (VC)

concentrations within the water-supply distribution systems. Based on these objectives three general remedial action alternatives are presented below as candidates for evaluation. A summary of technologies associated with these alternatives are presented in Table 3-2. A more detailed screening of alternatives will be completed in a Focused Feasibility Study.

3.2.1 Containment

The feasibility of this alternative is dependent upon identifying a relatively small or isolated area or areas of ground water requiring control that may be effectively isolated to prevent further migration. This alternative also is dependent upon site geology. Specifically, a significant confining layer is required which extends under the area to be controlled and is located at a depth where containment walls could be constructed. Currently available information suggests that containment may be feasible in Area B.

3.2.2 Ground-Water Removal and Treatment

The goal of this alternative is to remove ground water and thus prevent migration of contaminants to water supply wells. Conditions most favorable for this alternative are a well-defined contaminant plume which is of limited extent, and an aquifer in which a reasonable pumping rate could remove the plume. The effectiveness of this alternative is reduced in a highly permeable aquifer of great thickness and lateral extent, or if recharge from surface-water bodies represents a high percentage of the total ground-water flow. This condition would require pumping and treatment of a large volume of water. The removed ground water could be treated for contaminant

TABLE 3-2. POTENTIALLY APPLICABLE REMEDIATION TECHNOLOGIES WRIGHT-PATTERSON AIR FORCE BASE

Technology Type	Description	Concerns/Data Requirements
Containment		
Slurry Wall	Vertical wall of low permeability. Can be designed to divert ground water away from a contaminated area, encircle an affected area or enhance capture of contaminants. Slurry walls are composed of soil-bentonite, cement-bentonite or concrete panels.	Requires a natural confining layer beneath contaminated area. Contaminants must be compatible with wall material.
Sheet Piling	Steel piles driven into the ground to form a barrier to ground-water flow and contaminant migration.	Requires confining layer. Limited to shallow depth. Possible leakage through joints.
Ground-Water Removal		
Extraction Wells	A system of one or more wells designed for ground-water removal to create a combined zone of capture that will span the width of the plume.	Can be used in shallow and deep aquifers. The number of wells required to achieve capture may be excessive in low permeability soils.
Interceptor Trench	A narrow excavation filled in with permeable material to allow ground water removal and prevent contaminant migration. Trench location is downgradient of a source area with orientation perpendicular to ground water flow.	Limited to use in relatively shallow aquifers.

TABLE 3-2
(continued)

<u>Ground-Water Treatment</u>		
Air Stripping	Involves contacting contaminated ground water with air in a counter-current manner to facilitate mass transfer of contaminants to the vapor phase. A packed tower stripper is usually used.	Design requires information on ground water chemistry (iron, hardness, etc.). May require pretreatment or post treatment to prevent solids accumulation.
Activated Carbon Adsorption	Involves passing contaminated ground water through one or more tanks containing activated carbon. Contaminants are adsorbed onto carbon granules.	Contaminant concentrations and adsorption capacity information is needed to determine carbon consumption. Pretreatment depends on ground-water chemistry (solids, hardness, etc.).
UV Catalyzed Oxidation	Contaminated ground water is passed through an ultra-violet light source with an oxidant such as hydrogen peroxide present. Contaminants are oxidized by hydroxyl radicals generated by the ultra-violet light.	Design requires information on contaminant concentrations and light transmittance of the ground water. Requires proper dosing of chemicals.

removal and discharged to surface water, directly discharged to the sanitary sewer, or reinjected to ground water.

3.2.3 Ground-Water Treatment In Conjunction with the Water Supply System

This alternative involves the use of existing water-supply wells for ground-water removal and includes treatment for contaminant removal prior to distribution. Treatment may be performed at the discharge of individual wells at an existing treatment facility, or just prior to the distribution system. Treatment at a public drinking water supply could be used in conjunction with an on-Base ground-water removal system if contamination has migrated from the Base boundary to the extent that on-Base removal alternatives could not prevent contaminants from reaching a water-supply well field.

This brief presentation of potential removal alternatives has been based on a preliminary determination of technical feasibility for WPAFB considering available site information. The applicability and effectiveness of the alternatives was determined according to the specific technology types comprising the alternatives. For example, the feasibility of ground-water removal and treatment is dependant on the individual ground-water collection, extraction, and treatment technologies in relation to the contaminant characteristics and the site conditions. Specific technologies within these general categories are presented in Table 3-2 and will be evaluated in the feasibility study.

4.0 WORK PLAN RATIONALE

4.1 Data Quality Objectives and PARCC Parameters

This section outlines the data quality objectives with respect to ensuring that the appropriate data are obtained to meet the study objectives. Data quality objectives (DQOs) were established to ensure that the appropriate data are obtained to meet the objectives, and that the data collected are of sufficient quality for their intended use.

The sampling and analysis program for volatile organic compounds and metals presented in the SAP utilizes Special Analysis Services (SAS) procedures and Regular Analysis Services (RAS), respectively, under the CLP analytical protocol. A small percentage of the samples will be analyzed by non-CLP methods (e.g., cations and anions). References such as the latest edition of Standard Methods for the Examination of Water and Wastewater shall be used for these analyses.

A four-step process was used to develop site-specific DQOs; to identify appropriate analytical protocols; and to establish Precision, Accuracy, Representativeness, Comparability, and Completeness (PARCC) requirements for each data set, as follows:

- Identify data needs for engineering and modeling purposes.
- Select appropriate methods to allow quantification of parameters at levels which will minimize the number of critical data points.
- Evaluate the maximum allowable variability (i.e., maximum precision and accuracy range).

- Develop site-specific acceptable variability based on proposed data uses and method-specific precision and accuracy information.

This acceptable variability or precision and accuracy "window", was compared to historical laboratory performance data on a method-by-method basis. This comparison determined that the SAS procedures under the Contract Laboratory Program (CLP) are sufficient.

PARCC parameters which are indicators of data quality were reviewed as part of the DQO process. The objectives of the investigation and the intended use of the data needed to meet the objectives define the PARCC parameters. The following outlines the PARCC goals as they relate to this Task 4 field investigation.

4.1.1 Precision and Accuracy

Field and laboratory precision and accuracy performance can affect the attainment of project objectives, particularly when compliance with established criteria is based on laboratory analysis of environmental samples. Given the uncertainties associated with the site conditions, the following overall precision and accuracy goals are identified for most samples (low to medium concentration) to meet the project objectives:

- Precision ±50 percent RSD (Relative Standard Deviation)
- Accuracy ±50 percent recovery

Analytical precision and accuracy will be evaluated upon receipt of the laboratory data. Analytical precision will be measured as the relative standard deviation of the data from the laboratory (internal) duplicates. Analytical accuracy will be measured as percent recovery from matrix and surrogate spike samples.

Overall sampling and analytical precision and accuracy will be determined using the same rationale from field duplicates and laboratory internal QC data.

Field sampling precision and accuracy is not easily measured. Field duplicates, field (equipment rinsate) blanks, and trip blanks will be used to estimate field sampling precision and accuracy. Some estimate of field sampling precision and accuracy can be inferred by contrasting the overall precision and accuracy estimates obtained from field duplicates with internal laboratory precision and accuracy estimates.

Field contamination, sample preservation and sample handling will affect precision and accuracy. By following standard laboratory operating procedures (SOPs) precision and accuracy errors associated with field activities can be minimized. Any deviation from SOPs will be duly noted by the sampling team to ensure correct assessment of the data obtained from the sample in question.

No project resources will be expended to develop precision and accuracy data for method (field or analytical) validation, except those commonly applied in the CERCLA program for collection of routine QA/QC data. Routine QA/QC data will include analyses from field duplicates, equipment rinsate blanks, and trip blanks based on the existing guidance (U.S. EPA's "Interim Guidance for Preparing Quality Assurance Project Plans," QAMS-005/80) that specifies the type and proportion of samples submitted for QA/QC.

Validity of data (i.e., 95 percent confidence limit) with respect to its intended use will be assessed based on laboratory-supplied QA/QC data and protocols routinely employed for validation of CLP results. In general, results that are rejected by the validation process will be disqualified from application to the intended use. If critical data points are rejected, resampling will be necessary. Qualified data will be used to the greatest extent practicable.

4.1.2 Representativeness

The sampling program is designed to ensure that the data obtained during the investigation accurately represent the actual site conditions and can be used to characterize the extent of onsite/offsite contamination. In addition to the sampling program, sampling techniques may also affect representativeness. All sampling efforts will be conducted using procedures designed to maximize the goal that the sample be representative of the media from which it was taken. To ensure data represent site conditions, SOPs will be followed.

The SAP provides details on the technical guidelines and procedures to be used by the field personnel for the field investigation in order to collect samples which represent actual site conditions. For example, ground-water samples will be obtained from wells only after the well has been purged to ensure that standing water is removed and that the samples are representative of aquifer water quality.

4.1.3 Completeness

The goal of the field investigation is to obtain data of sufficient quantity and quality to meet the project goals. The amount and type of data that might be lost due to sampling and/or analytical error cannot be predicted or evaluated until the analytical results are obtained. The criticality of any lost or suspect data will be evaluated in terms of the sample location, the parameter in question, the nature of the problem, the decision to be made with the data, and the risk associated with an erroneous decision.

4.1.4 Comparability

One of the objectives of the field investigation is to ensure that the analytical data are of comparable quality between sample locations. The data collection mechanisms proposed in the SAP are designed to produce comparable data. To ensure comparable data, standard recognized field and analytical methodologies will be followed.

Data will be reduced, reported, and documented in a consistent manner throughout the study. For example, water quality data will be reported using a consistent set of units throughout the study. Any deviations from established protocols will be noted in the data base so that data comparability can be maintained.

4.2 Project Data Needs

The existing data base is inconclusive about the current environmental state of affairs of the Mad River Valley Aquifer in the vicinity of the western boundary of Area C and along Springfield Pike in Area B. While there is no denying that there are dissolved volatile organic compounds in ground water at these points, the existing data base does not permit full quantification of the problem.

Before the effectiveness of control or removal programs is evaluated, a numerical model will be developed. Additional site-specific data must be collected to calibrate the model. These data will be generated through a field investigation performed as a part of this overall ground-water study.

The subsections that follow present an overview of the data needs and information that should be collected during the field investigation to be conducted as Task 4 of this Phase I investigation.

