

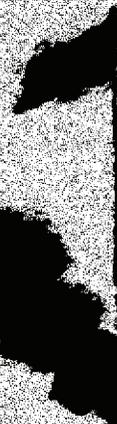
DOCUMENT



Arsenal-Wide

Investigation Workplan
FOR THE BENICIA ARSENAL

February, 1999



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ARSENAL-WIDE INVESTIGATION WORKPLAN
FOR
ENVIRONMENTAL INVESTIGATION AT
THE FORMERLY USED DEFENSE SITE (FUDS)
BENICIA ARSENAL
Benicia, California

FUDS SITE #: J09CA075600

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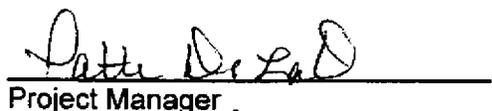
PREFACE

This Arsenal-Wide Investigation Workplan (Workplan) has been prepared for use in conducting Formerly Used Defense Site (FUDS) program investigative activities at the Benicia Arsenal (Arsenal). It outlines the planned approach for the Arsenal investigation and presents both the Arsenal-Wide approach and the details of site specific investigations. This Workplan presents an introduction, background information to the Arsenal and project team, general site controls, guidelines for the rapid site characterization approach to conducting investigation activities, and specific information to each of the five main "WIRMS" Arsenal areas. Each of the WIRMS areas contain a general area description, a site specific conceptual model, site specific Field Site Investigation Plans (FSIPs), and site specific Site Safety and Health Plans (SSHPs). This document has been established to comply with the February 1999 Quality Assurance Project Plan (QAPP) in order to promote consistency and comparability of all activities, and to assure defensible data collection and production. As the investigation of the Arsenal progresses, new FSIPs/SSHPs will be incorporated into this Workplan.

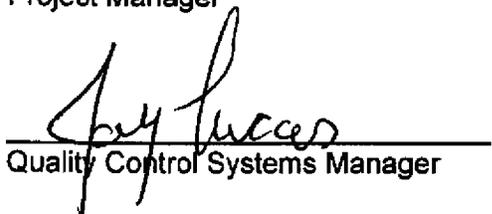
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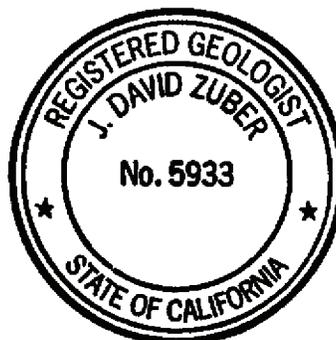

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LIST OF ACRONYMS

bgs	below ground surface
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COPC	chemicals of potential concern
DoD	Department of Defense
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
FSIP	Field Site Investigation Plan
FUDS	Formerly Used Defense Site
GAC	granular activated carbon
IDW	investigation derived waste
MLE	maximum likelihood estimation
msl	mean sea level
NFA	no further action
PAHs	polyaromatic hydrocarbons
PID	photoionization detector
PQL	practical quantitation limit
PRG	preliminary remediation goal
QAPP	Quality Assurance Project Plan
RCRA	Resource, Conservation, and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RL	reporting limit
RRR	Records Research Report
SSHPP	Site Safety and Health Plan
SSO	Site Safety Officer
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
UST	underground storage tank
UXO	unexploded ordnance
VOC	volatile organic compound
WIRMS	Warehouse, Industrial, Revetment, Motor Pool, and Storage (Areas)

Executive Summary

EXECUTIVE SUMMARY

This Arsenal-Wide Investigation Workplan (Workplan) outlines the planned approach for the United States Army Corps of Engineers' (USACE) environmental investigation at the Benicia Arsenal (Arsenal). The Arsenal is a Formerly Used Defense Site (FUDS), located approximately 25 miles northeast of San Francisco, California

The purpose of this Workplan is to develop a consensus between USACE and the regulatory community regarding planned Arsenal-wide, area-specific, and site specific activities that will be conducted as part of the environmental investigation. Environmental investigations under the USACE FUDS program are bound by RCRA and follow the intent and general process of Comprehensive Environmental Response Compensation, and Liability Act (CERCLA). The process presented in this document, though based in Resource, Conservation, and Recovery Act (RCRA) and CERCLA, has been modified to account for the long history of the Arsenal and the wide variety of potential sites that may have been impacted by former Department of Defense (DoD) operations. These modifications include overall Arsenal- and Area-wide planning and approaches to ensure consistency for the project, but conducting investigations, reporting, restoration, and closure activities on a site-by-site basis.

FUDS Program

The scope and objectives of the Arsenal-Wide FUDS program environmental investigation have been developed to achieve the goal of properly investigating the Arsenal and characterizing the nature and extent of any DoD related contamination. The determination of which analytical methods to use during specific investigations will be based on existing information about former military use of the site being investigated. The FUDS program is specifically designed to clean-up contamination from former military use, and

as a result, any chemical which is suggested to have been used by the military based on historical knowledge will be investigated for. Chemicals defined in initial investigations will be further evaluated in accordance with CERCLA guidance. Analytical methods described in the Quality Assurance Project Plan (QAPP) were selected with the assistance of end data users and risk assessors and are comprehensive and consistent with CERCLA. Throughout this Workplan the term "Chemicals of Potential Concern" or "COPC" is used in reference to chemicals or groups of chemicals known or suggested to have been used by the military. Once data are collected, the list of COPC will be refined based on actual site data in accordance with CERCLA guidance.

Specific analytical methods for individual Arsenal investigations will be selected site-by-site along with data quality objectives, sampling locations, and COPCs, and documented in site specific FSIPs. The FSIPs provide the detailed scope and objectives for data collection activities and are grouped by Arsenal WIRMS areas in Chapters 6 through 10 of this Workplan. As the Arsenal investigation proceeds, additional FSIPs will be developed and added to each chapter as appropriate.

Under the FUDS program, land previously utilized by the DoD that has no "beneficial use history" from subsequent landowners or lessors will be characterized and if necessary remediated appropriately. Beneficial use of former DoD land is defined as use by subsequent landowners or lessors in a manner that would either mask contamination caused by DoD or continue contamination in the same way. Once beneficial use has been established, no further investigation or characterization will occur under the FUDS program for that particular site.

Prioritization of the site investigations within each Arsenal area will be based on a number of criteria. The highest priority to investigation and restoration activities will always be given to sites that pose the greatest danger to human health and the environment. Other criteria that will be used to select sites for investigation include: presence or absence of Unexploded Ordnance (UXO); FUDS beneficial use; importance to other Arsenal actions; obtaining right of entry from property owner; site access and logistics; public interest; and the regulatory process. Wherever possible individual sites identified in the draft Records Research Report (RRR) will be grouped according to common historical use, common or related location, or common investigation techniques. The grouping of sites will typically take place when planning the investigations as part of the preparation of the site specific Field Site Investigations Plans (FSIPs) and maximizes the efficiency of investigations, restoration, and closure.

Site Access and Site Preparation

Site access and rights of entry will be obtained by USACE prior to commencement of work. USACE and the Benicia site investigation team will notify residents and current occupants of planned activities and schedules prior to site investigations. The Benicia Arsenal Community Relations Plan will be followed to ensure that disturbances to residents and current occupants are kept to a minimum. The Benicia site investigation team will obtain all necessary permits, including drilling and hot work permits, and will follow the Benicia Arsenal General Site Safety and Health Plan (SSHP) for all utility clearances.

Work Zones

Work zones will be established in accordance with Benicia Arsenal General SSHP requirements. All work zones will have clearly defined boundaries and will be

treated as restricted areas. Only authorized workers and visitors will be allowed to enter the work zones. Access to the site during investigations will be controlled by site personnel. The size and type of work zone designation will be based on the planned activities and current use of the site. Work zone boundaries will be delineated with barricades, cones, caution tape, warning signs, and/or temporary fencing. Work hours will generally be limited to 7:30 am to 6:00 pm on weekdays, depending on site locations and type of work performed.

Investigation Derived Waste Plan

IDW characterization will follow Environmental Protection Agency (EPA) guidance (USEPA, 1991). Investigation Derived Waste Plan (IDW) is defined as waste generated during an environmental investigation that has potential for being hazardous and thus requiring special handling. This plan is not intended to cover wastes generated by other activities at the site, such as removal actions, remediation activities, or previous investigations.

Use Categories

The site use categories for which general characterization approaches have been developed were selected based on a review and grouping of the various historic activities and facility uses at the Arsenal, as identified in the draft RRR (Jacobs, 1998). At a number of sites, multiple uses have been identified, and thus the site is associated with more than one use category.

The approach to characterization of sites with multiple uses will be developed based on a combination of the applicable general use category approaches. A miscellaneous use category has been established to encompass historic activities and uses that only occurred at a few sites (generally less than five) and thus did not warrant development of a generalized site characterization approach.

Characterization Approaches

The general site characterization approaches for each use category were developed based on:

- variables within the use category that may affect the characterization work;
- investigative methods that will be used, including the type of media that will be sampled (i.e., soil, soil gas, and/or groundwater), the target investigation areas, and the boundaries of the investigation (lateral and vertical); and
- analytical methods that will be used, including identification of decision criteria for use of field screening methods, field analytical methods, or fixed-base laboratory methods.

A flowchart was developed for each use category encompassing the approach used for the initial steps of investigation (Figures 5-1 through 5-7). Table 5-2 has been developed to present documented Arsenal substances that may be of concern, and the likely analytical methods that will be used to test for the substances. If contamination is found during these steps that is not determined to be associated with overlapping beneficial use by the current owner, the investigation will continue based on the procedures outlined in flowcharts for determining both the horizontal extent (step-out) and the vertical extent (step-down). Whenever possible, any additional sampling to define the vertical and lateral extent of contamination will be performed during the same field mobilization, in order to minimize the impact on current landowners.

Assessment Criteria

Assessment criteria will consist of values that will be used to evaluate results of individual site investigations and to determine when an investigation is complete, if no further action under FUDs is warranted, if a risk evaluation is necessary, or if remedial action is needed. Assessment

criteria values will consist of risk-based concentrations and ambient concentrations.

Risk-based Assessment Criteria.

Assessment criteria values will be developed for each individual COPC using a risk-based approach. The risk-based approach will be presented in Investigation Reports that correspond to individual FSIPs, and will include developing a conceptual risk model to evaluate potential exposure routes and receptors for COPCs at each facility. The result of the risk approach will be to select appropriate risk-based values for each COPC that may consist of established concentrations such as USEPA Preliminary Remediation Goals (PRGs) or may be derived based on the site specific risk assessment.

Ambient Assessment Criteria. In addition to risk derived values, assessment criteria will also include ambient (background) concentrations for naturally occurring COPCs (for example metals and nitrate), and when appropriate, ambient concentrations for some human-related COPCs. Ambient concentrations for human-related COPCs will be evaluated when there is a likely local or regional source that may have impacted Arsenal soils (for example pesticides from general use, and some hydrocarbon compounds related to the Exxon refinery). The purpose of calculating ambient concentrations is to avoid investigating and remediating COPCs that are present at or below ambient concentrations.

Ambient concentrations will be calculated according to each WIRMS area by statistical analysis of soil data collected from the Arsenal and surrounding area. A separate plan to determine ambient concentrations will be developed according to EPA guidance (USEPA, 1995) for each of the five WIRMS areas and will be attached to Chapter 6 through Chapter 10 of this Workplan, as appropriate. Each plan will include number and location of ambient samples, a list of analytes, and a description of the statistical methods. Although for

convenience the plans will be developed by WIRMS area, each plan will incorporate information on bedrock geology, hydrogeology, soil type, and sample grain-size distribution to address different Arsenal-Wide conditions. Each plan will also include a sampling and analysis plan to evaluate WIRMS area groundwater conditions. The purpose of the groundwater evaluation will be to assess if local groundwater is potable, and to evaluate groundwater as a potential exposure pathway for the conceptual risk models.

Although ambient concentrations will be calculated on a WIRMS area-by-area basis, ambient sampling and analysis will be conducted on a more focussed FSIP by FSIP schedule. Each WIRMS-area plan will include details for updating and maintaining the ambient database, and each individual FSIP will describe ambient specific sampling that will take place during field activities. Individual Investigation Reports for each FSIP will present the ambient results and when appropriate calculate ambient concentrations for use in the data analysis. Because ambient sampling will be conducted during several separate investigations, statistical ambient concentrations may not be available when preparing the initial investigation reports.

Reporting

Results of site investigations will be presented in a letter report for each site or for several sites based on groupings presented in FSIPs. Each letter report will review the scope of work, describe methods, and present results of file reviews and observations made during field work. The reports will include analytical data in table form, a comparison of data against assessment criteria, and a summary of quality assurance and data validation. Each report will also present conclusions based on the data, and recommendations for additional work.

WIRMS Areas

A description of each WIRMS area follows, including the physical characteristics, operational history, current use of the land, and land ownership. FSIPs and SSHPs for each area are presented at the end of each appropriate Workplan section. The FSIPs and SSHPs will be added to the Workplan as they are developed.

Area W occupies an irregularly shaped tract of land consisting of approximately 400 acres. It is bounded on the north by 2nd Street (formerly State Highway 21), on the northeast by the Arsenal boundary line, on the east by Suisun Bay, on the south by the drainage canal adjacent to Area M, and on the west by the drainage canal adjacent to Area S.

Area I occupies an irregularly shaped tract of land consisting of approximately 200 acres. It is bounded on the north and east by Area M, on the south by Carquinez Strait, and on the west by the Arsenal boundary line.

Area R occupies a tract of land of approximately 709 acres. It is bordered on the north, east, and west by the Benicia Arsenal leased property boundary and on the south by Areas S and W. The central and south-central portions of this area are generally flat and are overlain by alluvial deposits (which are described in Area W). The remainder of the area is comprised of low-lying foothills. According to a local resident and former Arsenal employee (personal communication, Buster Byerrum, 1998) the flat areas were covered with several tons of fill material following Arsenal closure.

Area M occupies a rectangular shaped tract of land consisting of approximately 400 acres. It is bounded on the north by the drainage canal adjacent to Area W, on the east by Suisun Bay, on the south by Area I, and on the west by the Arsenal boundary and Area S.

Area S occupies a trapezoidal shaped tract of land of approximately 500 acres. It is

bounded on the north by the Arsenal boundary and Area R, on the east by the drainage canal adjacent to Area W, on the southeast by Area M, and on the south and west by the Arsenal boundary.