4.2.1 Hydrogeologic and Hydraulic Data

The hydrogeology of the Mad River Valley Aquifer is the framework on which the numerical model will be built. Existing data on the hydraulic properties and recharge/ discharge relationships of the aquifer, which was obtained from previous and on-going investigations, will be used to develop a three-dimensional mathematical algorithm which describes the location, movement, and reaction of water or contaminant particles when hypothetical changes are imposed on the aquifer system. Hydrogeologic and hydraulic data which will be used in the Phase I investigation at WPAFB will be taken from the following references: Weston, 1985; Engineering-Science, 1989; Geraghty & Miller, 1987; Dames & Moore, 1986; and Weston, 1989.

Table 4-1 summarizes the range of hydraulic data for the Mad River Valley Aquifer available from existing data sources. With these data in mind and considering the complexity or simplicity of the hydrogeologic system at WPAFB, a judgement must be made regarding the adequacy of these data for development of the numerical flow model.

While hydrogeologic complexity is evident on the microscale at WPAFB, assumptions can be made to simplify the description of the hydrogeologic systems and achieve the modelling objectives. It has been judged, therefore, that the existing data are sufficient to permit development of a numerical flow model using a proven code (i.e., MODFLOW or others) that can represent the Mad River Valley Aquifer at WPAFB and the MRWF.

It will be unnecessary to conduct any Task 4 field investigation efforts that specifically result in new hydrogeologic or hydraulic information, as the existing data base contains a sufficient amount of information on regional hydrogeologic and hydraulic conditions to permit development of a numerical flow model. However, to permit calibration of the ground-water flow model to a unique time in history, water-level data from newly installed wells and existing wells will be needed (see Subsection 4.3.4 for additional information). In addition, observation wells will be installed during future phases of the project to verify the model-predicted capture zone scenarios. These data will act as the baseline against which the numerical model outputs will be

TABLE 4-1. RANGE OF HYDRAULIC CONDUCTIVITIES FOR WPAFB AND VICINITY (WESTON 1989; GERAGHTY & MILLER 1987)

Area	Well No.	Test Method	Conductivity (cm/sec)
WPAFB	24-579	S	4.6E-04
WPAFB	02-815	P	1.30E-03
WPAFB	02-810	P	1.10E-03
WPAFB	07-609	M	6.40E-03
WPAFB	12-547	M	9.70E-02
WPAFB	12-621	M	2.80E-02
WPAFB	11-535	S	1.70E-03
WPAFB	11-617	M	7.90E-02
WPAFB	14-553	M	1.10E-01
WPAFB	14-626	M	3.90E-02
WPAFB	08-522	M	1.70E-02
WPAFB	08-523	M	1.10E-02
WPAFB	09-530	S	7.90E-03
WPAFB	10-532	M	2.40E-02
WPAFB	13-550	M	7.80E-03
WPAFB	22-575	M	2.20E-02
WPAFB	19-564	M	1.30E-01
WPAFB	00-500	M	1.00E-02
WPAFB	00-600	M	1.70E-02
WPAFB	23-576	M	9.60E-02
MRWF	MR-103S	S	6.00E-02
MRWF	MR-103D	S	3.90E-03
MRWF	MR-104S	S	1.50E-01
MRWF	MR-105S	S	4.60E-02
MRWF	MR-105D	S	1.20E-02
MRWF	MR-106S	S	1.60E-02
MRWF	MR-107S	S	3.10E-02
MRWF	MR-109S	S	6.00E-02
MRWF	MR-114S	S	1.50E-01
MRWF	MR-114D	S	9.20E-02
MRWF	MR-115S	S	9.20E-03

(continued)

Table 4-1 (continued)

Area	Well No.	Test Method	Conductivity (cm/sec)
MRWF	MR-116S	S	7.80E-02
MRWF	MR-116D	S	1.80E-01
MRWF	2	C	5.30E-01
MRWF	3	C	6.00E-01
MRWF	6	C	5.00E-01
MRWF	10	C	8.80E-01
MRWF	20	C	2.00E-01
MRWF	24	C	7.00E-02
MRWF	27	C	6.40E-01
MRWF	Rohrer's Island	P	1.30E-01
MRWF	Huffman Dam	P	7.00E-01 to 8.10E-01

Footnotes:

S = Slug test
P = Pump test
M = Mini-pump test
C = Specific capacity test

compared. Model input parameters and assumptions will be adjusted, as needed, until the numerical model reproduces the baseline potentiometric configuration developed from this round of water-level measurements.

4.2.2 Ground-Water Use

The existing data base contains enough information on current ground-water use to support development of the numerical flow model. Although the city of Dayton will have to provide data on future well field configurations and pumping schedules and the Base will have to provide data on pumping rates and schedules for their Area B well fields, no specific data will need to be collected as part of a Task 4 field investigation.

4.2.3 Ground-Water Quality

The data base on ground-water quality lacks both adequate spatial coverage and temporal relationships to assess probable long-term and short-term affects on water-quality trends of any removal actions. Without an understanding of these trends, the full effectiveness of any control methodology cannot be judged.

The appropriate magnitude of the effort needed to fully characterize ground-water quality conditions is difficult to establish, considering the size and apparent complexity of contaminant migration patterns of the area of interest. A complex network of monitoring-well clusters from which samples are collected over several years may be needed for the evaluation of the long-term remedial action programs needed at WPAFB. The requirements of this removal action dictate, however, that only a limited Task 4 field investigation is viable. The immediate needs of this removal action limit this Task 4 investigation to a single sampling of existing and new wells located in proximity to the western boundary of Area C and the Springfield Pike boundary of Area B.

4.2.4 Area of Investigation

The primary objective of this Phase I, Task 4 investigation is evaluation of conditions at the southwestern boundary of Area C and adjacent to Springfield Pike in Area B. Available data have indicated that a plume of PCE and TCE is migrating off-Base from Area C near Landfill 5; however, the existing data do not define the lateral or vertical extent of this plume. In Area B there are no data to determine whether or not contaminants are migrating off-Base. While several production wells located up-gradient from Base boundaries in Area B yield water with low levels of volatile organic compounds, there are no wells located between the production wells and the boundary to determine the quality of ground water migrating off-Base.

Because the Rohrer's Island Well Field is located approximately one mile downgradient of Area C and only a few hundred feet downgradient from Area B, this Phase I, Task 4 investigation should include the well field. The area of investigation upgradient of the two boundaries must be selected somewhat arbitrarily inasmuch as the existing data suggest that contamination may extend in the upgradient direction to the eastern and southern boundaries of the Base. A distance extending about 3000 feet upgradient from each boundary has been selected. This distance generally corresponds to the ground-water flow time field of 3 to 5 years. This distance will allow predication of future water-quality conditions at the property lines.

4.3 Work Plan Approach

The Phase I, Task 4 field investigation will be completed in four basic steps as follows:

- Water-quality sampling of existing wells.
- Installation of new wells.

- Water-quality sampling of new wells.
- Water-level measurements from existing and new wells.

4.3.1 Sample Existing Wells

To develop a current picture of conditions at WPAFB and the MRWF, several existing monitoring wells will be sampled for chemical analysis. To achieve this objective all existing wells in the vicinity of the western boundary of Area C and Springfield Pike of Area B and Rohrer's Island Well Field and monitoring and production wells reported to contain detectable organic solvents will be concurrently sampled using consistent sampling and analytical procedures. A total of 52 wells will be sampled. Figure 4-1 shows locations of the existing wells to be sampled under Phase I, Task 4.

Collected samples will be analyzed for volatile organics of the Target Compound List (TCL) and total petroleum hydrocarbons (TPH). This set of constituents is most representative of the environmentally mobile contaminants detected at WPAFB.

The analytical results from this effort will supplement and confirm information already available. This sampling will also generally provide a re-evaluation of known conditions.

4.3.2 Install New Wells

Because more information on ground-water quality conditions at the Area C and Area B property boundaries is needed, eight multiple-well clusters will be installed. Well clusters will be used to identify three-dimensional flow and evaluate movement of dissolved and nonaqueous phase liquids across Base boundaries. At a minimum, two new wells will be installed at each cluster location. To the extent possible the new wells will be paired with existing wells to provide a full range of vertical conditions.