FSIPs/SSHPs

As described in Section 2, investigation activities within each WIRMS area will be conducted on a site by site basis. The scope and objectives of each investigation are documented in site specific FSIPs. Site specific health and safety protocols are presented in SSHPs. The FSIPs/SSHPs for each WIRMS area are attached to the appropriate chapters of this Workplan. As the Arsenal investigation progresses, new FSIPs will be added to each chapter as they are developed and approved. A table in each chapter summarizes the site use categories for each WIRMS area. The flysheet preceding the FSIPs/SSHPs lists each FSIP/SSHP in the order of completion.

1.0 Introduction

1. INTRODUCTION

This Arsenal-Wide Investigation Workplan (Workplan) outlines the planned approach for the United States Army Corps of Engineers' (USACE) environmental investigation at the Benicia Arsenal (Arsenal). The Arsenal is a Formerly Used Defense Site (FUDS), located approximately one mile east of the City of Benicia and 25 miles northeast of San Francisco, California (Figure 1-1). Figure 1-2 is a map of the Arsenal area.

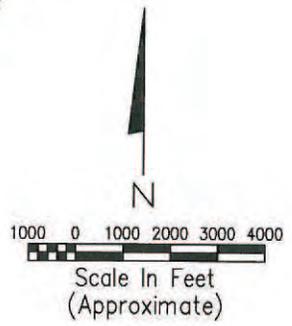
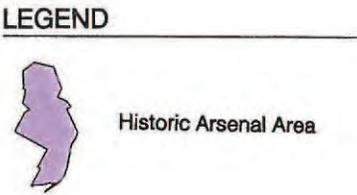
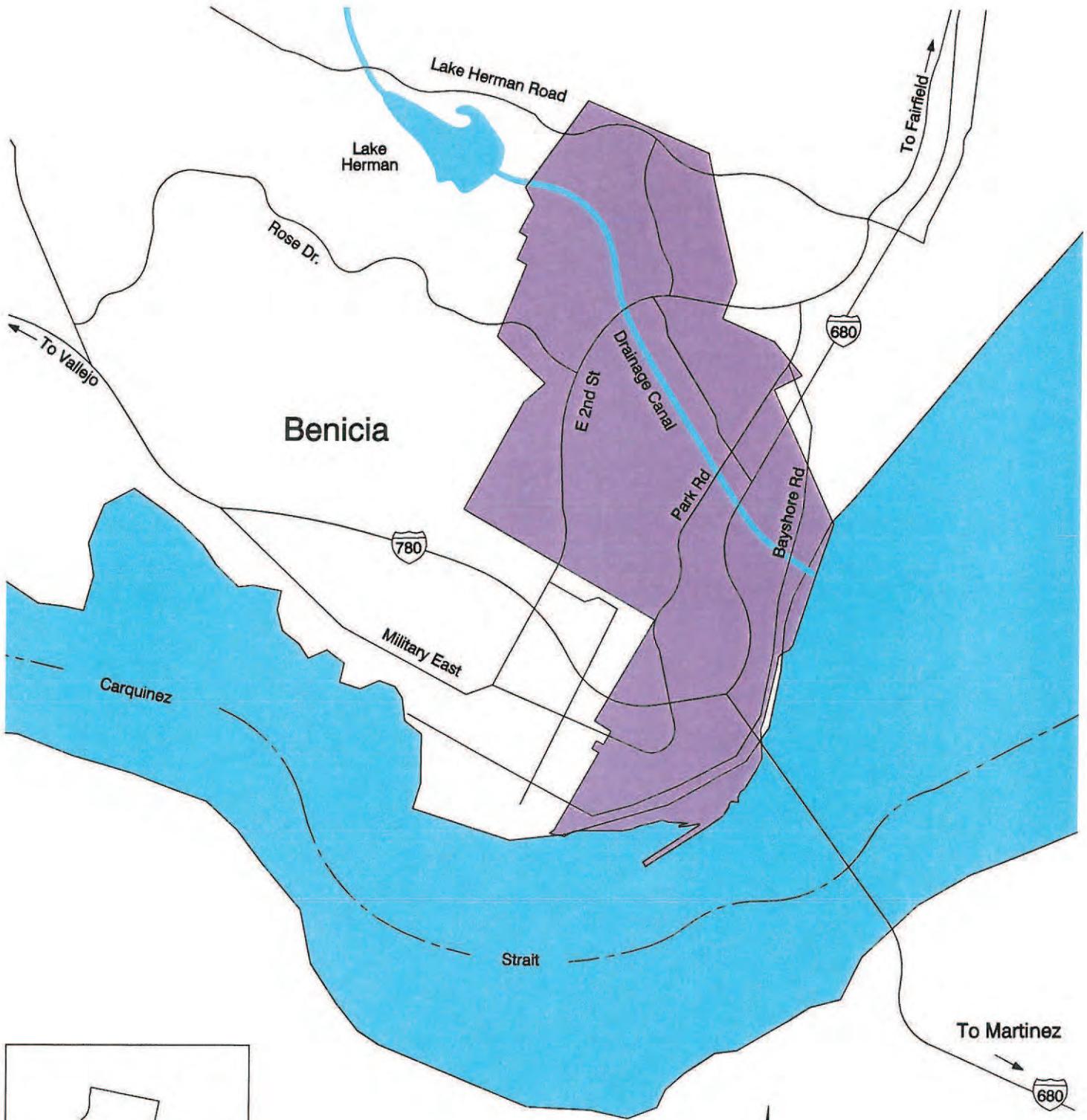
The purpose of this Workplan is to develop a consensus between USACE and the regulatory community regarding planned Arsenal-wide, area-specific, and site specific activities that will be conducted as part of the environmental investigation. Environmental investigations under the USACE FUDS program are bound by RCRA and follow the intent and general process of Comprehensive Environmental Response Compensation, and Liability Act (CERCLA). The process presented in this document, though based in Resource, Conservation, and Recovery Act (RCRA) and CERCLA, has been modified to account for the long history of the Arsenal and the wide variety of potential sites that may have been impacted by former Department of Defense (DoD) operations. These modifications include overall Arsenal- and Area-wide planning and approaches to ensure consistency for the project, but conducting investigations, reporting, restoration, and closure activities on a site-by-site basis.

The background and overall approach to investigating the Arsenal is presented in this Workplan and several additional site-wide documents including: the Conceptual Work Plan; the draft Records Research Report (RRR); a Quality Assurance Project Plan (QAPP); and a General Site Safety and Health Plan (SSHP). The Conceptual Workplan is the companion document to this Workplan and outlines the overall scope and objectives of the planned environmental investigation. The draft RRR (comparable

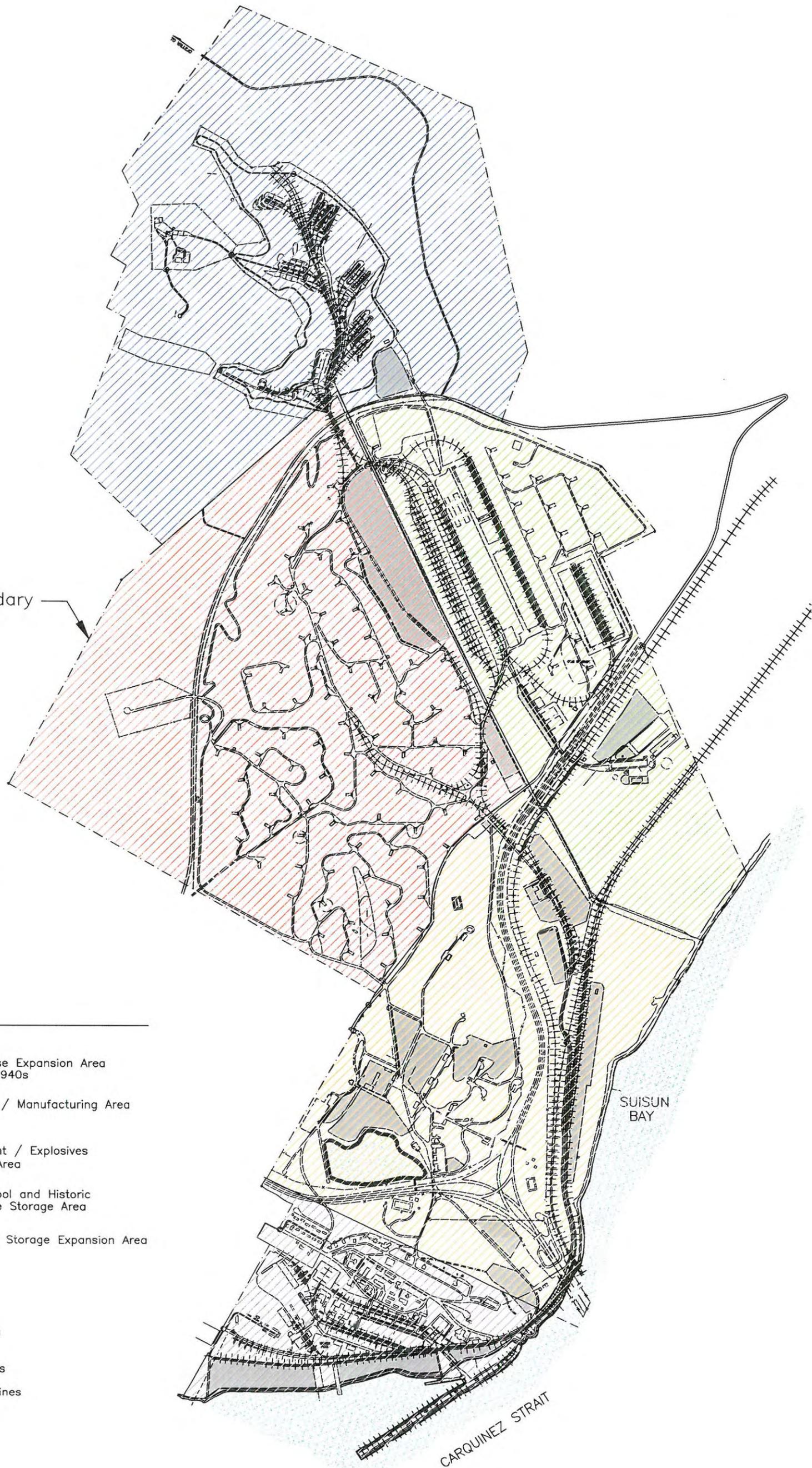
to a CERCLA Preliminary Assessment) details the DoD history of the Arsenal. The QAPP and General SSHP present the guidelines to promote consistency and comparability of investigation activities, to assure defensible data collection and production safely.

This Workplan presents both the Arsenal-wide investigation approach and the details of site specific investigations. This Workplan is organized into 11 Chapters including this introduction. Chapters 2 and 3 present background information to the Arsenal and project team. Chapter 4 discusses general site controls. Chapter 5 presents guidelines for the rapid site characterization approach to conducting investigation activities. Rapid site characterization is consistent with Superfund Accelerated Clean-up Model to streamline investigation and remediation under CERCLA. Each approach represents a site use category and outlines the general sequence of events and decision points that will occur during individual site investigations.

Chapters 6 through 10 provide information specific to each of the five main "WIRMS" Arsenal areas. Area W (Chapter 6) is the warehouse expansion area of the 1940's and 1950's. Area I (Chapter 7) is the industrial manufacturing area. Area R (Chapter 8) is the revetment area or the explosives holding yard. Area M (Chapter 9) is the motor pool area and the former historical ordnance storage area. Area S (Chapter 10) is the storage igloos area. Each of these chapters includes a general area description, a site specific conceptual model, site specific Field Site Investigation Plans (FSIP), and site specific SSHP which describe details of investigation activities. As the investigation of the Arsenal progresses, new FSIPs/SSHPs will be incorporated into Chapters 6 through 10 of this document, as appropriate. Chapter 11 presents references.



Location of Benicia Arsenal
 Arsenal-Wide Investigation Workplan
 Benicia Arsenal



Arsenal Boundary



300 0 300 600 900 1200 1500
Scale In Feet
(Approximate)

LEGEND

- Area W - Warehouse Expansion Area of the 1940s
- Area I - Industrial / Manufacturing Area
- Area R - Revetment / Explosives Holding Area
- Area M - Motor Pool and Historic Ordnance Storage Area
- Area S - Magazine Storage Expansion Area
- Water
- Open Storage Areas
- Area Boundary Lines
- Arsenal Boundary Lines
- Road
- Railroad Tracks

SOURCE: BASIC INFORMATION MAPS, MARCH 1958
 LAND UTILIZATION MAP, MAY 1956
 PRELIMINARY BENICIA ARSENAL REHABILITATION
 OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

Benicia Arsenal WIRMS Areas
 Arsenal-Wide Investigation Workplan
 Benicia Arsenal

2.0 FUDS Program and Background of Arsenal

2. FUDS PROGRAM AND BACKGROUND OF ARSENAL

This section of the workplan presents a description of the FUDS program approach to investigation of the Benicia Arsenal and a summary of the background of the Arsenal. A more detailed description of the history of the Arsenal is presented in the draft RRR for the Benicia Arsenal (Jacobs, 1998).

2.1 FUDS Program

The scope and objectives of the Arsenal-Wide FUDS program environmental investigation have been developed to achieve the goal of properly investigating the Arsenal and characterizing the nature and extent of any DoD related contamination. The determination of which analytical methods to use during specific investigations will be based on existing information about former military use of the site being investigated. The FUDS program is specifically designed to clean-up contamination from former military use, and as a result, any chemical or group of chemicals which is suggested to have been used by the military based on historical knowledge will be investigated for. Chemicals defined in initial investigations will be further evaluated in accordance with CERCLA guidance. Analytical methods described in the QAPP were selected with the assistance of end data users and risk assessors and are comprehensive and consistent with CERCLA. Throughout this Workplan the term "Chemicals of Potential Concern" or "COPC" is used in reference to chemicals, groups of chemicals, or degradation products known or suggested to have been used by the military. Once data are collected, the list of COPC will be refined based on actual site data in accordance with CERCLA guidance.

Specific analytical methods for individual Arsenal investigations will be selected site-by-site along with data quality objectives, sampling locations, and COPCs, and documented in site specific FSIPs. The

FSIPs provide the detailed scope and objectives for data collection activities and are grouped by Arsenal WIRMS areas in Chapters 6 through 10 of this Workplan. As the Arsenal investigation proceeds, additional FSIPs will be developed and added to each chapter as appropriate.