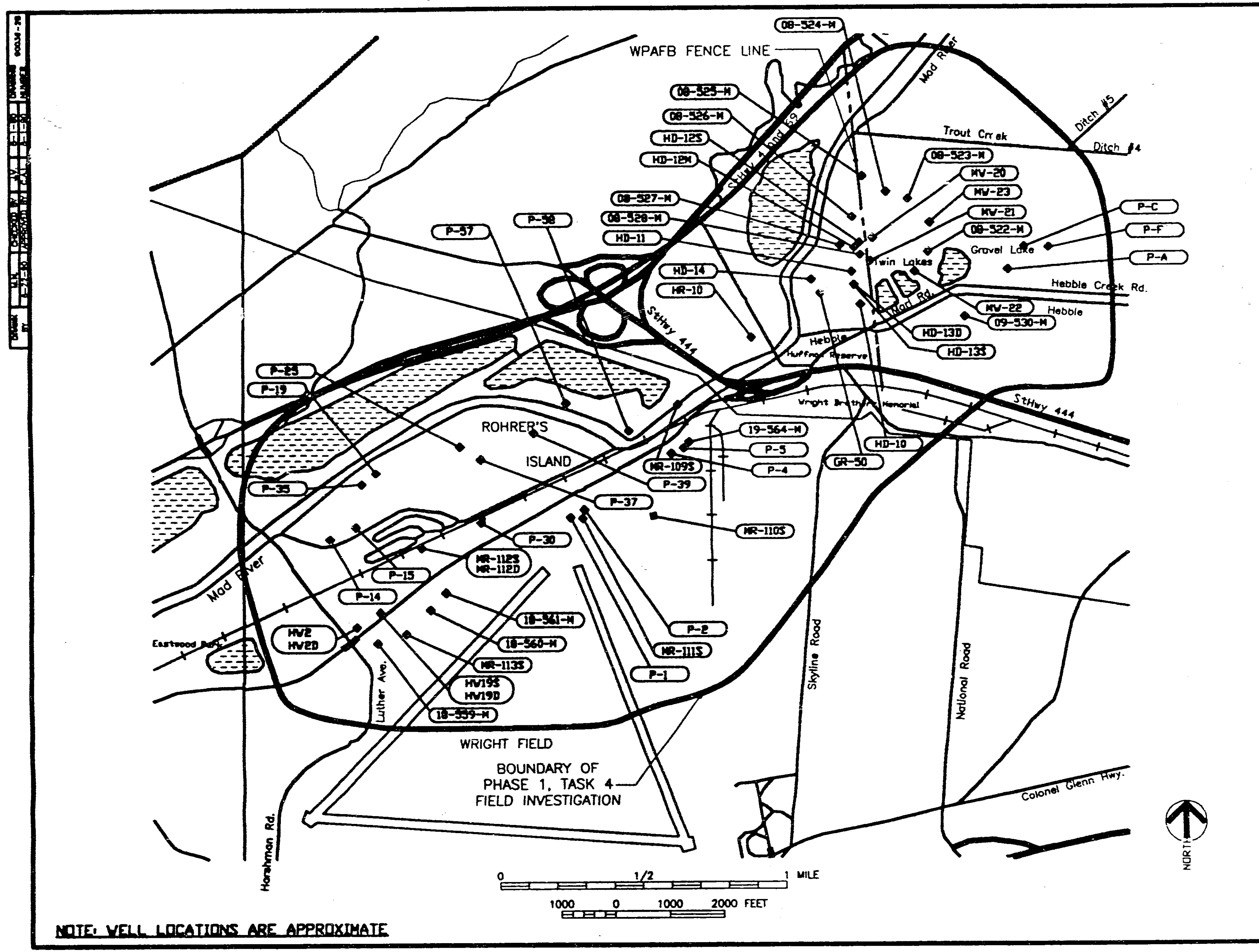


Figure 4-1. Location of Existing Wells to be Sampled for Phase I, Task 4

To facilitate location of the screened zones for each well in the cluster, a deep pilot hole will be drilled. For the Task 4 investigation, the pilot hole will be limited to a maximum of 150 feet due to Phase I time constraints imposed on the study. Requirements for a ground-water investigation below this depth will be evaluated during Phase III efforts, if necessary.

A total of 22 new wells constituting eight clusters will be installed. Three clusters will be installed in Area B between the West Well Field and the Area B property line. Five clusters will be installed in Area C along the fenceline. New monitoring well locations, as shown in Figure 4-2, were selected based on known flow pathways and water-quality information from potential on-Base contaminant sources to the Rohrer's Island Well Field. Table 4-2 provides information on the new wells to be installed during this effort. The well clusters are equally spaced along the Base boundaries and locations that are hydraulically downgradient of the Base. The number of wells to be installed is restricted by project scheduling constraints, such as well installation and development and analytical time requirements. The schedule in Section 6 assumes the installation of 22 wells. Water-level and water-quality data from the new wells will supplement information available from existing wells.

4.3.3 Sample New Wells

Following installation and development, each new well will be sampled for analysis of TCL volatiles and TPH. Analytical results from these wells will be added to the data generated during the resampling of existing wells to provide a three-dimensional representation of ground-water quality. In addition six wells (i.e., three in Area B and three in Area C representing three different depths in each area) will be sampled and analyzed to evaluate gross water quality (i.e., cations, anions, hardness, alkalinity,

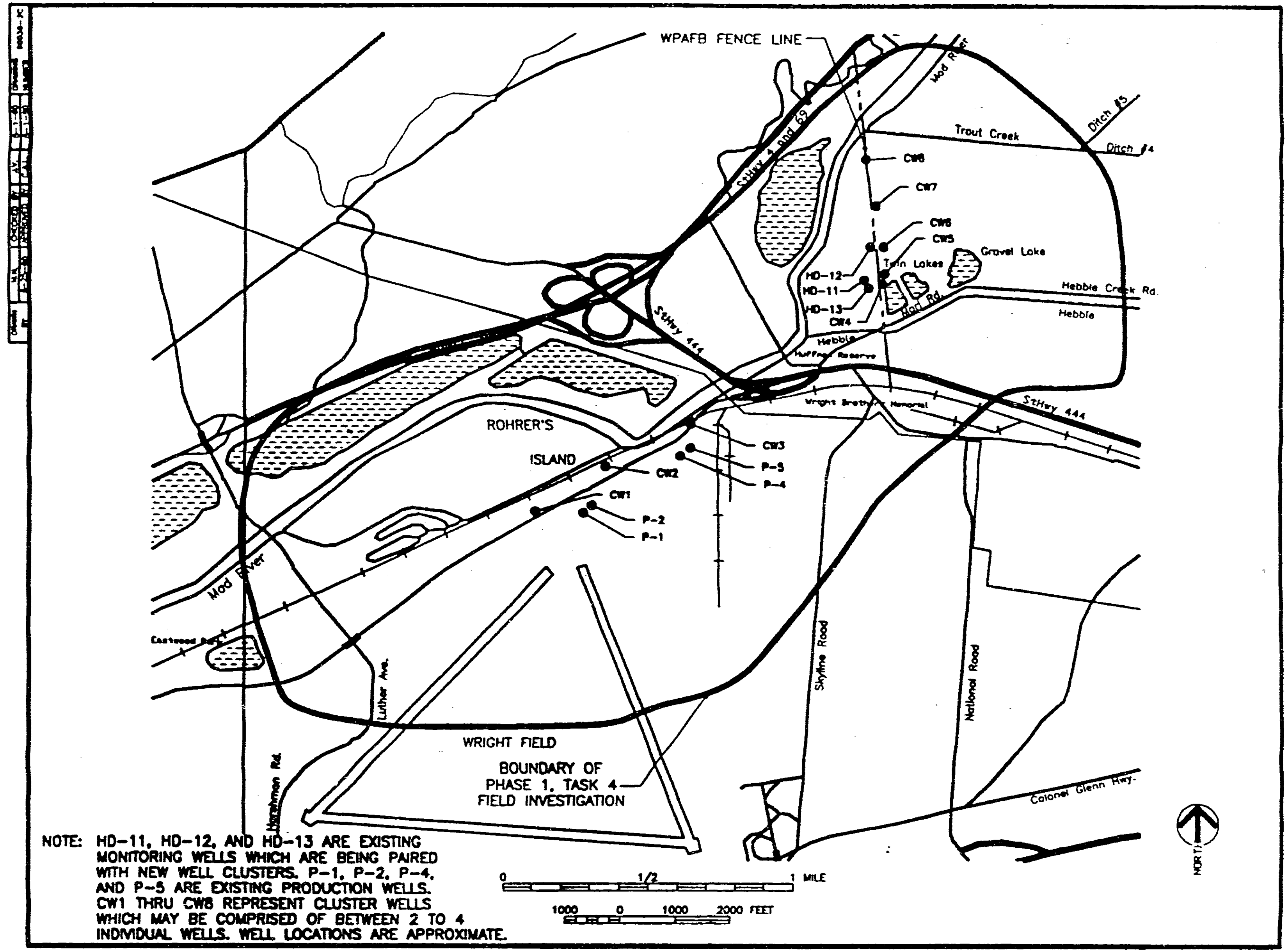


Figure 4-2. Location of New Phase I, Task 4 Monitoring Well Clusters

TABLE 4-2. GENERALIZED WELL-CLUSTER CONFIGURATION

Cluster I.D.	Existing Wells Placed Near	Depth of New Wells[1]	Depth of All Wells in Cluster
CW1	NA	<35	<35
		60-70	60-70
		90-100	90-100
CW2	NA	<35	<35
		60-70	60-70
		90-100	90-100
CW3	NA	<35	<35
		60-70	60-70
		90-100	90-100
CW4	HD-13S		32 (HD-13S)
		50-70	50-70
	HD-13D		107 (HD-13D)
		130-150	130-150
CW5	MW-21		23 (MW-21)
	HD-11		81 (HD-11)
		90-110	90-110
		130-150	130-150
CW6	HD-12S		14.5-24.5 (HD-12S)
	MW-20		21 (MW-20)
	HD-12M		55 (HD-12M)
		70-80	70-80
		100-120	100-120
CW7	08-525-M		16 (08-525-M)
		40-70	40-70
		90-110	90-110
		130-150	130-150
CW8	NA	20-30	20-30
		40-70	40-70
		90-110	90-110
		130-150	130-150

Footnotes

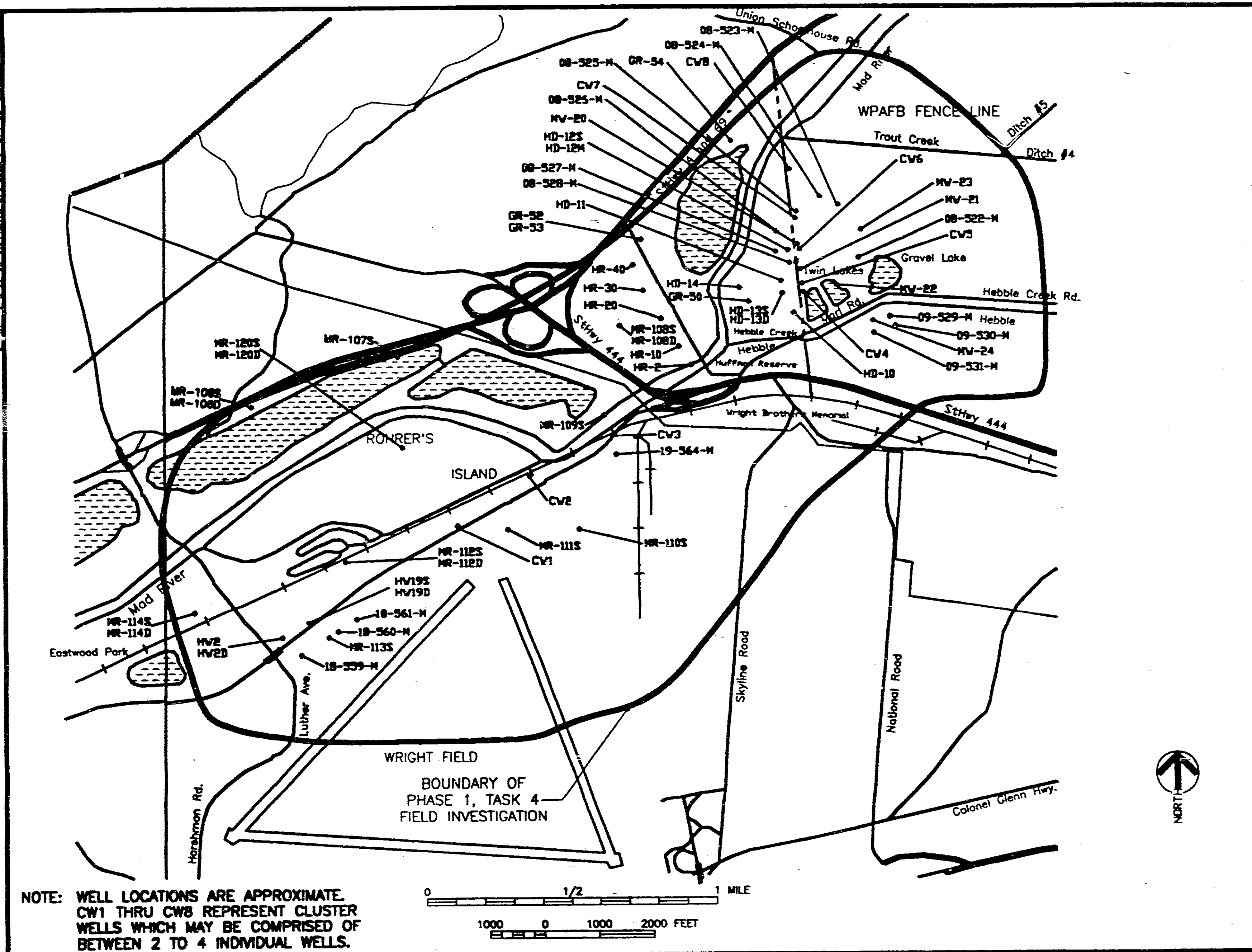
[1] These footages are estimated ranges only and are subject to revision based on knowledge gained during the course of the field investigation.