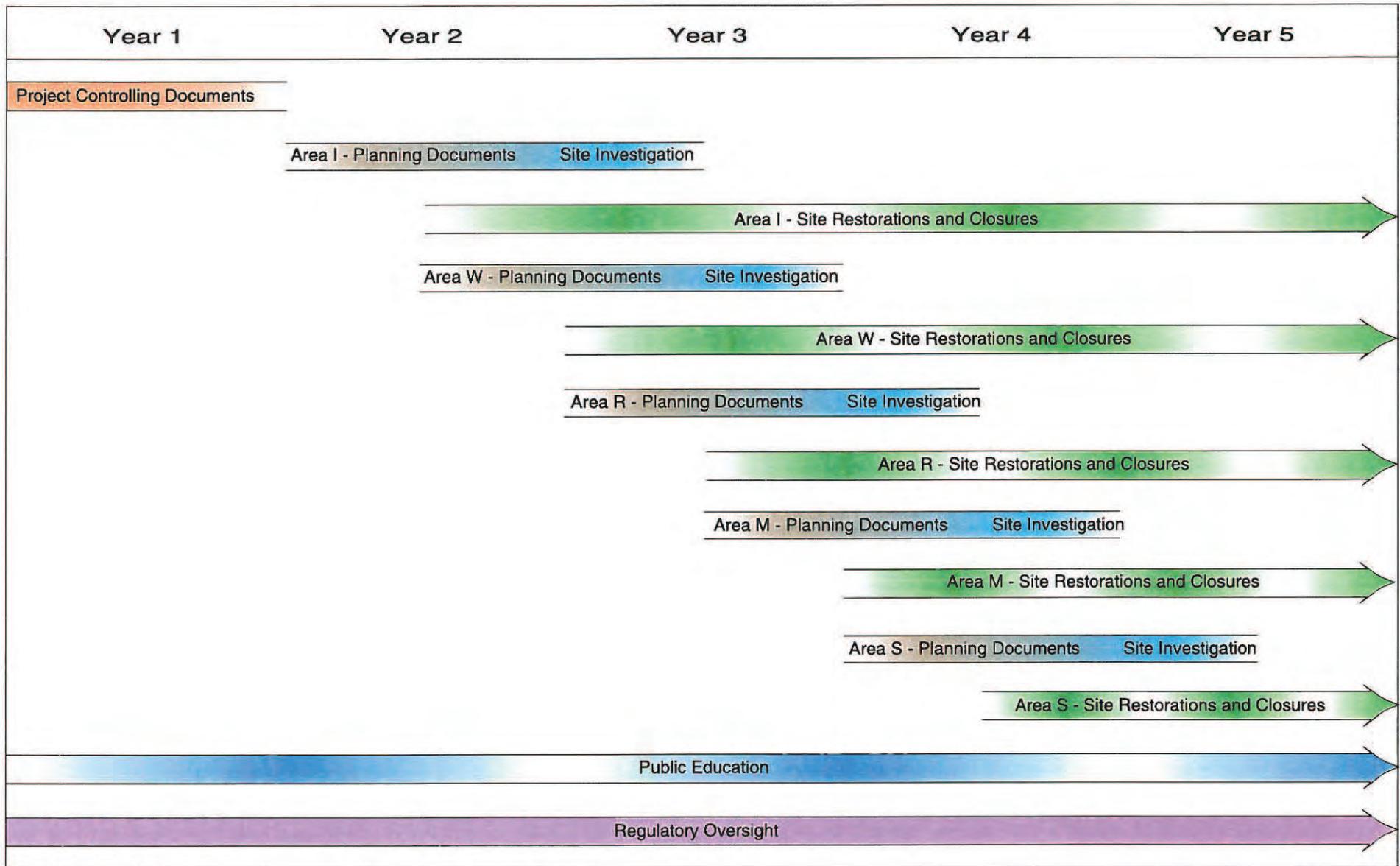
Under the FUDS program, land previously utilized by the DoD that has no "beneficial use history" from subsequent landowners or lessors will be characterized and if necessary remediated appropriately. Beneficial use of former DoD land is defined as use by subsequent landowners or lessors in a manner that would either mask contamination caused by DoD or continue contamination in the same way. Once beneficial use has been established, no further investigation or characterization will occur under the FUDS program for that particular site.

There are numerous individual property owners at the Arsenal. Participation in the FUDS program by these individual property owners is voluntary. Therefore, property owner access and approvals will determine the degree to which the environmental investigation described in this Workplan and subsequent FSIPs can be implemented at individual sites.

Under the FUDS program, work cannot proceed in an area until the area is cleared of unexploded ordnance (UXO). Area I has been chosen as the starting point for the work at the Arsenal because it has the lowest potential for buried UXO. All areas to be investigated will be cleared prior to or concurrent with the field investigation. Ordnance clearance will be addressed by USACE separately from the activities described in this Workplan.

2.2 FUDS Program Schedule

Figure 2-1 presents a conceptual schedule that illustrates the flow of FUDS project



This conceptual schedule is based on continuing availability of Federal funding.
 Site closures are dependent on regulatory approval.

Conceptual Schedule
 Arsenal-Wide Investigation Workplan
 Benicia Arsenal

activities at the Benicia Arsenal Environmental Restoration. In general, investigations will be conducted on a site-by-site basis with a number of activities taking place simultaneously in several Arsenal areas. The conceptual schedule indicates general time frames for investigation, restoration and closure activities for a period of approximately five years. However, the actual duration of individual activities and the overall Arsenal FUDS program will depend greatly on what we find, and the availability of federal funding.

Prioritization of the site investigations within each Arsenal area will be based on a number of criteria. The highest priority to investigation and restoration activities will always be given to sites that pose the greatest danger to human health and the environment. Other criteria that will be used to select sites for investigation include: presence or absence of UXO; FUDS beneficial use; importance to other Arsenal actions; obtaining right of entry from property owner; site access and logistics; public interest; and the regulatory process. Wherever possible individual sites identified in the draft RRR will be grouped according to common historical use, common or related location, or common investigation techniques. The grouping of sites will typically take place when planning the investigations as part of the preparation of the site specific FSIPs and maximizes the efficiency of investigations, restoration, and closure.

2.3 Background of the Arsenal

The Benicia Arsenal was created in 1849 with a land transfer of 345 acres from the founders of the City of Benicia (Jacobs, 1998). Originally referred to as "the Post at Point near Benicia, California," the post was later designated Benicia barracks (Jacobs, 1998). In 1862, then President Lincoln ordered that a plot of land at Benicia be segregated from the public lands for the purpose of a military

reservation. Between 1849 and 1958, the United States acquired 1,790.48 fee acres, 351.12 public domain acres, 6.40 license acres, and 580.04 easement acres, for a total of 2,728.04 acres. Of the 2,728.04 acres acquired for the Arsenal, 190 acres were located in Carquinez Strait to the south, and the Suisun Bay to the northeast (Jacobs, 1998).

The Arsenal served as the principal depot for ordnance and ordnance stores, issuance (supplies, ammunition, small arms parts and accessories), the manufacture and testing of small arms, mobile and seacoast artillery targets, and vehicle maintenance for the Division of the Pacific. A massive expansion took place at the Arsenal during World War II. Physical expansion included the addition of 1,847 acres and over 200 structures. Another full-scale expansion took place just prior to and following the Korean Conflict, with the addition of approximately 40 to 50 structures. Many of these additions were warehouses for inert materials and transitory shelters. Throughout the Arsenal's history, the functions of many buildings and operation areas changed, in response to changing government needs.

The Arsenal was continuously occupied by the military from its establishment in 1849 to its closure in 1964. Benicia Arsenal was declared excess by DoD and was reported to the General Services Administration on 11 January 1963. Deactivation and closure of the Arsenal was completed on 31 March 1964 (Jacobs, 1998).

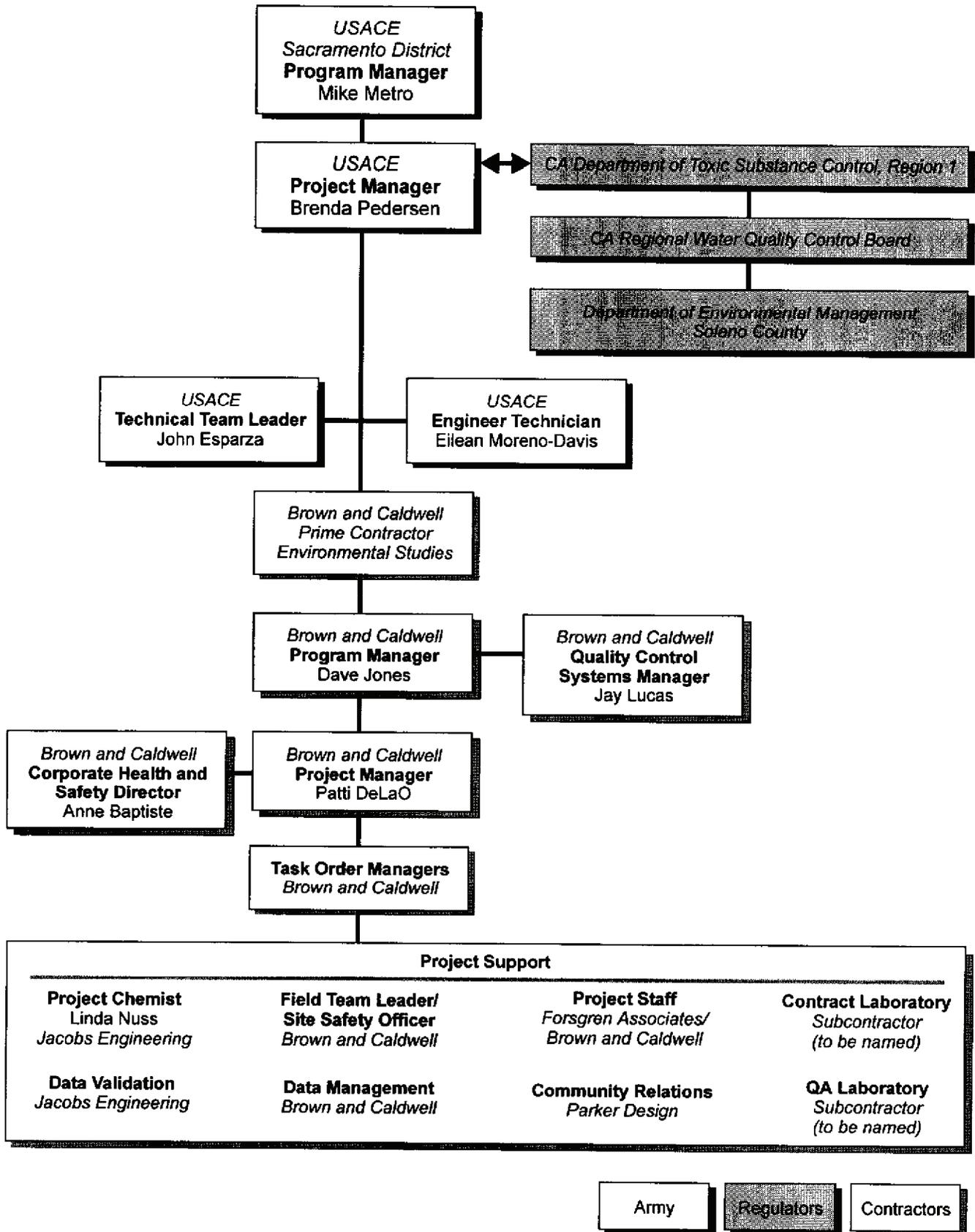
3.0 Team Organization

3. TEAM ORGANIZATION

The organizational structure for this project is shown on Figure 3-1. This organizational structure provides the program manager with a dedicated project team, including project managers, technical and administrative support staff, and subcontracting managers. In addition, the program manager will be able to meet the fluctuating staffing and technical needs by utilizing the team's corporate network of experience and diversified technical resources as needed. A detailed description of team member responsibilities is presented in the QAPP (Brown and Caldwell, 1999).

This program organization is designed to provide a clear line of management responsibility and authority; facilitate delegation of authority to the

management level responsible for completing work products; and maintain appropriate cost, schedule, and quality control. The organization reflects strong technical and management leadership and integration across multiple task orders, and provides a direct line of communication between team managers and their USACE counterparts. The team lines of authority flow from the program manager to the project manager to the respective support staff. This section addresses all general organizational items for the contract.



Project Management Organization Chart

Arsenal-Wide Investigation Workplan
Benicia Arsenal

4.0 General Site Controls

4. GENERAL SITE CONTROLS

This section of the Workplan presents a description of general site controls that will apply to environmental investigations at the Arsenal. Site specific controls will be set forth in the FSIPs and site specific SSHPs for the individual sites. This section includes a general description of site access, site preparation, work zones, and site control at the Arsenal, and presents an Arsenal-Wide Investigation Derived Waste (IDW) Plan.

4.1 Site Access and Site Preparation

Site access and rights of entry will be obtained by USACE prior to commencement of work. USACE and the Benicia site investigation team will notify residents and current occupants of planned activities and schedules prior to site investigations. The Benicia Arsenal Community Relations Plan will be followed to ensure that disturbances to residents and current occupants are kept to a minimum. The Benicia site investigation team will obtain all necessary permits, including drilling and hot work permits, and will follow the Benicia Arsenal General SSHP for all utility clearances.

4.2 Work Zones

Work zones will be established in accordance with Benicia Arsenal General SSHP requirements. All work zones will have clearly defined boundaries and will be treated as restricted areas. Only authorized workers and visitors will be allowed to enter the work zones. Access to the site during investigations will be controlled by site personnel. The size and type of work zone designation will be based on the planned activities and current use of the site. Work zone boundaries will be delineated with barricades, cones, caution tape, warning signs, and/or temporary fencing. More restrictive work zone requirements, such as traffic controls and noise abatement, will be

applied when heavy equipment use is planned and work is performed in congested areas. Traffic controls, when required, will comply with city and/or county regulations and procedures. Trenches and open boreholes will be secured with trench or borehole plates, fencing, or barriers during and after work hours. Work hours will generally be limited to 7:30 am to 6:00 pm on weekdays, depending on site locations and type of work performed.