NA = Not applicable

TDS, pH, and TOC) for use in assessing general aquifer geochemistry and to provide data for evaluating potential groundwater treatment technologies. Ohio EPA concurrence with the selection of the six proposed wells will be obtained prior to samples being collected. It should be noted that the monitoring wells along the Springfield Street boundary will be sampled at a time when the adjacent WPAFB water supply production wells are not operating. After a post-shutdown waiting period of 24 hours, which is sufficient to allow the hydraulic influence of the production wells to be minimized, the monitoring wells will be sampled. Table 4-3 is a complete list of analytical parameters for this investigation.

4.3.4 Measure Water Levels

To permit calibration of the ground-water flow model, water-level measurements will be made in select existing and new monitoring wells. Figure 4-3 shows the location of monitoring wells from which water-level data will be collected. Data generated by this effort will act as the baseline against which the numerical model outputs will be compared. Collection of new water-level data will be limited to the vicinity of the western property line of Area C and the Springfield Pike portion of Area B. The area assessed will cover an area far enough upgradient to define upflow conditions and far enough downgradient to include the MRWF. The investigation will be limited to monitoring wells to avoid problems with pumps and cables in production wells and to eliminate effects of head loss caused in production wells by screen encrustations and pump inefficiencies.



NOTE: WELL LOCATIONS ARE APPROXIMATE. CW1 THRU CW8 REPRESENT CLUSTER WELLS WHICH MAY BE COMPRISED OF BETWEEN 2 TO 4 INDIVIDUAL WELLS.

Figure 4-3. Location of Monitoring Wells Where Water Levels will be Measured for Phase I, Task 4

Table 4-3. List of Analytical Parameters

TCL Volatile Organic Compounds

- Acetone
- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- 2-Butanone
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chloroform
- Chloroethane
- Chloromethane
- Cis-1,3-dichloropropene
- Dibromochloromethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- 1,2-Dichloroethane
- 1,2-Dichloroethene
- 1,2-Dichloropropane
- Ethylbenzene
- 2-Hexanone
- 4-Methyl-2 pentanone
- Methylene chloride
- Styrene
- Tetrachloroethene
- 1,1,2,2-Tetrachloroethane
- Toluene
- Trans-1,3-dichloropropane
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Vinyl acetate
- Vinyl chloride
- Xylenes

Metals

- Calcium
- Iron
- Manganese
- Magnesium
- Potassium
- Sodium

Anions

- Chlorides
- Sulfates
- Carbonate
- Bicarbonate

Miscellaneous Parameters

- Alkalinity
- Hardness
- pH
- TDS
- TOC
- TPH

5.0 KEY ASSUMPTIONS

This task will be completed in two subtasks: Task 4A involves the actual field investigation; and Task 4B is laboratory analysis of the environmental samples collected during Task 4A. The following assumptions have been made specific to timely accomplishment of Task 4 activities:

- All field efforts must be expedited requiring a 24-hour, 7-day per week schedule.
- Installation of 8 stainless steel monitoring well clusters (with at least two wells per cluster).
- Drilling will be accomplished using cable tool and hollow-stem auger requiring 24-hour, 7-day/week efforts with at least 2 crews/rig/day.
- Collection of 52 ground-water samples from existing wells and 22 samples from new wells.
- Water level measurements will be taken at 52 existing and 22 new monitoring wells.
- Laboratory analysis will be conducted for all environmental samples plus appropriate QA/QC samples for VOCs and TPH.
- 7 calendar days turn around time on laboratory analyses.
- WPAFB will provide all site access.
- Temporary office space (e.g., trailer) will be required.
- Level D will be appropriate for field work unless determined otherwise (see Volume 4, Health & Safety Plan for details).

Upon completion of all Task 4A field activities and Task 4B laboratory analysis, a draft Field Investigation Report will be submitted for approval.

6.0 SCHEDULE

The period of performance of Task 4A field activities shall be 49 calendar days from approval of all finalized plans to proceed under Task 3. The field investigation schedule is extremely tight, therefore, as dictated by project scheduling constraints. The Final Field Investigation Report shall be submitted 99 days after plan approval. Figure 6-1 is an anticipated time-line for completion of all Phase I, Task 4 activities.

6.0 SCHEDULE

The period of performance of Task 4A field activities shall be 49 calendar days from approval of all finalized plans to proceed under Task 3. The field investigation schedule is extremely tight, therefore, as dictated by project scheduling constraints. The Final Field Investigation Report shall be submitted 99 days after plan approval. Figure 6-1 is an anticipated time-line for completion of all Phase I, Task 4 activities.

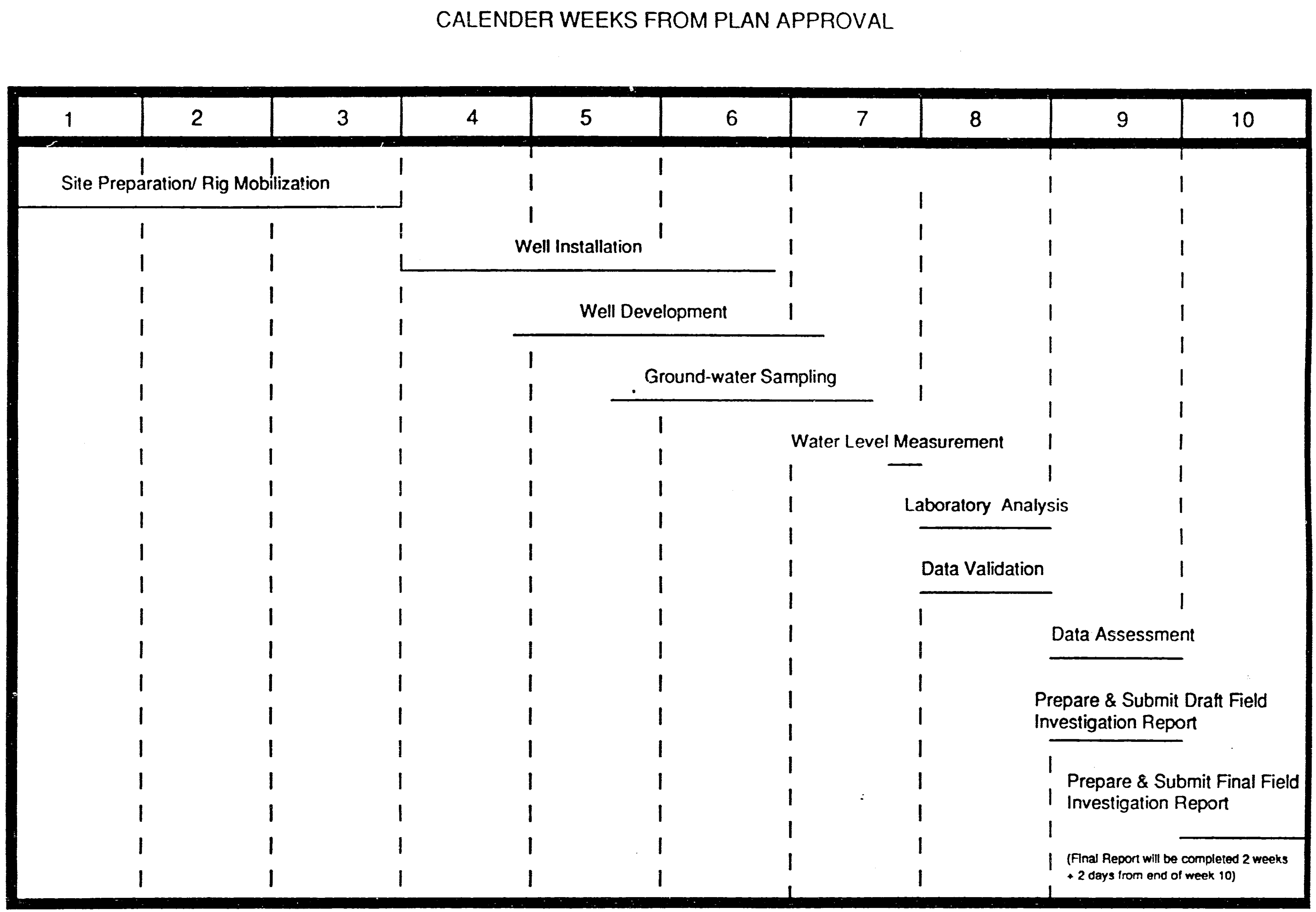


Figure 6-1. Anticipated Time-Line for Completion of Task 4 Field Activities

7.0 PROJECT MANAGEMENT

7.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

WPAFB initiated an investigation to evaluate a potential CERCLA removal action to prevent, to the extent practicable, the migration of ground-water contamination in the Mad River Valley Aquifer within and across WPAFB boundaries. Environmental Management Operations[a] (EMO) is providing overall contract management support for WPAFB for this project. International Technology Corporation (IT) has been retained by EMO to perform the environmental investigation of ground-water contamination at WPAFB (Figure 7-1). These relationships and the key contact person in each organization are shown in Figures 7-2, 7-3, and 7-4. Nevertheless, it should be noted that some of the key contact personnel may change over time.