4.3 Central Staging Area

Prior to initiation of field work, a central equipment staging area will be established in a location proposed by USACE. The purpose of the staging area is to provide space for temporarily storing equipment and materials such as empty containers, soil boring equipment, drilling core, microwell construction materials, etc. The staging area will be located so that it will not interfere with any business activities. The area will be kept neat and secure at all times. Proposed IDW will be temporarily stored in the central staging area.

4.4 Site Control

During investigative activities, project personnel will be required to establish and maintain site controls. These measures include:

- prohibiting the entry of unauthorized personnel;
- ensuring that personnel and subcontractors follow guidelines set forth in the Benicia Arsenal General SSHP;
- ensuring through the Site and Safety Officer (SSO) that appropriate

personal protective equipment is available for use as directed in the Benicia Arsenal General SSHP;

- ensuring through the SSO that job site hazards are properly controlled and that safe access and egress from the work sites are provided;
- providing field personnel with emergency telephone numbers; and
- conduct tailgate safety meetings, discuss pertinent site safety topics, and record all relevant information on the safety forms.

4.5 Investigation Derived Waste Plan

The purpose of this IDW Plan is to outline the procedures to be used for proper collection, characterization, storage, containerization, transport, and disposal of the Arsenal's IDW. IDW characterization will follow EPA guidance (USEPA, 1991). IDW is defined as waste generated during an environmental investigation that has potential for being hazardous and thus requiring special handling. This plan is not intended to cover wastes generated by other activities at the site, such as removal actions, remediation activities, or previous investigations.

4.5.1 Waste Collection and Characterization. This section discusses the procedures to be used for the proper collection and disposal characterization procedure for soil, groundwater decontamination rinsate, disposable protective clothing, and plastic ground covers.

4.5.1.1 Soil. Soil derived from drilling and sampling activities may contain hazardous constituents. For purposes of segregating potentially uncontaminated and contaminated soil at sites where volatile constituents are suspected, the soil will be visually inspected and screened using a photoionization detector (PID) or equivalent instrument. The soil will be stockpiled or placed into

Department of Transportation (DOT)-approved 55-gallon containers or other approved containers such as roll-off bins. All waste containers or stockpiles will be appropriately labeled and secured. As described in Section 4.5.2.3, containers containing soil with suspected contamination will be labeled as "impacted" and containers containing soil that is not suspected to be contaminated will be labeled as "non-impacted." Where non-volatile constituents are suspected, data from the site investigation sampling will be used to determine if the soil requires off-site disposal. Asphalt and concrete cores and debris will be separated from other waste soils disposed of as a non-hazardous waste.

If investigation results or general knowledge of non-volatile or volatile constituent concentrations indicate that off-site disposal is necessary, then additional sampling will be conducted as required by the potential disposal facility. Samples will be shipped under chain-of-custody protocols to a California State certified laboratory. When the analytical results are received, soil designated as "non-impacted" and confirmed as such by the analytical results will be disposed of properly on-site, if possible, or at a local landfill. Hazardous soils will be transported by a licensed hazardous waste transporter and disposed of at a licensed disposal facility.

4.5.1.2 Groundwater. Groundwater derived from drilling and sampling activities may contain hazardous constituents. The groundwater will be placed in DOT-approved 55-gallon containers or other approved containers. All containers will be appropriately labeled as described in Section 4.5.2.3 of this Workplan. Samples will be collected from selected containers (if more than one container contains groundwater from the same source, only one of the containers will be sampled). The samples will be

submitted to a State certified analytical laboratory for analysis of site specific COPC. The results of the laboratory analysis will be used to determine the appropriate disposal method. Disposal may include on-site treatment of the water using granular activated carbon (GAC) or similar media and then discharging the treated water to the sanitary sewer or the storm drain. Regulatory approval for discharging would be obtained prior to initiation of discharge.

4.5.1.3 Decontamination Rinsate. Waste water generated during decontamination of field sampling equipment must be collected and containerized in portable storage tanks or DOT-approved 55-gallon containers, since it may contain hazardous constituents. Rinsate water samples will be collected from the tanks and submitted to a laboratory for analysis for site-specific COPC. Results of the analyses will be used to determine appropriate disposal methods (see Section 4.5.1.2 for possible method).

4.5.1.4 Disposable Protective Clothing and Ground Covers. Other wastes include disposable protective clothing, plastic ground covers, and non-reusable sampling equipment (e.g., disposable bailers) that have come into contact with potentially-contaminated soil or groundwater. These wastes will be collected, bagged and placed in a separate container in the central staging area, and designated for non-hazardous waste disposal as appropriate. These wastes will not be mixed with the soil and the container or bin will be labeled appropriately.

4.5.2 Waste Containers and Storage.

This section discusses the types of containers to be used during the investigation and labeling and storage procedures for the containers.

4.5.2.1 Soil Waste Containers. Waste soils and other solid wastes will be containerized in DOT 17H 55-gallon steel containers with removable container heads or other approved containers. Containers will be inspected before filling for physical integrity. The

condition of the container head gasket will also be inspected.

4.5.2.2 Liquid Waste Containers. Liquid wastes will be containerized in DOT 17H steel closed-head 55-gallon containers with standard bungs or in portable tanks for larger quantities. Before use, each container and tank will be inspected for physical integrity.

4.5.2.3 Labeling of Containers. A container label will be attached to any container containing waste material. The container will be stored on end with the label placed on the side of the container in the upper third section (not on the container head). The label will be completed using waterproof ink. Waste material labels (Figure 4-1) will be used before receiving the results of the analytical samples used to characterize the container contents. If analytical results characterize the container contents as hazardous, a hazardous waste label (Figure 4-2) will replace the waste material label.

4.5.2.4 On-Site Container Storage. Containers will be stored in a central staging area designated by USACE for temporary waste storage. Rinsate water will be containerized at the designated decontamination area and taken to the central staging area. The waste storage and decontamination area will be located where containers will be protected from vehicular traffic or access by unauthorized personnel. Length of storage will depend on classification of the waste.

4.5.3 Waste Handling and Disposal. Waste handling, including loading and transport, will be conducted by a licensed waste disposal contractor. Whenever possible, wastes characterized as hazardous will be disposed of, or recycled, in a manner by which a "Certification of Destruction" can be issued by the disposal facility.

WASTE MATERIAL

ANALYSES PENDING

DESCRIPTION OF CONTENTS _____

DATE COLLECTED: _____

SOURCE OF WASTE (Well/Soil Boring): _____

CONTAINER _____ of _____

OWNER/GENERATOR: _____

Waste Material Label
*Arsenal-Wide Investigation Workplan
Benicia Arsenal*

HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY
AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES

PROPER D.O.T.

SHIPPING NAME _____ UN or NA# _____

GENERATOR INFORMATION:

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

EPA / MANIFEST
ID NO. / DOCUMENT NO. _____ / _____

EPA WASTE NO. _____ CA WASTE NO. _____ ACCUMULATION
START DATE _____

CONTENTS, COMPOSITION: _____

PHYSICAL STATE: | HAZARDOUS PROPERTIES: FLAMMABLE TOXIC
 SOLID LIQUID | CORROSIVE REACTIVITY OTHER _____

HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES

STYLE 191CM

Printed by LABELMASTER, Div. of AMERICAN LABELMARK CO. CHICAGO, IL 60646

Hazardous Waste Label

Arsenal-Wide Investigation Workplan
Benicia Arsenal

Hazardous Waste Manifests and Bills of Lading will be filled out by the Benicia project team, the transporter, or the disposal facility and signed by a representative of the USACE or their agent. The USACE will be identified as the waste generator.

4.5.4 Reporting. Summary tables on the disposal of the IDW will be produced and submitted to the USACE at regular intervals during the course of the investigations at the Arsenal. The tables will include container identification, a description of the waste, the sampling method, and laboratory analytical results. The tables will also include the location and telephone number of the disposal facility or facilities. The method or methods of disposal will be described and copies of the waste manifests or bills of lading and certificates of destruction attached.

*5.0 Rapid Site
Characterization
Approaches*

5. RAPID SITE CHARACTERIZATION APPROACHES

As described in the Conceptual Workplan (Brown and Caldwell, 1998a), environmental investigations at the Arsenal will follow a step-wise approach that will include preliminary site characterization and focused characterization of any DoD contamination. To provide consistency in the characterization of sites with similar use histories, a set of general approaches for various site use categories have been developed and are presented in this section.

5.1 Use Categories

The site use categories for which general characterization approaches have been developed were selected based on a review and grouping of the various historic activities and facility uses at the Arsenal, as identified in the draft RRR (Jacobs, 1998). At a number of sites, multiple uses have been identified, and thus the site is associated with more than one use category. Table 5-1 is a summary of the total number of sites for each use category, and a summary of the number of sites from the five major areas of the Arsenal: Warehouses, Industrial/Manufacturing, Revetment, Motor Pool, and Storage/Igloos (WIRMS). This table is based on the draft RRR (Jacobs, 1998), and quantities may change as further information becomes available.

The approach to characterization of sites with multiple uses will be developed based on a combination of the applicable general use category approaches. A miscellaneous use category has been established to encompass historic activities and uses that only occurred at a few sites (generally less than five) and thus did not warrant development of a generalized site characterization approach.

5.2 Characterization Approaches

The general site characterization approaches for each use category were developed based on:

- variables within the use category that may affect the characterization work;
- investigative methods that will be used, including the type of media that will be sampled (i.e., soil, soil gas, and/or groundwater), the target investigation areas, and the boundaries of the investigation (lateral and vertical); and
- analytical methods that will be used, including identification of decision criteria for use of field screening methods, field analytical methods, or fixed-base laboratory methods.

A flowchart was developed for each use category encompassing the approach used for the initial steps of investigation (Figures 5-1 through 5-7). Table 5-2 has been developed to present documented Arsenal substances that may be of concern, and the likely analytical methods that will be used to test for the substances. If contamination is found during these steps that is not determined to be associated with overlapping beneficial use by the current owner, the investigation will continue based on the procedures outlined in flowcharts for determining both the horizontal extent (step-out) and the vertical extent (step-down). Whenever possible, any additional sampling to define the vertical and lateral extent of contamination will be performed during the same field mobilization, in order to minimize the impact on current landowners.

The flowcharts provide initial guidelines. A review of site specific practices and inspections may recommend deviations from the general approaches presented by the flowcharts. Test methods with a prefix of SW appear in the SW-846 methods

Table 5-1
WIRMS Areas Site Usages by Category

Area	Storage and Warehouse Areas	Ordnance and Ammunition Handling and Storage	Maintenance, Repair, Paint Facilities and Carpenter Shops	Fuel Facilities	Landfill and Fillsites	Burnsites	Septic, Sewer, and Storm Drain Systems	Potable Water Facilities and Utilities	Offices, Barracks, Hospitals, Firehouses	Misc.	Area Usage Totals
Area W	17	29	1	1	0	0	5	2	2	0	57
Area I	34	15	39	18	4	1	3	10	13	7	155
Area R	2	15	0	0	1	3	1	1	0	5	28
Area M	24	26	14	1	4	1	4	13	10	9	106
Area S	5	81	1	0	1	0	0	0	1	3	92
Usage Sub Totals	82	166	55	20	10	5	13	26	26	24	438