7.1.1 WRIGHT-PATTERSON AIR FORCE BASE

The host command for WPAFB is the 2750 Air Base Wing (ABW) which is responsible for overall execution of this project. The Office of Environmental Management (EM) of the 2750 ABW is managing this project through its Restoration Branch (EMR). The WPAFB organization and involved personnel are shown in Figure 7-2.

Overall coordination of this project will be provided by Mr. Ronald Lester, Chief of the Restoration Branch of the EM at WPAFB. He is the Base Point of Contact for

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[a] EMO is operated for the U.S. Department of Energy by Battelle Memorial Institute.

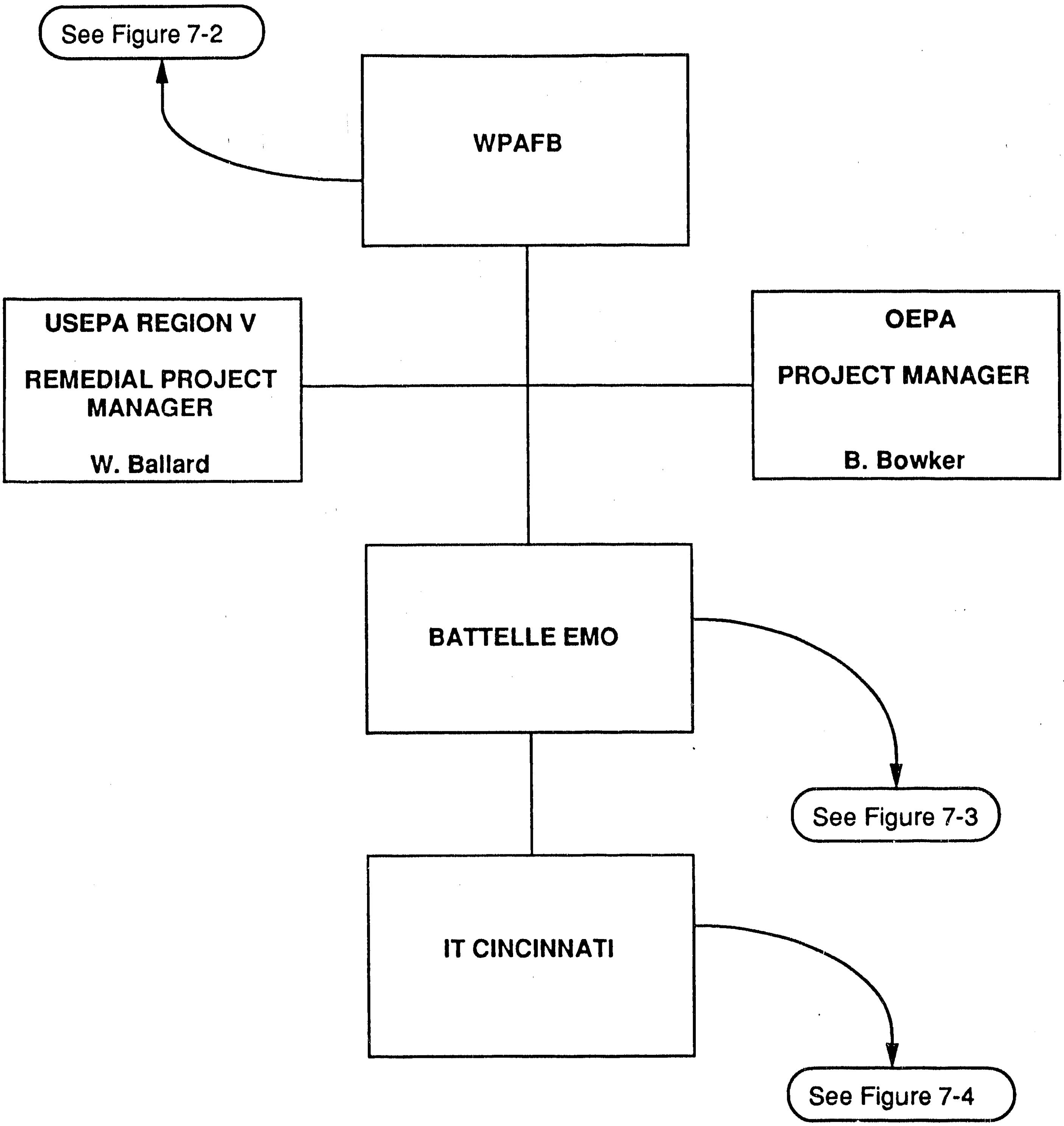

Figure 7-1. General Organization Chart.

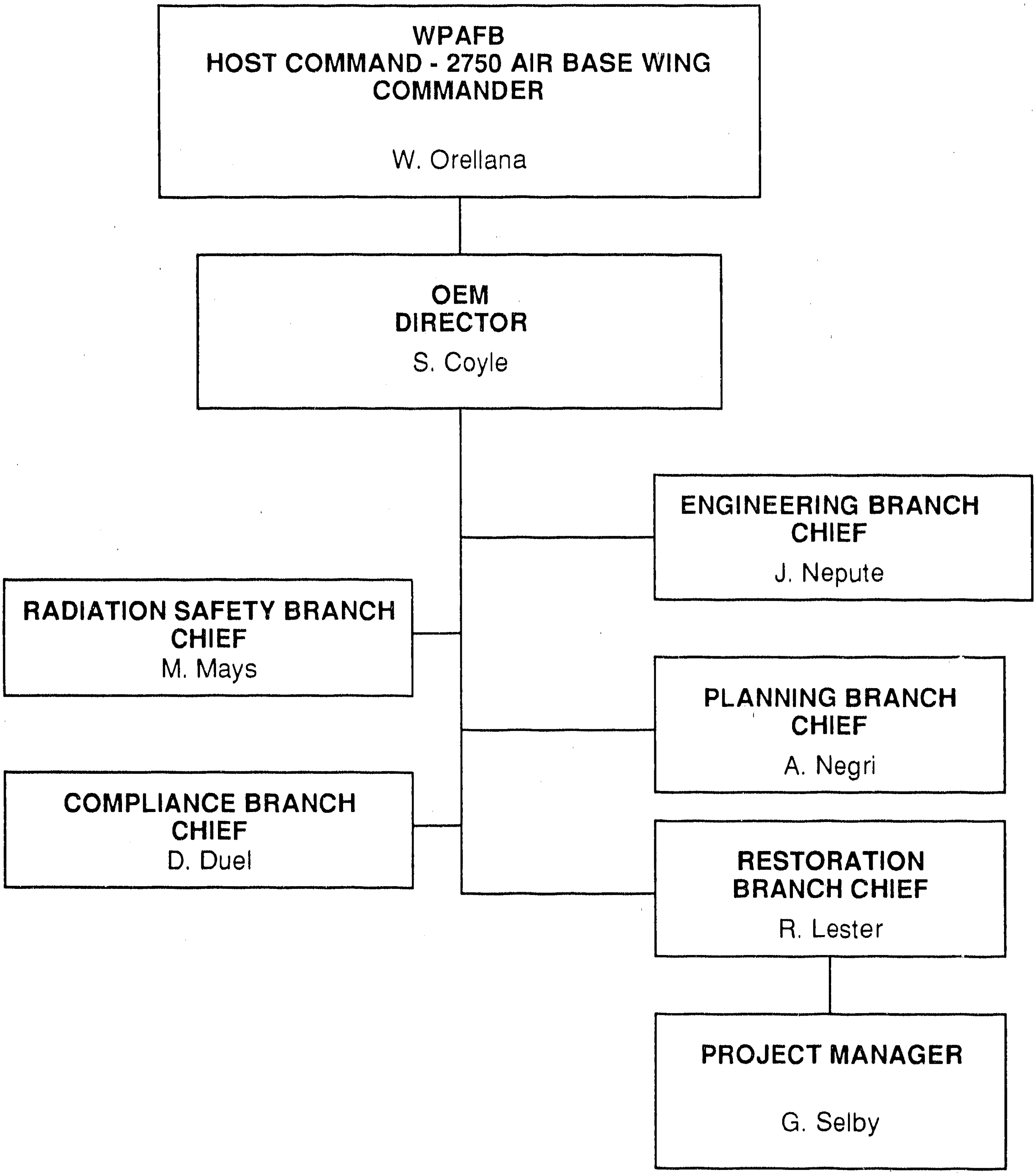

Figure 7-2. WPAFB Organization Chart.

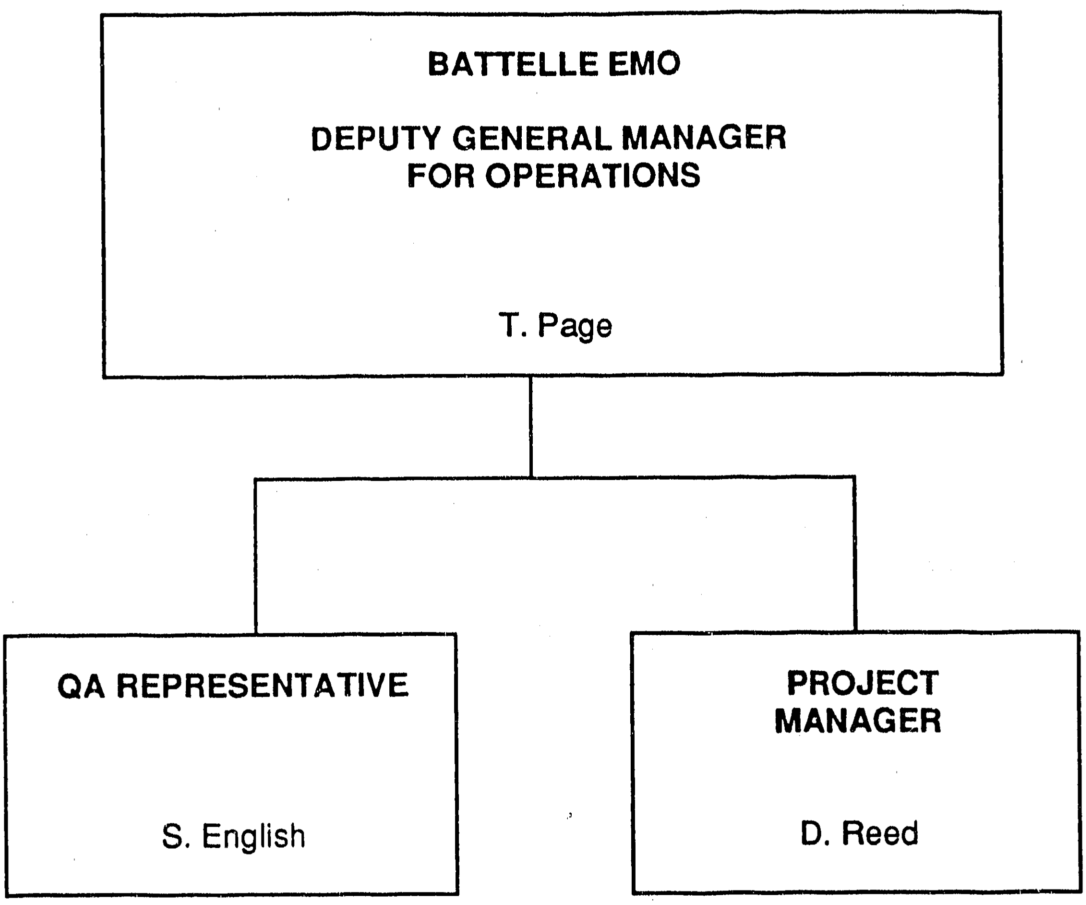

Figure 7-3. Battelle EMO Organization Chart.