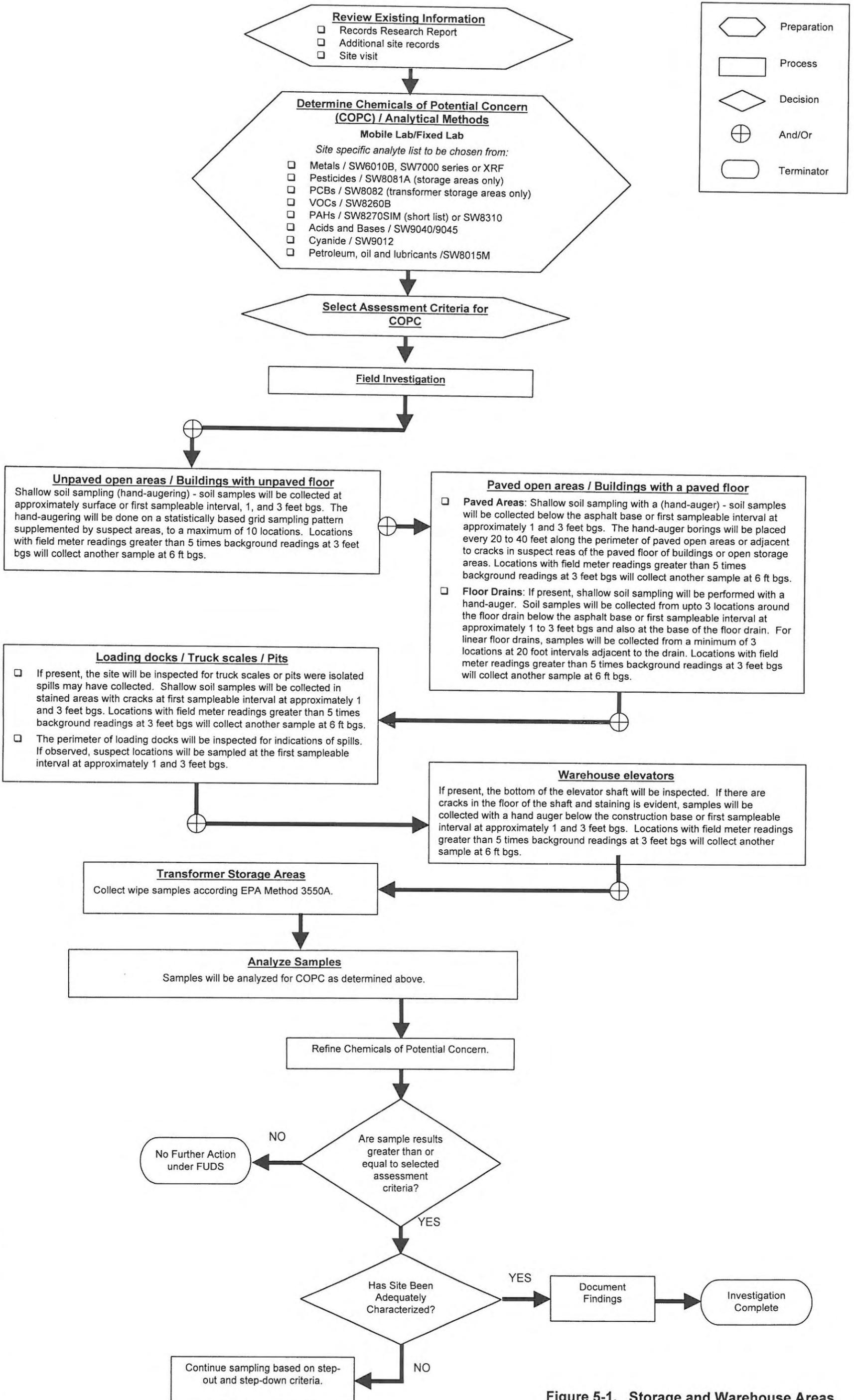


Figure 5-1. Storage and Warehouse Areas General Approach

Figure 5-1. Storage and Warehouse Areas General Approach

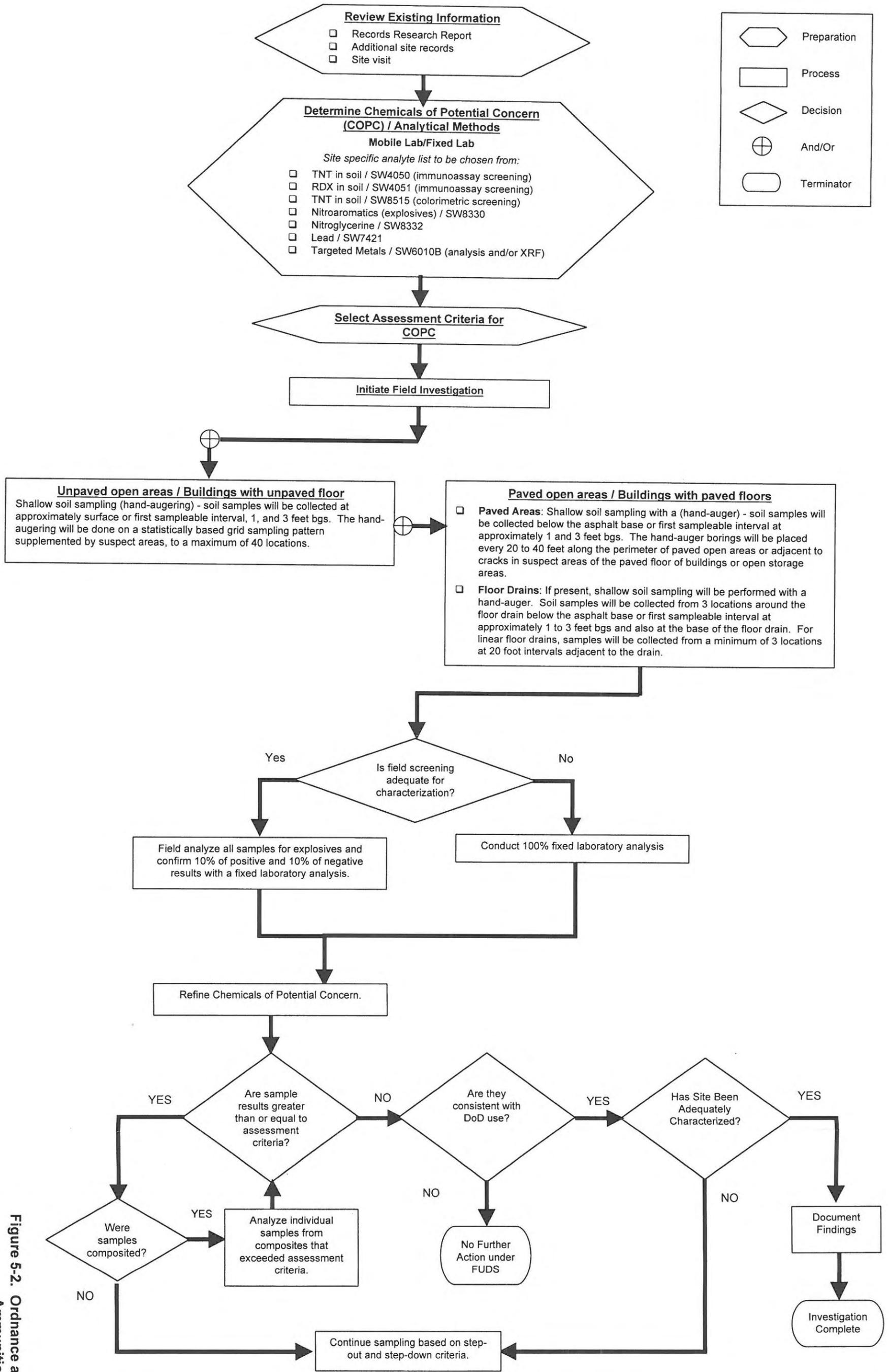


Figure 5-2. Ordnance and Ammunition Handling and Storage Facility General Approach

Figure 5-2. Ordnance and Ammunition Handling and Storage Facility General Approach

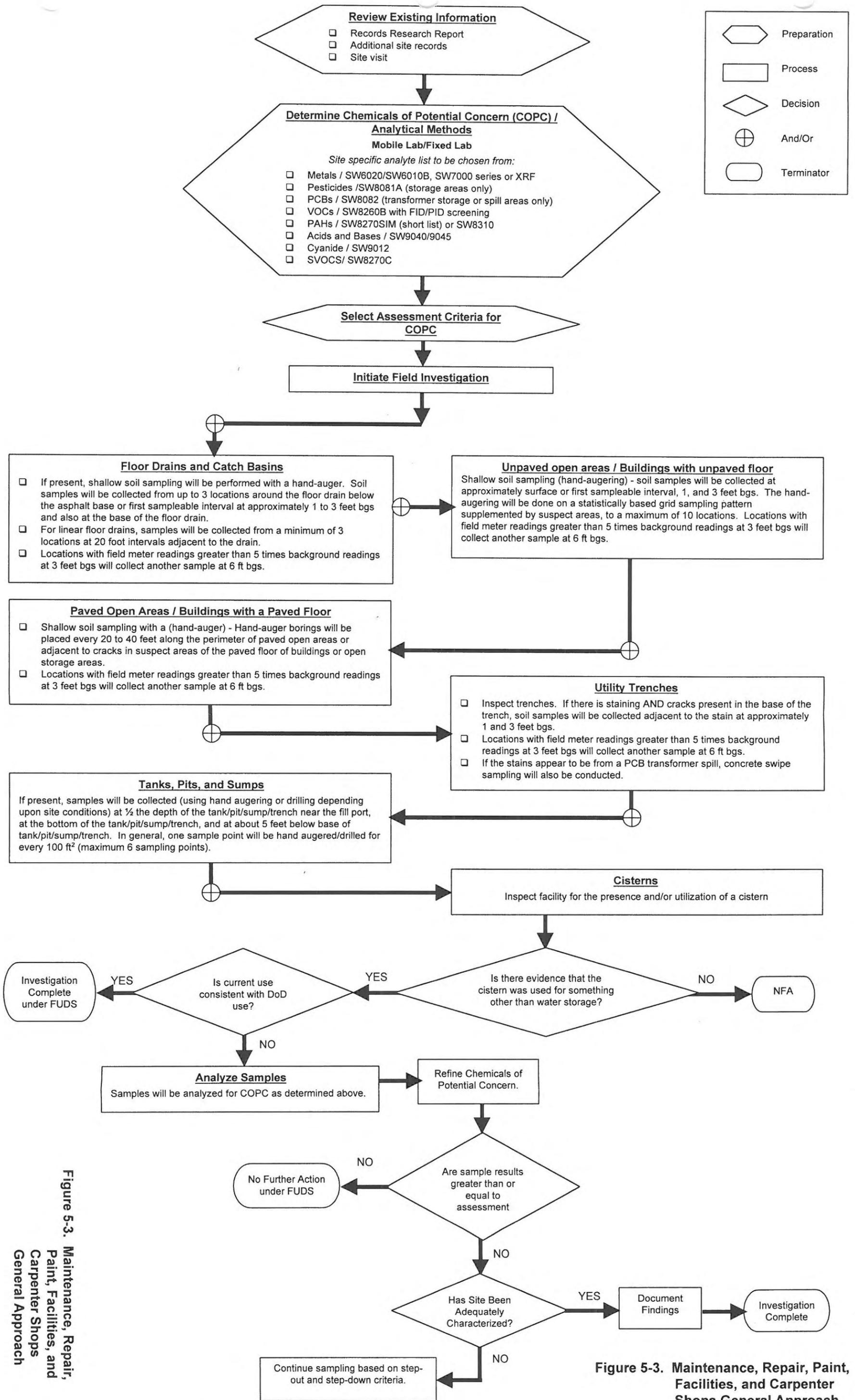


Figure 5-3. Maintenance, Repair, Paint, Facilities, and Carpenter Shops General Approach

Figure 5-3. Maintenance, Repair, Paint, Facilities, and Carpenter Shops General Approach