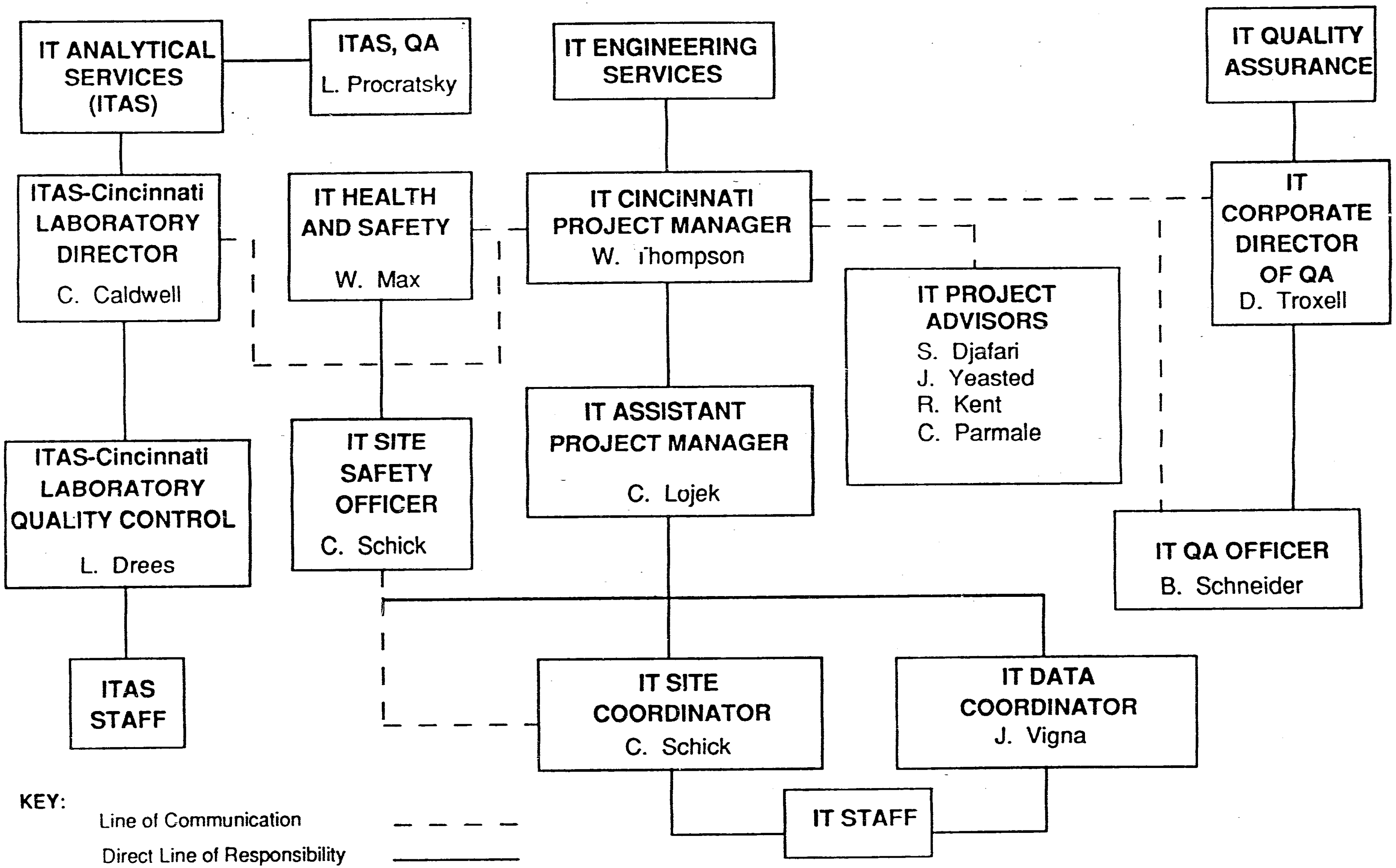

Figure 7-4. IT Organization Chart.

those regulatory organizations involved in this project as shown in Figure 7-1. Mr. Gary Selby is the restoration project manager for this investigation.

7.1.2 ENVIRONMENTAL MANAGEMENT OPERATIONS

EMO is providing contract oversite for this project to WPAFB (Figure 7-3). Dr. Tom Page, EMO Deputy General Manager for Operations, has overall responsibility for the management of the WPAFB Project. Ms. Sandy English, the EMO Quality Assurance Representative, is responsible for assuring that QA requirements for the WPAFB project are met. The EMO Project Manager is Mr. Denny Reed. Mr. Reed is responsible for managing a contractor to perform this investigation. IT is the contractor retained to perform this investigation.

7.1.3 INTERNATIONAL TECHNOLOGY CORPORATION

7.1.3.1 Project Organization and Responsibilities

The organization and functions within International Technology Corporation (IT) assigned to perform this project are described below and shown in Figure 7-4.

Project Manager (PM)

The Project Manager, Mr. Bill Thompson, will be the prime point of contact with EMO and WPAFB and will have day-to-day responsibility for technical, financial, and scheduling matters. Mr. Thompson will also serve as the interface with the project advisors. Other duties, as necessary, will include:

- Procurement, along with administrative personnel, and supervision of subcontractor services.
- Assignment of duties to the project staff and orientation of the staff to the needs and requirements of the project.
- Approval of IT project-specific procedures and internally prepared plans, drawings, and reports.
- Dissemination of project-related information from EMO and WPAFB and others.

- Serving as liaison between the project staff and other internal groups, such as QA, Health and Safety, and the laboratory.

- Serving as the "collection point" for project staff reporting of nonconformances and changes in project documents and activities.

- Determination of the effect of the nonconformances and changes on the project and the appropriateness for reporting such items to EMO and provision of appropriate documentation for any reporting.

- Notification of the project and QA groups of the project nonconformances and changes.

- Review of project documents.

Assistant Project Manager (APM)

The responsibilities of the Assistant Project Manager, Ms. Carole Lojek, are to perform the tasks of the PM in the PMs absence, and act as a backup to the Site Coordinator and Data Coordinator. Ms. Lojek will be a principal report writer and reviewer for project related documents.

Project Site Coordinator (SC)

The Project Site Coordinator, Mr. Charles Schick, will be responsible for coordinating all site activities with the Project Manager, base personnel, IT Analytical Services (ITAS) laboratory, and on-site subcontractors. Mr. Schick will be responsible for completing the work in accordance with this plan and notifying the Project Manager of any changes to the plan that may be required. The duties will include:

- Providing direction and supervision to the drilling contractor during the drilling of soil test borings and monitoring well installation.

- Insuring that appropriate field logs are maintained for project activities.

- Supervising the collection of all samples, and providing for their proper handling and shipping.

- Monitoring all drilling, well installation and sampling operations to provide that the drilling contractor and sampling team members adhere to the QA provisions of the plan.

- Processing and evaluating the results of the chemical analysis of the samples prior to preparation of the Field Investigation report.

Data Coordinator

The Data Coordinator, Mr. John Vigna, is stationed at an IT office equipped with complete data management services, (i.e., central files, word processing, duplication and drafting). Responsibilities include:

- Receipt and acknowledgement of all data from remote activity centers (i.e., lab and field).
- Processing of data for analysis and report inclusion.
- Quality control associated with data processing.
- Coordination of report preparation.

Project Advisors

The project advisors, Mr. Sirius Djafari, Mr. Joe Yeasted, Mr. Bob Kent, and Mr. Chuck Parmale, will provide the Project Manager with input to project plans, procedures, and conclusions. These senior individuals have broad range of experience with characterization of hazardous waste sites, contaminant transport, and development and implementation of remedial measures.

Laboratory Director

Responsibilities of the ITAS-Cincinnati Laboratory Director Craig Caldwell, shall include:

- General supervision of the laboratory.
- Collaboration with the project group in establishing sampling and testing programs.
- Schedule and execution of testing programs.
- Serving as liaison between the laboratory staff and other personnel.
- Serving as the "collection point" for the laboratory staff reporting of nonconformances and changes in laboratory activities.

- Notification of the laboratory and QA groups of specific laboratory nonconformances and changes.
- Maintenance of laboratory data and checkprints.
- Release of testing data and results.
- Calibration of equipment.
- Storage of samples.

Laboratory Quality Control

The Quality Control Officer, Ms. Lauren Drees, will be responsible for QC at the ITAS Cincinnati Laboratory.

Corporate Director of QA

The responsibilities of the Corporate Director of QA, Mr. Dave Troxell, include:

- Administration of the corporate QA program.
- Review and approval of this plan.
- Supervision of QA activities.
- Notification of personnel of nonconformances and changes in QA procedures.
- Determination of audit schedule.

The Corporate Director of QA reports directly to the President of IT. Accordingly, Mr. Troxell may take actions independent of the project group if required for compliance with the project QA/QC Program.

QA Officer

The QA Officer Mr. Barry Schneider is responsible for the development of this plan and the day-to-day control of project QA/QC activities. Mr. Schneider will provide the necessary guidance to the project and laboratory staffs on quality-related matters and perform the project audits. Mr. Schneider has the authority and freedom to identify quality problems; initiate, recommend, or provide corrective actions; and verify the implementation of the corrective actions.