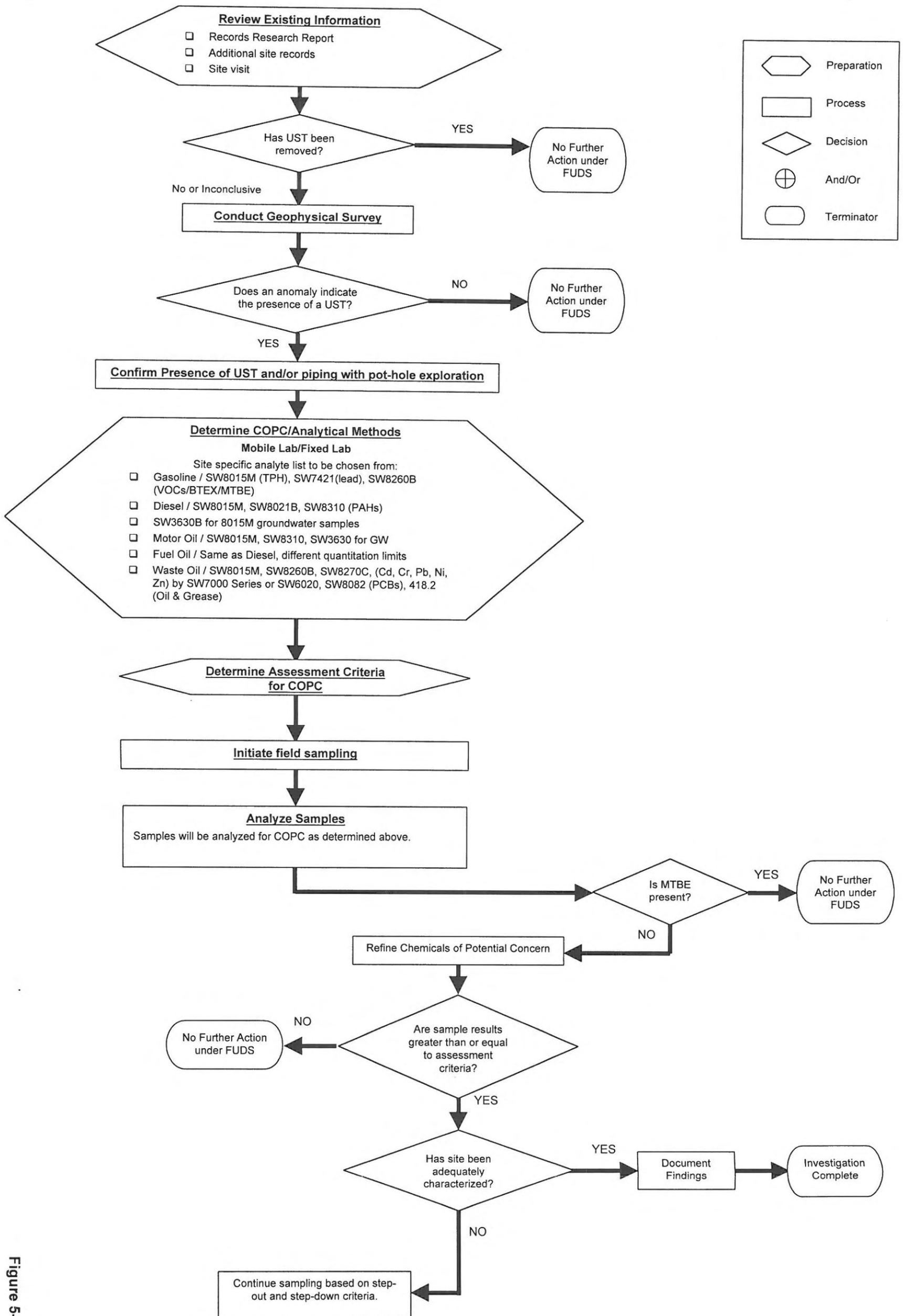


Figure 5-4. Fuel Facilities General Approach

Figure 5-4. Fuel Facilities General Approach

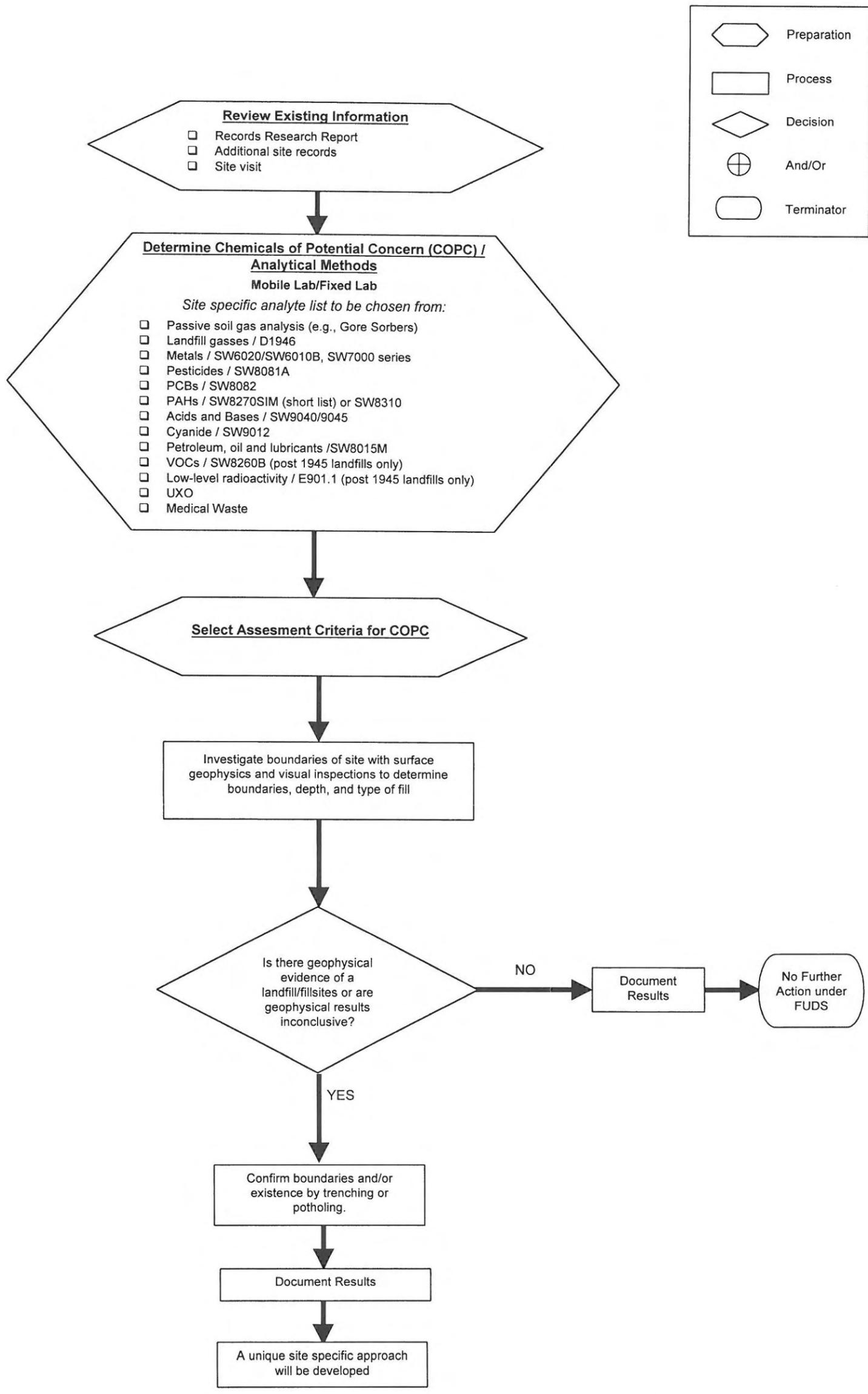


Figure 5-5. Landfills and Fillsites General Approach

Figure 5-5. Landfills and Fillsites General Approach

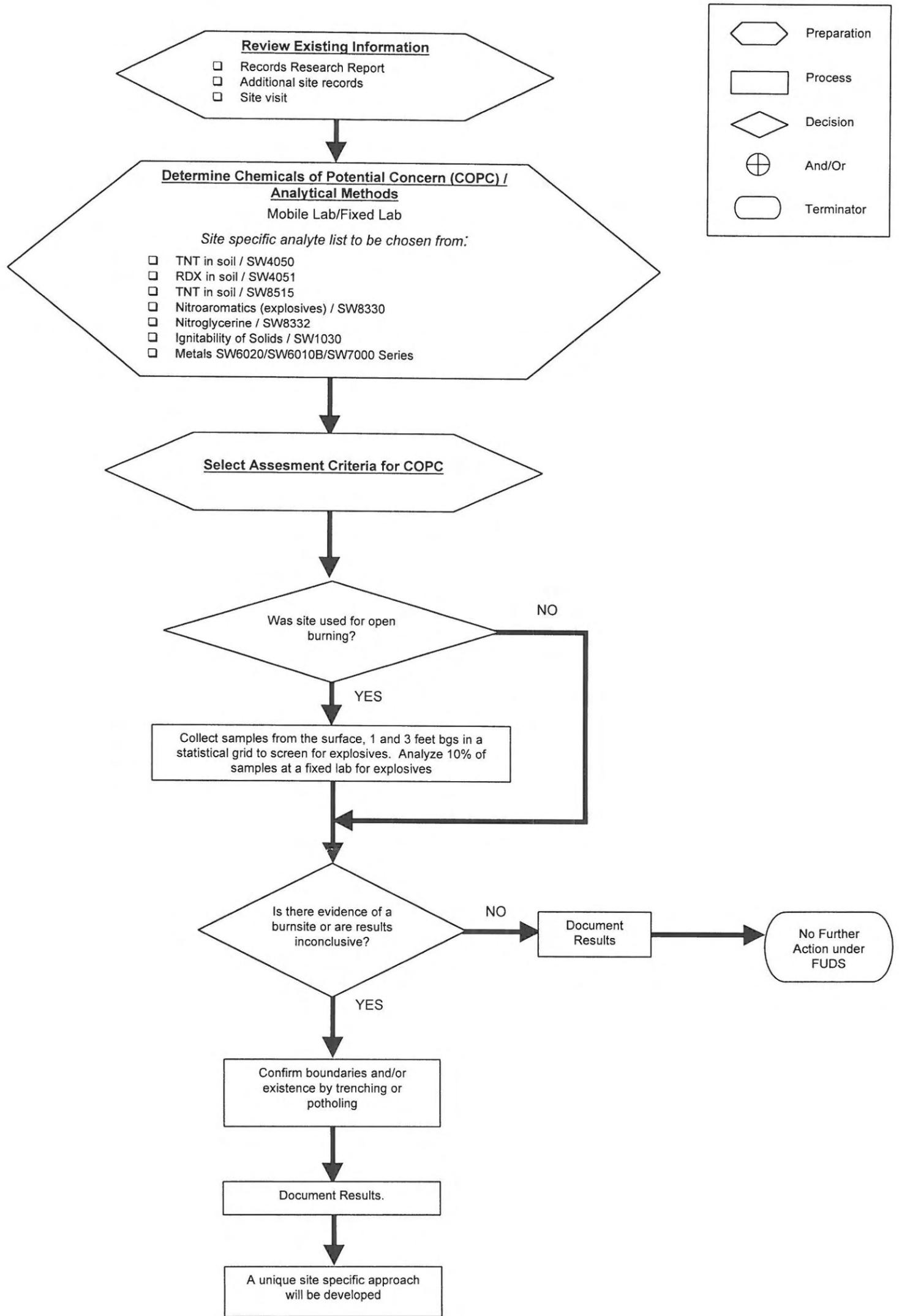


Figure 5-6. Burnsites General Approach

Figure 5-6. Burnsites General Approach

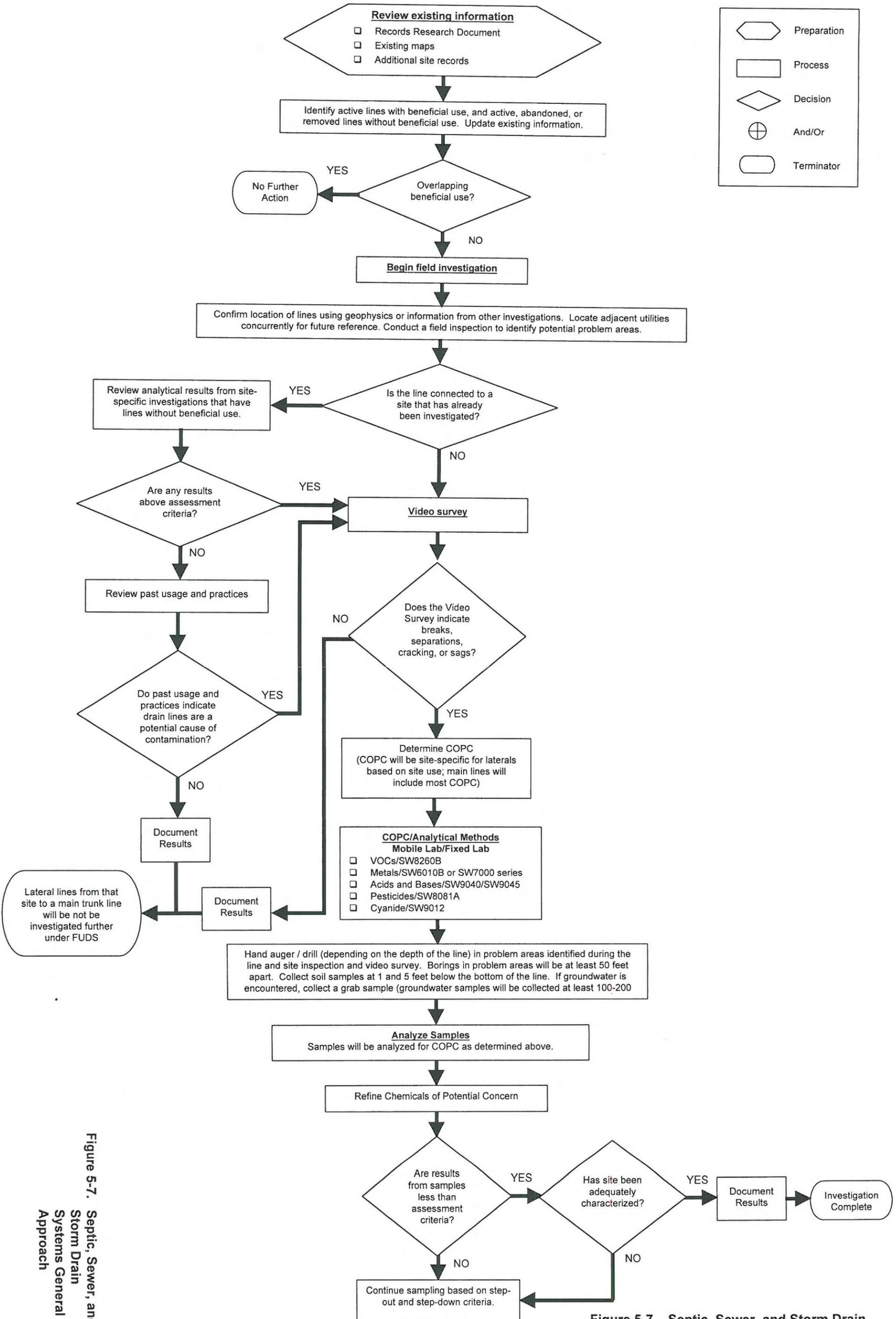


Figure 5-7. Septic, Sewer, and Storm Drain Systems General Approach

Figure 5-7. Septic, Sewer, and Storm Drain Systems General Approach

Table 5-2

Summary of Commonly Used Substances at the Benicia Arsenal and Analytical Rationale

Benicia Arsenal Substance of Concern	Example Process Source	Example Chemicals	Laboratory Soil Method ¹	Laboratory Water Method ¹	Laboratory Air Method	Field Screening Method
Acids	Arms cleaning, arms remanufacturing, Parkerizing	Sulfuric acid Hydrochloric acid Phosphoric acid Nitric acid Chromium trioxide	SW9045C SW9045C SW9045C SW9045C/300.0 SW7196A/6010 or SW6020	SW9040B SW9040B SW9040B SW9040B/300.0 SW7196A/6010 or SW6020		SW9041 (pH) SW9041 SW9041 SW9041 SW6200 (total chromium)
Anilines	Used in dyes intermediates, photographic chemicals, explosives, herbicides	Aniline 4-Chloroaniline 2-Nitroaniline 3-Nitroaniline 4-Nitroaniline	SW8270C	SW8270C		
Bases or Alkalis	Arms cleanings, Parkerizing, bluing	Sodium carbonate Sodium resinate Trisodium phosphate Sodium Pyrophosphate Sodium hydroxide Ammonium salts Ammonia Cyanide salts	SW9045C SW9045C SW9045C/E300.0 SW9045C/E365.2 SW9045C E350.3/SW9045C E350.3/SW9045C SW9012	SW9040B SW9040B SW9040B/E300.0 SW9040B/E365.2 SW9040B E350.3/SW9040C E350.3/SW9040C SW9012		SW9041 SW9041 SW9041 SW9041 SW9041 SW9041 SW9041
Browning process fluids	Arms browning	Tincture of Steel (muriatic acid, iron carbonate and alcohol) Blue Vitriol (copper sulfate) Sweet Spirits of Nitre (alcohol and nitrous ether)	SW9045C/SW8015A (alcohols and ethers) SW6020 (copper), E300.0, SW8260B, SW8015A	SW9040B/SW8015A (alcohols and ethers) E300.0, SW6020 (copper), SW8015A		SW9041
Petroleum distillate	Cosmoline		M8015E/SW8260B	M8015E/SW8260B		
CWM	Potentially disposed on site in landfill areas	Mustard gas Lewisite Phosgene (unstable) Arsenic base CWM Nerve gases (MPA)	SW8321 SW8321 Colorimetric SW6020 or SW7000 Ion chromatography	SW8321 SW8321 Colorimetric SW 6020 or SW7000 Ion chromatography		
Cyanide		Cyanide	SW9012A	SW9012A		
Degreasing fluids	Arms degreasing, military equipment repair and manufacture	Chlorinated solvents Trichloroethene Tetrachloroethene	SW8260B	SW8260B	TO-14	
Dioxins	Burned material	2,3,7,8-TCDD OCDD	SW8280A/SW8290	SW8280A/SW8290		

Table 5-2 (Continued)

Summary of Commonly Used Substances at the Benicia Arsenal and Analytical Rationale

Benicia Arsenal Substance of Concern	Example Process Source	Example Chemicals	Laboratory Soil Method ¹	Laboratory Water Method ¹	Laboratory Air Method	Field Screening Method
Explosives ²	Arms testing, ordnance disposal and manufacturing	Fulminate of mercury Black powder Nitrate residues Sulfur TNT Tetryl Dynamite Nitroglycerine Ammonium picrate Picric acid Nitrocellulose Nitrostarch Ballistite	SW7470A E300.0 E300.0 SM4500S02, SM4500S03, SM4500S04 SW8330 SW8331 SW8330 SW8332 E350.3 Ion chromatography Ion chromatography Ion chromatography Ion chromatography	SW7470A E300.0 E300.0 SM4500S02, SM4500S03, SM4500S04 SW8330 SW8331 SW8330 SW8332 E350.3 Ion chromatography Ion chromatography Ion chromatography Ion chromatography		Test Kit SW4050/SW8515 SW4050 Test Kit for nitrates Test Kit for nitrates
Firing Area residual material	Arms testing	Arsenic, Lead, Antimony, Copper, Zinc Ammunition powder	SW7000 or SW6020 or SW6010 E300.0	SW7060A or SW6020 SW7421 or SW6020 SW7041 or SW6020 E300.0 or SW9210		SW6200
Foundry wastes	Foundry	Metals	SW6010B/SW6020	SW6010B/SW6020		SW6200 or test kits
Fuels	Fuel storage facilities, USTs, ASTs	Gasoline (and lead) Diesel Kerosene Unknown fuels PAH	M8015V/SW8260B (SW7421 or SW6020 or SW6010) M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015V/M8015E/SW8260B SW8310 or SW8270SIM	M8015V/SW8260B (SW7421 or SW6020 or SW6010) M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015V/M8015E/SW8260B SW8310 or SW8270SIM	TO-14	SW4030 SW4030 SW4030 SW4030 SW6200 or Test kit SW4035
Herbicides	Disposal of herbicides	2,4-D 2,4-DB Dalapon Dicamba DNBP MCPA MCPD	SW8151A	SW8151A		
Hexavalent chromium	(See acids) Parkerizing, corrosion resistance, protective coating for metals	Hexavalent chromium Total chromium	SW7196A SW6010 or SW6020	SW7196A SW6010 or SW6020		Test kit

Table 5-2 (Continued)

Summary of Commonly Used Substances at the Benicia Arsenal and Analytical Rationale

Benicia Arsenal Substance of Concern	Example Process Source	Example Chemicals	Laboratory Soil Method ¹	Laboratory Water Method ¹	Laboratory Air Method	Field Screening Method
Hydrazines (reducing agent, fuel propellant)	Reducing agent, fuel propellant		ASTM S1385	ASTM D1385		Test kit
Hydraulic Oil	Hydraulic stamp, hoists	See fuels PAH PCBs	M8015E/SW8260B SW8310 SW8082	M8015E/SW8260B SW8310 SW8082	TO-14	SW4030 SW4035 SW4020
Incinerator wastes	Incinerator	Metals Hexavalent chromium Explosives Black powder	SW6020 or SW6010 SW7196A SW8330 E300.0	SW6020 or SW6010 SW7196A SW8330 E300.0 or SW9210		SW6200 or test kits Test kit SW4050/SW8515/ test kit for nitrates
Known industrial process with specified fluids	Parkerizing, arms cleaning	SVOCs PAHs	SW8270C SW8310 or SW8270SIM	SW8270C SW8310 or SW8270SIM		SW4010 (PCP) SW4045
Lubricants		See Oils, VOCs	SW8260B SW8015E	SW8260B SW8015E		
Metals – general list	Forge, arms manufacture	Aluminum, Arsenic, Antimony, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Molybdenum, Nickel, Potassium, Silver, Sodium, Thallium, Tin, Vanadium, Zinc	SW6020 or SW6010B and 7000 series (Sb, As, Cd, Ag, Tl only)	SW6020 or SW6010B and 7000 series (Sb, As, Cd, Ag, Tl only)		SW6200 (XRF) or test kits
Metals – specific metals	Arms testing, retinning	Lead Tin Arsenic Antimony Mercury Hexavalent Chromium Total Chromium	SW6020 or SW6010B SW6020 or SW6010B SW7060A or SW6020 SW7041 or SW6020 SW7471 SW7196A SW6010/SW6020	SW6020 or SW6010B SW6020 or SW6010B SW7060A or SW6020 SW7041 or SW6020 SW7470 SW7196A SW6010/SW6020		SW6200 SW6200 SW6200 SW6200 SW6200 Test kit
Oakite (lye or bluing compound)	Arms bluing	Lye See Parkerizing process fluids	SW9045C	SW9040B		SW9041
Oils	Manufacturing, motor pool	Motor Oil Aviation gear oil Heavy duty engine oil Light oil Unspecified oils P-20 PAH See Preservatives	M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B SW8310 or SW8270SIM	M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B M8015E/SW8260B SW8310 or SW8270SIM	TO-14 TO-14 TO-14 TO-14 TO-14 TO-14	SW4030 SW4030 SW4030 SW4030 SW4030 SW4030 SW4035

Table 5-2 (Continued)

Summary of Commonly Used Substances at the Benicia Arsenal and Analytical Rationale

Benicia Arsenal Substance of Concern	Example Process Source	Example Chemicals	Laboratory Soil Method ¹	Laboratory Water Method ¹	Laboratory Air Method	Field Screening Method
Oxidizing agents		Chlorine (gas)			NIOSH Method 6011	
PAHs	Fuel storage	Benzo(a)anthracene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Chrysene Dibenzo(a,h)anthracene Indeno(1,2,3-cd)pyrene Naphthalene	SW8310 or SW8270SIM	SW8310 or SW8270SIM		SW4035
Paint	Paint storage or disposal	Lead	SW6010B or SW6020	SW6010B or SW6020		SW6200 (XRF)
Parkerizing process fluids	Parkerizing	VOCs and stoddard solvent Preservatives Acids (phosphoric) Bases or Alkalis Metals Hexavalent chromium Oakite (lye) Light Oil	SW8260B SW8015E SW9045C SW9045C SW6020 or SW6010B SW7196A SW9045C M8105E	SW8260B SW8015E SW9040B SW9040B SW6020 or SW6010B SW7196A SW9040B M8105E	TO-14	SW9041 SW9041 SW6200 (XRF) or test kits Test kit SW4030
PCBs	Transformers	Aroclors	SW8082	SW8082		SW4020
Pesticides	Pesticide disposal	DDT Dieldrin Lindane (g BHC) Chlordane Lead arsenate Nicotine sulfate	SW8081A SW8081A SW8081A SW8081A SW6010B/SW6020 E300.0	SW8081A SW8081A SW8081A SW8081A SW6010B/SW6020 E300.0		SW4042 SW4042 SW4042 SW4041 SW6200 (XRF)
Phosphorus			E365.2	E365.2		Test kit
Photo Lab Fluids	Photo lab	Sodium sulfite (developer, clearing bath) Hydroquinone (developer) Boric acid (developer) Potassium bromide (developer) Sodium Hydroxide (developer) Potassium dichromate (bleaching bath) Sulfuric acid (bleaching bath)	E377.1 SW8270C (TIC) SW9045C SW9211 or E300.0 SW9045C SW6020 or SW7196A SW9045C	E377.1 SW8270C (TIC) SW9040B SW9211 SW9040B SW6020 or SW7196A SW9045C		SW9041 (pH)

Table 5-2 (Continued)

Summary of Commonly Used Substances at the Benicia Arsenal and Analytical Rationale

Benicia Arsenal Substance of Concern	Example Process Source	Example Chemicals	Laboratory Soil Method ¹	Laboratory Water Method ¹	Laboratory Air Method	Field Screening Method
POL	Fuel storage	Fuel oil Lube oil Engine oil (e.g., #5 Heavy oil) Kerosene Gasoline (and lead) Diesel Heating oil Turpentine Stoddard solvent Coal oil PAHs	M8015E M8015E M8015E M8015E M8015V/SW8260B, SW7421 or SW6020 M8015E M8015E M8015E SW8260B M8015E SW8310 or SW8270SIM	M8015E M8015E M8015E M8015E M8015V/SW8260B, SW7421 or SW6020 M8015E M8015E M8015E SW8260B M8015E SW8310 or SW8270SIM	TO-14 TO-14 TO-14 TO-14 TO-14 TO-14 TO-14 TO-14 TO-14 TO-14	SW4030 SW4030 SW4030 SW4030 SW4030 SW4030 SW4030 SW4030 SW4030 SW4035
Propellants	Explosives	Pentalin pentachlorethane Hydrazine	SW8260B (TIC) ASTM	SW8260B or SW3640A ASTM		Test kit
Preservatives ³ (USA 2-82, USA 2-84, AS-674, AS-673, AS-700, AS-777, "White lead")	Arms manufacture, repair	VOCs See Oils See Metals	SW8260B SW8015E SW6020 or SW6010/SW7000	SW8260B SW8015E SW6020 or SW6010/SW7000	TO-14	SW4030 SW6200 (XRF) or test kits
Reducing agents	Parkerizing	Sodium sulfite Hydroquinone Zinc phosphide White phosphorus ¹ Hydrazine	E377.1 SW8270C SW6010B or SW6020 SW7580 ASTM	E377.1 SW8270C SW6010B or SW6020 SW7580 ASTM		Test kit Test kit
Retinning	Tinning/retinning	Tin See metals – specific See metals - general	SW6010B or SW6020	SW6010B or SW6020		SW6200 (XRF) or test kits
Solvents (VOCs)	Degreasing, arms refurbishing	Acetone Naphthalene Toluene Methyl ethyl ketone Trichloroethene Ethyl ether Methylene chloride Pentalin (pentachloroethane) Carbon tetrachloride Chloropicrin	SW8260B SW8260B SW8260B SW8260B SW8260B SW8015A or E524.2 SW8260B SW8260B SW8260B SW8265 no standard method available	SW8260B SW8260B SW8260B SW8260B SW8260B SW8015A or E524.2 SW8260B SW8260B SW8260B SW8260B no standard method available	TO-14 TO-14 TO-14 TO-14 TO-14 TO-14 TO-14	SW4030

Summary of Commonly Used Substances at the Benicia Arsenal and Analytical Rationale

Benicia Arsenal Substance of Concern	Example Process Source	Example Chemicals	Laboratory Soil Method ¹	Laboratory Water Method ¹	Laboratory Air Method	Field Screening Method
Stoddard solvent			SW8015V	SW8015V	TO-14	
Waste Oil	Waste oil tank/UST	VOCs SVOCs Oil and Grease Metals (cadmium, chromium, lead, nickel, zinc only) PAH	SW8260B SW8270C SW8015E SW6020 or SW6010/SW7000 SW8310 OR SW8270SIM	SW8260B SW8270C SW8015E SW6020 or SW6010/SW7000 SW8310 OR SW8270SIM	TO-14	SW4010 (PCP) SW4030 SW6200 (XRF) or test kits SW4035
"White lead" (preservative)	Arms manufacture	VOCs See Fuels See Metals specific (lead)	SW8260B SW8015E SW6020 or SW6010/SW7000	SW8260B SW8015E SW6020 or SW6010/SW7000	TO-14	SW4030 SW6200 (XRF) or test kits

¹ Preparation/Extraction Methods to be used are as follows:

- Metals by SW6010, SW6020, SW7000 – SW3050
- Hexavalent chromium, SW3060
- TPH gas SW8015V – SW5035
- TPH diesel SW8015E – SW3550 and SW3630
- PCBs by SW8082 – SW3550
- VOCs by SW8260B – SW5035
- PAHs by SW8310 – SW3550
- Semi VOCs by SW8270 – SW3550

² Energetic materials are to be investigated only by qualified explosives ordnance disposal personnel.

³ Historical records have indicated that preservatives are composed of one or more of the following chemicals:

- A. "White Lead"
- B. Heavy (thick, almost hard) Petroleum based oil
- C. Light Petroleum based oil
- D. Thin Petroleum based oil
- E. Lubricating Oil
- F. Hydraulic Oil

BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes
 CWM = Chemical Warfare Materials
 PAH = Polyaromatic Hydrocarbons
 PCP = Pentachlorophenol
 POL = Petroleum, Oils, and Lubricants

SVOCs = Semi-Volatile Organic Compounds
 TIC = Tentatively Identified Compound
 VOCs = Volatile Organic Compounds
 XRF = X-Ray Fluorescence

manual (USEPA, 1996). All SW-846 methods refer to the most current revision.

5.3 Assessment Criteria

The flow charts presented in Figures 5-1 through 5-7 refer to a comparison of investigation data to assessment criteria. Assessment criteria will consist of values that will be used to evaluate results of individual site investigations and to determine when an investigation is complete, if no further action under FUDs is warranted, if a risk evaluation is necessary, or if remedial action is needed. Assessment criteria values will consist of risk-based concentrations and ambient concentrations that are described below.

5.3.1 Risk-based Assessment Criteria.

Assessment criteria values will be developed for each individual COPC using a risk-based approach. The risk-based approach will be presented in Investigation Reports that correspond to individual FSIPs, and will include developing a conceptual risk model to evaluate potential exposure routes and receptors for COPCs at each facility. The result of the risk approach will be to select appropriate risk-based values for each COPC that may consist of established concentrations such as USEPA Preliminary Remediation Goals (PRGs) or may be derived based on the site specific risk assessment.

5.3.2 Ambient Assessment Criteria. In addition to risk derived values, assessment criteria will also include ambient (background) concentrations for naturally occurring COPCs (for example metals and nitrate), and when appropriate, ambient concentrations for some human-related COPCs. Ambient concentrations for human-related COPCs will be evaluated when there is a likely local or regional source that may have impacted Arsenal soils (for example pesticides from general use, and some hydrocarbon compounds related to the Exxon refinery). The purpose of calculating ambient concentrations is to

avoid investigating and remediating COPCs that are present at or below ambient concentrations.

Ambient concentrations will be calculated according to each WIRMS area by statistical analysis of soil data collected from the Arsenal and surrounding area. A separate plan to determine ambient concentrations will be developed according to EPA guidance (USEPA, 1995) for each of the five WIRMS areas and will be attached to Chapter 6 through Chapter 10 of this Workplan, as appropriate. Each plan will include number and location of ambient samples, a list of analytes, and a description of the statistical methods. Although for convenience the plans will be developed by WIRMS area, each plan will incorporate information on bedrock geology, hydrogeology, soil type, and sample grain-size distribution to address different Arsenal-Wide conditions. Each plan will also include a sampling and analysis plan to evaluate WIRMS area groundwater conditions. The purpose of the groundwater evaluation will be to assess if local groundwater is potable, and to evaluate groundwater as a potential exposure pathway for the conceptual risk models.

Although ambient concentrations will be calculated on a WIRMS area-by-area basis, ambient sampling and analysis will be conducted on a more focussed FSIP by FSIP schedule. Each WIRMS-area plan will include details for updating and maintaining the ambient database, and each individual FSIP will describe ambient specific sampling that will take place during field activities. Individual Investigation Reports for each FSIP will present the ambient results and when appropriate calculate ambient concentrations for use in the data analysis. Because ambient sampling will be conducted during several separate investigations, statistical ambient concentrations may not be available when preparing the initial investigation reports.

5.4 Reporting

Results of site investigations will be presented in a letter report for each site or for several sites based on groupings presented in FSIPs. Each letter report will review the scope of work, describe methods, and present results of file reviews and observations made during field work. The reports will include analytical data in table form, a comparison of data against assessment criteria, and a summary of quality assurance and data validation. Each report will also present conclusions based on the data, and recommendations for additional work.