Health and Safety Coordinator (HSC)

The Health and Safety Coordinator (HSC), Mr. Willmax, is responsible for the development of the project Health and Safety Plan and the day-to-day control of health and safety activities. The coordinator will provide the necessary guidance to the project and laboratory staffs so they can safely perform their functions in accordance with federal and state regulations.

Site Safety Officer (SSO)

The Site Safety Officer (SSO), Mr. Charles Schick, will be responsible to the HSC for coordination of the HSP. The responsibilities of the SSO include:

- Supervise the day-to-day implementation of the site-specific health and safety program.
- Train new site personnel on site specific health and safety items.
- Interact with project personnel on health and safety matters.
- Investigate and report accidents/incidents.
- Maintain liaison between field activities, the Project Manager, and the HSC.
- Perform air quality and personal monitoring as required.
- Assist the Project Manager in enforcing the requirements of this manual and the site-specific program.
- Complete all required forms on a timely basis.

7.2 Project Communications

Incoming project-related materials in the form of correspondence, sketches, logs, authorizations, or other information shall be routed to the Project Manager after the original is marked with the date received and the project number by a member of the project staff or a secretary assigned this duty. The Project Manager shall then determine which personnel should review the incoming materials and shall route the materials accordingly.

As soon as practical, incoming correspondence originals shall be placed in the project central file. If the correspondence is required by the project personnel for reference, a copy should be made rather than holding the original. Correspondence which is addressed to the project group but is of importance to the project QA/QC Program shall be routed to the QA officer.

Project-related materials including correspondence, reports, and drawings shall be appropriately reviewed, approved, and if necessary signed prior to transmittal.

Outgoing project correspondence and reports should be read by the program director and project manager prior to mailing. The office copy of project correspondence should bear routing information and be routed by QA personnel, if judged appropriate by the project manager.

Communications relative to the project which are initiated by third parties (e.g., media, interested individuals, and groups) will be referred directly to EMO without comment.

REFERENCES CITED

Geraghty & Miller, Inc. April 1987. Mad River Well Field Assessment and Appendices. Prepared for the City of Dayton.

Weston, Inc. September 1985. Final Report Phase II-Stage 1 Study. Prepared for Wright-Patterson Air Force Base.

Weston, Inc. July 1989. Stage 2 Report-Volumes I, II, and III, Technical Report and Appendices. Prepared for Wright-Patterson Air Force Base.

Dames & Moore. August and September 1986. Site Investigation Report-Landfills 8, 10 and 12. Prepared for Wright-Patterson Air Force Base.

Engineering-Science, Inc. 1990. Project Work Plan for Remedial Investigations and Feasibility Studies at Wright-Patterson Air Force Base, Ohio. Volumes 1 and 4. Prepared for Wright-Patterson Air Force Base.

APPENDIX A

COMMENTS ON VOLUME

This appendix was attached to the front of the August 1990 Draft. The comments relevant to this volume have been incorporated into this issuance.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 2750TH AIR BASE WING (AFLC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-5000

31 AUG 1990

Y TO
OF: EM

JECT: Completion of Work Plans, Off-Site Groundwater Investigation, Wright-Patterson Air Force Base

TO: See Distribution

1. Attachments 1, 2, and 3 provide our comments, Ohio EPA comments (dated 20 Aug 90) and additional technical information respectively required for the subject work plans. The addition of this letter and the attachments to the front of Volumes 2-4 and Volume 3 Appendix A shall be considered sufficient to complete these work plans. The terms and conditions, as specified in the Ohio EPA letter dated 20 Aug 90, will be followed during the Field Investigation.

2. Should you have any questions or require additional copies of this letter, please contact Mr Gary W. Selby, (513) 257-2201.

FOR THE COMMANDER

JOHN A. NEPUTE, P.E., Acting Deputy Director
Office of Environmental Management

3 Atch
1. EMR Comments, 20 Aug 90
2. OEPA Comments, 20 Aug 90
3. Additional Technical Information

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HQ AFLC/DEVR

COMMENTS ON VOLUME 2, WORK PLAN

1. List of Acronyms: "DQA" should be "DQO". Also, "OEPA" should be added.

2. Section 2: Figures 2-1 and 2-2 are out of order.

3. Page 2-4, last paragraph: "product" should be "production" in the fourth line.

4. Page 2-5: This paragraph should be replaced with the following:

During May and June 1990, the City of Dayton conducted field screening for volatile organic compounds (VOC) and total petroleum hydrocarbons (TPH) of groundwater samples. The sampling was done upgradient from the Rohrer's Island Well Field near Huffman Dam and along the southwestern boundary of Area C. Monitoring wells were installed at some of the sampling locations (HD10 through HD14) based upon the field screening data. The following data, as of August 16, 1990, were generated during this sampling effort:

Sample Location	Depth of Sample Below Ground (ft)	Total VOC Concentration (ppb)
HD1	20-70	ND
HD2	20-150	ND
HD3	25	3.09
	100	1.53
	170	ND
	200	ND
HD4	28	2.29
	65	26.76
	90	8.44
HD5	20	7.01
	70	8.61
	115	2.53
	120	2.83
	125	3.66
HD6	25	3.59
	45	1.91
	150	ND
HD7	20-70	ND
HD10	27-32	ND
	38-43	ND
	48-53	ND
	58-63	2
	66-71	3.5
HD11	20-25	17
	28-33	129
	38-43	562
	48-53	453
	58-63	376
	68-73	563
	78-83	785

HD12	18-23	106
	38-43	2
	48-53	17
	58-63	4
	68-73	3
	78-83	ND
HD13	18-23	51
	28-33	98
	38-43	36
	53-58	8
	63-68	7
	78-83	7
	82-87	ND
	102-107	ND
HD14		
	28-33	5
	38-43	4
	48-53	7
	58-63	2
	68-73	ND

5. Section 3.1: "alternative" should be plural in the second paragraph.

6. Section 3.2, second paragraph: The first sentence should indicate that the ultimate intent is to prevent the off-site migration of contaminants from Wright-Patterson AFB. If successfull, the protection of Dayton's well field would be a positive consequence.

7. Section 3.2.1: "dependent" is misspelled in the first two sentences. Also, in the third sentence, "over" should be "under" as a confining layer is required under the area to be controlled for the containment alternative to be feasible.

8. Page 3-6, last line: "3-5" should be "3-2".

9. Page 4-3, second full paragraph: "laboratory" should be added after "standard" in the second sentence.

10. Page 4-5, bottom of page: Weston 1989 should be added as a reference.

11. Page 4-6, last paragraph: "As" should be deleted and "the" should be capitalized in the second sentence.

12. Section 4.2.3, second paragraph: "be" should be "the" in the last sentence.

13. Page 4-10, third line: "that" should be deleted.

14. Page 4-13, seventh line: "affected" should be "restricted" and "back-end project" should be "schedule".

15. Table 4-2: "MD-13D" should be "HD-13D" in the second column. "HD-12S" should be added in the second column for Cluster CW6. The

elements in columns 2 and 3 should be lined up horizontaly with the elements in column 4 so that association can be made between well screen depths and well nomenclature.

16. Table 4-3: Carbontetrachloride and bromomethane should be added to this table.

17. Section 6: Please review the schedule for accuracy. Also, "back-end" should be "schedule".

18. Section 7: Since personnel change over time, a qualifying statement should be added that states that these names may change in the future.

19. Page R-1: Dames & Moore 1986 and Engineering-Science 1990 should be ad

OhioEPA

State of Ohio Environmental Protection Agency

Southwest District Office
40 South Main Street
Dayton, Ohio 45402-2086
(513) 285-6357
FAX (513) 285-6249

Hand-delivered to WPAFB
Aug 20, 1990

Richard F Celeste
Governor

August 20, 1990

Re: Workplan for the Investigation of Ground Water Contamination at WPAFB

Scott Mallette, Chief
Environmental Restoration Branch
2750 ABW/EM (AFLC)
Wright-Patterson Air Force Base, Ohio 45433

Dear Mr. Mallette:

With exceptions noted, the following comments on the "Workplan, Phase I Task 4 Field Investigation" were discussed with Gary Selby, Denny Reed, and Bill Thompson at the August 13, 1990 progress meeting. It is Ohio EPA's understanding that the Air Force had no objections to the comments discussed at that meeting and that the comments will be incorporated into the work to be performed during the Phase I Task 4 investigation. It is also Ohio EPA's understanding that the drilling subcontractor was notified to mobilize so as to be able to start work on this project by September 5, 1990. Ohio EPA hereby concurs with the "Workplan, Phase I Task 4 Field Investigation" with the following four conditions:

1. All of Ohio EPA's comments appearing below will be incorporated into the work to be performed during this investigation.

2. In the interest of time, and with the intent of avoiding any delays in the start date for this investigation, the Workplans for the project will not be revised by the Air Force or resubmitted to Ohio EPA. In lieu of revision, this comment letter will be copied by the Air Force and bound into the front of each of the separate volumes of the Phase I Task 4 Field Investigation Workplan so as to become part of that Workplan.

3. Ohio EPA's August 2, 1990 correspondence containing comments on the Field SOPs for the RI/FS Workplan will be incorporated into the Phase I Task 4 field work. The RI/FS Field SOPs in combination with the procedures outlined in the RI/FS Workplan will be followed during the Phase I Task 4 field work except where modified by Ohio EPA approved project-specific amendments.

4. The Air Force will provide Ohio EPA with written confirmation that the conditions outlined above are understood and will be met during the Phase I Task 4 Field Investigation. This written confirmation is to be provided to Ohio EPA no later than Tuesday, August 28, 1990.

<u>Ohio EPA Comments - Volume 2, Workplan for Phase I Task 4 Field Investigation</u> - (August 6, 1990)

1. Page iii, Table 4-3: Correct page # for Table 4-3 is 4-17.

2. Page 2-4, third line from bottom: Typo - "product" should be "production"

3. Page 3-1, 3.1, second paragraph: Typo - "alternative" should be "alternatives".

4. Page 3-3, 3.2.1: "Dependant" should be spelled "dependent".

5. Page 3-3, 3.2.1: The confining layer would need to be under the area to be controlled, not over.

6. Page 3-6, 3.2.3, last sentence of first paragraph: Delete the word "or" from this sentence. Contaminants may have already migrated beyond the WPAFB boundary to a point where they are affecting Dayton's well field. This may indeed require treatment at the well field. This does not mean that an interception system designed to prevent further off-base contaminant migration will not be necessary at the base boundary, although this is what seems to be implied by the current wording of this sentence. It must be clearly understood that treatment at Dayton's well field is not an acceptable substitute for contaminant control at the base boundary.

7. Page 3-6, 3.2.3, last sentence on page: "Table 3-5" should read "Table 3-2".

8. Page 4-2, 4.1.1, second sentence: Delete this sentence. The referenced criteria are not used in the screening of remedial alternatives.

9. Page 4-3, third paragraph: Specify that the existing guidance being referred to is U.S. EPA's "Interim Guidance for Preparing Quality Assurance Project Plans", (QAMS-005/80).

10. Page 4-5, 4.2, second paragraph: Reword to read: "Before the effectiveness of control or removal programs is evaluated, a numerical model will be developed. Additional

site-specific data must be collected to calibrate the model. These data will be generated through a field investigation performed as a part of this overall ground water study."

11. Page 4-5 and 4-6, 4.2.1: Indicate in this section that observation wells will be installed during future phases of the project to verify the model-predicted capture zone scenarios.

12. Page 4-6, second paragraph, first sentence: Delete the phrase "...to control contaminant migration..." from this sentence.

13. Page 4-6, third paragraph, second sentence: Delete the first word "As" and start the sentence "The existing data base...".

14. Page 4-9, 4.2.2: Include the pumping rates and schedules for WPAFB's Area B and Area B East well fields as data needs which will need to be factored into the model.

15. Page 4-9, 4.2.3, last sentence: Typo - Change "be" to "the".

16. Page 4-10, first full sentence: Delete the word "that" so the sentence reads ""While several production wells located upgradient from Base boundaries in Area B yield water with low levels of...".

17. Page 4-13, top of page: Replace the phrase "back-end project requirements" with the phrase "project scheduling constraints" and explain how those constraints affect the number of wells installed. Note that Ohio EPA expects to see 22 monitoring wells installed during the Phase I investigation (see Table 4-2 on page 4-15).

18. Page 4-13, 4.3.3: Identify the purpose behind sampling the six wells for gross water quality. Indicate that Ohio EPA concurrence with the selection of these six sampling points will be obtained prior to the samples being collected.

19. Page 4-13, 4.3.3: Indicate that monitoring wells along the Springfield Street boundary will be sampled at a time when the adjacent WPAFB water supply production wells are not operating. A waiting period after shut down should be established which is sufficient to allow flow conditions in the area to return to prepumping conditions prior to sampling the monitoring wells.

20. Page 4-17, Table 4-3: Include Carbon tetrachloride and Bromomethane in the TCL Volatile Organic Compounds.

21. Page 6-1, 6.0: Replace the phrase "back-end deadlines" with the phrase "project scheduling constraints".

22. Page 7-4, Figure 7-2: The names in this table are not current. Please update the table.

<u>Ohio EPA Comments - Volume 3, Sampling and Analysis Plan (SAP) Phase I Task 4</u> - (August 8, 1990)

1. Comments provided above that apply to sections of the SAP which are identical to sections in Volume 2 are to be incorporated into the SAP. These comments have not been repeated below.

2. Page 5-10, 5.4.1: The drillers and site geologist must be sensitive to changes in lithology during the drilling of the deep pilot hole. Although a lithologic sample will be collected every five feet, the bore hole will likely be bailed more frequently. The cutting should be visually examined for gross changes in lithology each time the bailer is withdrawn from the bore hole, and a lithologic sample needs to be collected each time a change in lithology is detected in addition to those collected every five feet.

3. Page 5-10, 5.4.1: Driving the casing may prove difficult through parts of the formation, particularly the boulder zone. Refer to the attached table of recommended casing standards excerpted from Ohio EPA's Water Well Standards (OAC 3745-9-06) for assistance in determining which well casing is appropriate for the project.

4. Page 5-12, first and second bullets: Drill cuttings are to be containerized if any reproducible readings above background are obtained with the field screening instruments. Delete the reference to 10 ppm which appears in these two bullets and revise accordingly. Any soils which are determined to be contaminated are at least solid waste and may be hazardous waste. Procedures to be followed in testing and disposing of project generated wastes are those identified in the RI/FS Field SOPs and the RI/FS Workplan.

5. Page 5-12, first paragraph: The first two sentences need to be combined using a comma after the OAC reference.

6. Page 5-12, last sentence carrying over to 5-13: The sand pack is to consist of coarse silica sand.

INTERNATIONAL TECHNOLOGY CORPORATION

August 27, 1990

Mr. Dennis Reed
Battelle Management Operations
Wright Point 2
5100 Springfield Pike, Suite 210
Dayton, Ohio 45431-1231

Re: Response to OEPA Comment Letter of August 20, 1990
PN 199814.03.02

Dear Mr. Reed:

Per your request I have prepared responses to two questions contained in the OEPA letter of August 20, 1990.

Volume 2, Pages 4-13, 4.3.3: Indicate that monitoring wells along the Springfield Street boundary will be sampled at a time when the adjacent WPAFB water supply production wells are not operating. A waiting period after shutdown should be established, which is sufficient to allow flow conditions in the area to return to prepumping conditions prior to sampling the monitoring wells.

Response: Generally, IT has already agreed to shutdown the production wells for some period of time prior to sampling the new wells along Springfield Pike. The issue of concern and confusion with the OEPA comment is the phrase "shutdown should be established which is sufficient to allow flow conditions in the area to return to prepumping conditions."

Initially, we believe that the sampling of the new wells should be reflective of normal Base operations. Normal operations means that the wells along Springfield Pike are cyclically pumped with an average daily withdrawal from the well field at about one million gallons per day.

The West Well Field has been operating for several decades. There can be no return to "prepumping" conditions since the Dayton Rohrer's Island well field has been greatly expanded since the Base wells were installed.

It appears that OEPA is most concerned about what happens when the wells are off for a few hours or days. A particle of water and entrained dissolved contaminants move through the ground-water system at rates less than 8 feet per day. The Base production wells are tens of feet from the Base boundaries, thus the wells would have to be shut off for an extended period before contaminants at the production wells would reach the monitoring wells in Base boundary.

Since prepumping conditions cannot be re-established and since ground-water flow times from the production wells to the monitoring wells are very long, IT will shut the wells down for 24 hours only. This is anticipated to be sufficient time to allow the hydraulic influence of the production wells to be minimized, but there will be little, if any, affect on the quality of water at the monitoring wells.

Volume 3, Appendix A, FP5-2, Amendment 7: This amendment is not acceptable. The grout used to telescope wells should be allowed to cure a minimum of 24 hours before proceeding.

Response: OEPA provides no rationale for its comment on curing time.

To assist OEPA's evaluation of this comment, the following generalized well construction details are provided:

- 8-inch or 10-inch casing will be driven 2 to 3 feet into the clay confining layer during drilling.

- 6-inch secondary casing will be driven 3 to 5 feet into the clay confining layer.

- Grout will be tremied between 8-inch and 6-inch casings as 8-inch casing is pulled.

- Grout will be allowed to cure for 12 hours (there will be no grout inside the 6-inch secondary casing.

- A 4-inch casing will be driven during drilling through the confining layer. There should be minimal vibration of the 6-inch casing during drilling with the 4-inch casing.

- Following installation of the monitoring well, grout will be tremied into the 4-inch borehole and extend back to land surface.

I hope this information will be helpful to you.

Sincerely,

IT CORPORATION

Bill

William E. Thompson
Project Manager

WET:sdw

Table 2-1. City of Dayton Monitoring Well Data, 1990

Well Identification	Well Location	Total Well Depth (ft. BGS)	Screened Interval (ft. BGS)	Sample Depth (ft. BGS)	Contaminant Identified	Concentration (µg/l)
HD-10D	Southernmost along WPAFB fenceline.	69.5	59-69	27-32	N/A	ND
				38-43	N/A	ND
				48-53	N/A	ND
				58-63	Toluene	2
				66-71	1,1-DCE	2.5
				"	Toluene	1
HD-11	South of HD-12 along WPAFB fenceline.	81.5	71-81	20-25	1,1-DCE	3
				"	TCE	4
				"	PCE	5
				"	m,p Xylene	5
				28-33	Trans-DCE	3
				"	TCE	123
				"	Ethylbenzene	3
				38-43	Trans-DCE	6
				"	TCE	556
				48-53	Trans-DCE	4
				"	TCE	446
				"	Ethylbenzene	3
				58-63	Trans-DCE	3
				"	TCE	373
				68-73	Trans-DCE	9
				"	TCE	551
				"	Ethylbenzene	3
				78-83	Trans-DCE	9
				"	TCE	773
				"	Ethylbenzene	3
HD-12S	Northernmost along WPAFB fenceline.	24.5	14-24	18-23	PCE	105
				"	Ethylbenzene	1
HD-12M	Cluster well with HD-12S.	54.5	44-54	38-43	TCE	2
				48-53	TCE	17
				58-63	TCE	4
				68-73	TCE	3
				78-83	N/A	ND

Table 2-1. Continued

Well Identification	Well Location	Total Well Depth (ft. BGS)	Screened Interval (ft. BGS)	Sample Depth (ft. BGS)	Contaminant Identified	Concentration (µg/l)
HD-13S	South of HD-11 along WPAFB fenceline.	33	22.5-32.5	18-23	1,1-DCE	3
				"	Trans-DCE	4
				"	TCE	35
				"	Toluene	4
				"	m,p Xylene	5
				28-33	1,1-DCE	3
				"	Trans-DCE	13
				"	TCE	75
				"	m,p Xylene	7
HD-13D	Cluster well with HD-13S.	106.5	92-107	38-43	Trans-DCE	16
				"	TCE	20
				53-58	Trans-DCE	5
				"	TCE	3
				63-68	Trans-DCE	5
				"	TCE	1
				"	Ethylbenzene	1
				78-83	Trans-DCE	6
					TCE	1
				82-87	N/A	ND
				102-107	N/A	ND
HD-14S	East of HD-11.	33	22.5-32.5	18-23	Trans-DCE	3
				"	Benzene	1
				"	TCE	10
				"	Toluene	2
				"	PCE	4
				28-33	Trans-DCE	5
				38-43	Trans-DCE	3
				"	Ethylbenzene	1
				48-53	Trans-DCE	3
				"	TCE	2
				"	Ethylbenzene	2
				58-63	Trans-DCE	1
				"	TCE	1
				68-73	N/A	ND

Footnotes:
BGS = Below Ground Surface
N/A = Not applicable
ND = Not detected

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