5.5 Miscellaneous Use

There are several sites that do not fit into any of the previous categories. The nature, size, and utilization of each of the individual facilities vary so extensively that a single general approach that is applicable to most or all of the sites is not feasible. An individual investigation plan will be developed for each miscellaneous site reflecting the sampling and analysis methods that are most appropriate for that site.

5.6 Firing Ranges, Incinerators and Test Facilities

The nature, size, and utilization of each of the individual firing ranges and test facilities varies so extensively that it is not feasible to have a single general approach that is applicable to most or all of the sites. Individual investigation plans will be developed for each site that reflect the methods of sampling and analysis that are most appropriate for that site.

5.7 Potable Water Facilities and Utilities

The nature, size, and utilization of each of the individual firing ranges and test facilities varies so extensively that it is not feasible to

have a single general approach that is applicable to most or all of the sites. Individual investigation plans will be developed for each site that reflect the methods of sampling and analysis that are most appropriate for that site. Any ancillary facilities, such as fuel-fired boilers, will be investigated under the appropriated use category.

5.8 Offices, Barracks, Hospitals, and Firehouses

The nature, size, and utilization of each of the individual firing ranges and test facilities varies so extensively that it is not feasible to have a single general approach that is applicable to most or all of the sites. Individual investigation plans will be developed for each site that reflect the methods of sampling and analysis that are most appropriate for that site. Any ancillary facilities, such as fuel-fired boilers, will be investigated under the appropriate use category.

*6.0 Area W – Warehouse
Expansion Area of the
1940's*

6. AREA W – WAREHOUSE EXPANSION AREA OF THE 1940S

A description of Area W follows, including the physical characteristics, operational history, current use of the land, and land ownership. FSIPs and SSHPs for Area W are presented at the end of this section. The FSIPs and SSHPs will be added to the Workplan as they are developed.

6.1 Location

Area W occupies an irregularly shaped tract of land consisting of approximately 400 acres. It is bounded on the north by 2nd Street (formerly State Highway 21), on the northeast by the Arsenal boundary line, on the east by Suisun Bay, on the south by the drainage canal adjacent to Area M, and on the west by the drainage canal adjacent to Area S (see Figure 6-1).

6.2 Area W Conceptual Geologic Model

Figure 6-2 is a generalized geologic map of the Arsenal. Figure 6-3 is a schematic geologic cross section (A-A') that crosses Area I, M, and W. Figure 6-4 is a conceptual hydrogeologic model that includes Areas S and W. Area W lies mostly within a large alluvial channel located at the Arsenal's eastern edge. The alluvial channel deposits include terrace deposits and unconsolidated flood plain deposits. The terrace deposits are isolated, elevated areas in the foothills and canyons, and consist of generally unconsolidated gravel, sand, silt, and clay. They occur mostly around Sulphur Springs Creek Channel, a drainage (lined with concrete) channel running north-northwest to south-southeast through the Arsenal. The unconsolidated flood plain deposits include sand, silt, gravel and clay, and are generally equivalent to the terrace deposits. Alluvial deposits within the northwestern portion of Area W are known to extend at least 30 feet below ground surface (bgs). The alluvial deposits near the southeastern portion of

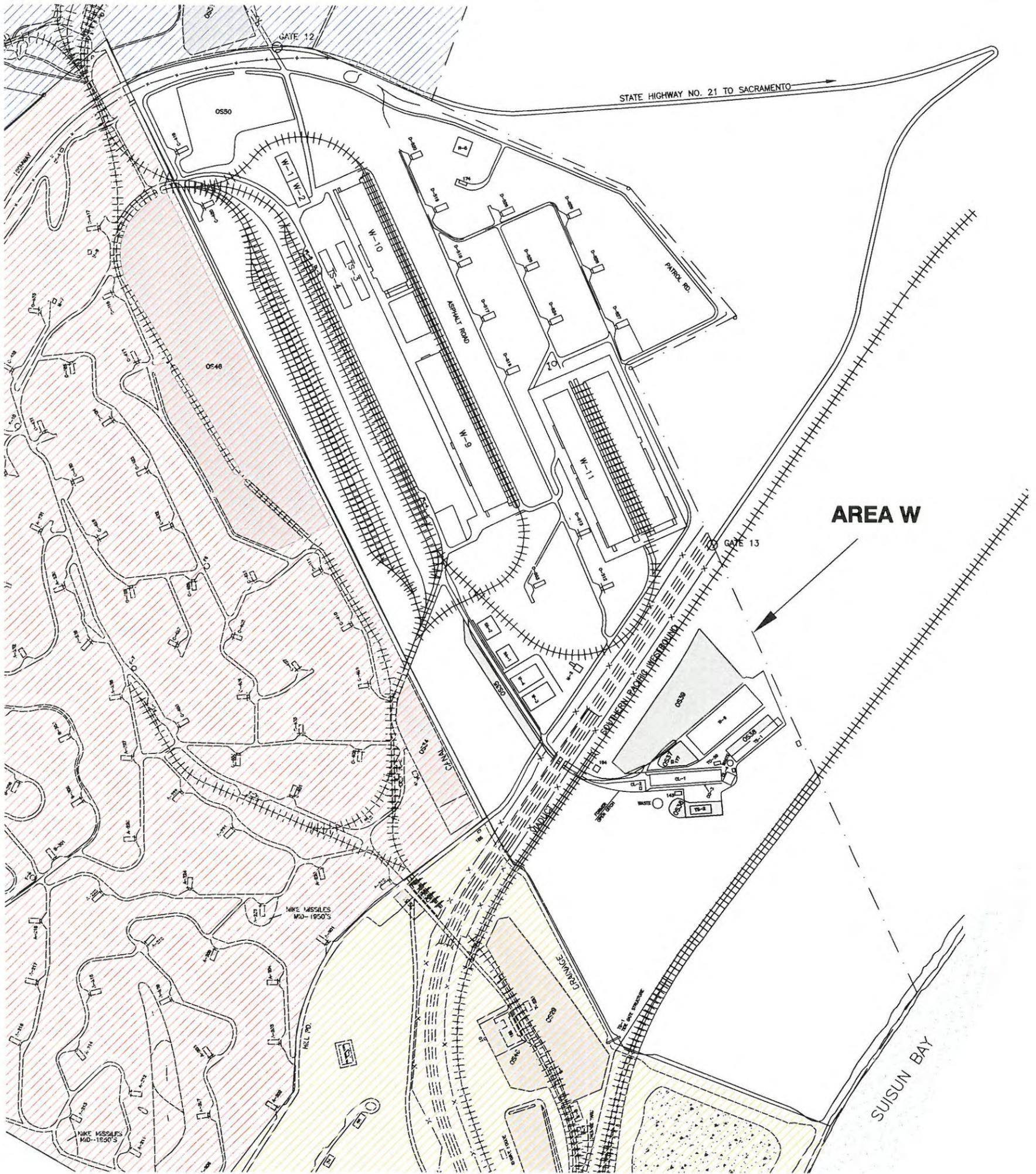
Area W extend to a depth of 85 feet bgs (SEC 1996, ITI 1997, Montgomery Watson, 1995).

The alluvial deposits are believed to overlie steeply dipping beds of the Knoxville Formation. The Knoxville Formation includes thinly bedded mudstone, shale, siltstone, and sandstone. According to Sims, et al. (1973) the northern extent of the Mt. Diablo Anticline axis passes through Area W, east of the Exxon Oil Refinery. The axis of the anticline appears to trend north-northwest. This is evidenced by a change in dip direction from the west side (southwest dip) to the east side (northeast dip) of the alluvial deposits.

Subsequent to closure of the Arsenal, a spoils area (Spoils Area 4) was designated in 1967 by Humble Oil Company, in the southern most portion of Area W adjacent to Sulphur Springs Creek Channel and Suisun Bay. Dredging materials, which were likely generated during the construction of the Exxon Oil refinery (located in Area S), were dumped in Spoils Area 4 and in an adjacent site to the southwest.

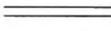
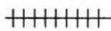
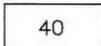
First groundwater in this area is encountered at approximately 10 to 15 feet bgs. Groundwater has been identified as flowing towards Sulphur Springs Creek channel near the northern half of Area W, and towards Suisun Bay near the southern half. Shallow water contained in the alluvium exists in several distinct strata and is typically too brackish to be potable.

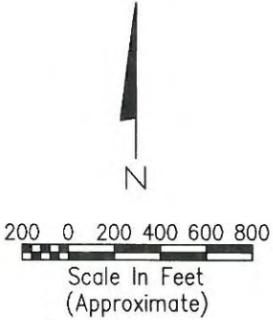
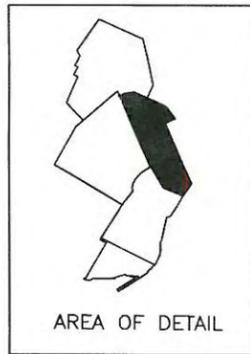
Several fuel underground storage tanks (USTs) exist or have been removed in Area W. Site closure has been requested by private landowners and granted by the lead UST regulatory agency (Solano County) for some of these sites.



AREA W

LEGEND:

- | | | | |
|---|--|---|----------|
|  | Area M - Motor Pool and Historic Ordnance Storage Area |  | Landfill |
|  | Area R - Revetment / Explosives Holding Area |  | Water |
|  | Area S - Magazine Storage Expansion Area | | |
|  | Open Storage Areas | | |
|  | Arsenal Boundary Lines | | |
|  | Area Boundary Lines | | |
|  | Road | | |
|  | Railroad Tracks | | |
|  | Building | | |



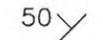
SOURCE: BASIC INFORMATION MAPS, MARCH 1958
 LAND UTILIZATION MAP, MAY 1956
 PRELIMINARY BENICIA ARSENAL REHABILITATION
 OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

**Area W
 Warehouse Expansion Area
 of the 1940s**

Arsenal-Wide Investigation Workplan
 Benicia Arsenal

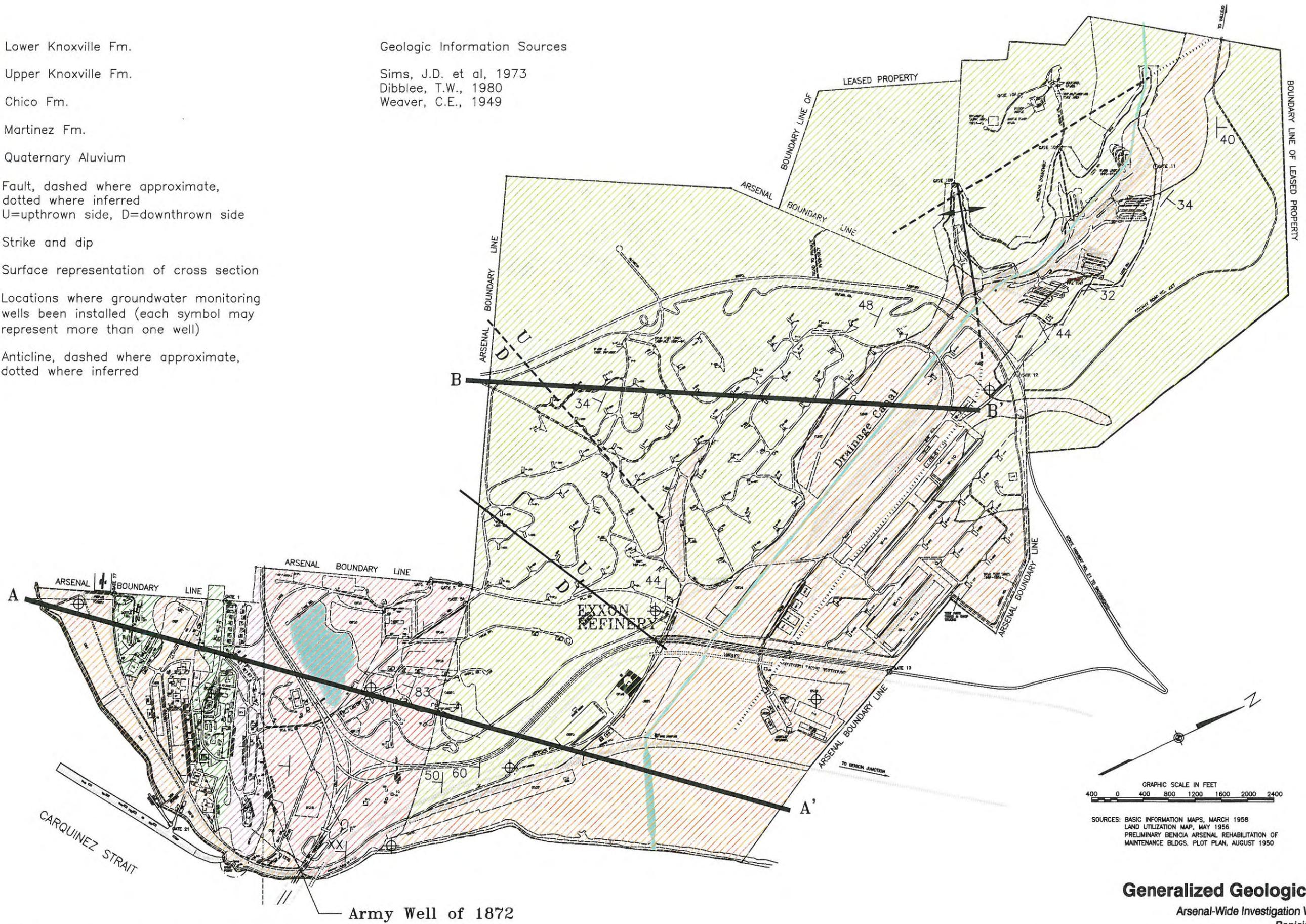
Legend

-  Lower Knoxville Fm.
-  Upper Knoxville Fm.
-  Chico Fm.
-  Martinez Fm.
-  Quaternary Aluvium

-  Fault, dashed where approximate, dotted where inferred
-  U=upthrown side, D=downthrown side
-  50 Strike and dip
-  A—A' Surface representation of cross section
-  Locations where groundwater monitoring wells been installed (each symbol may represent more than one well)
-  Anticline, dashed where approximate, dotted where inferred

Geologic Information Sources

- Sims, J.D. et al, 1973
- Dibblee, T.W., 1980
- Weaver, C.E., 1949



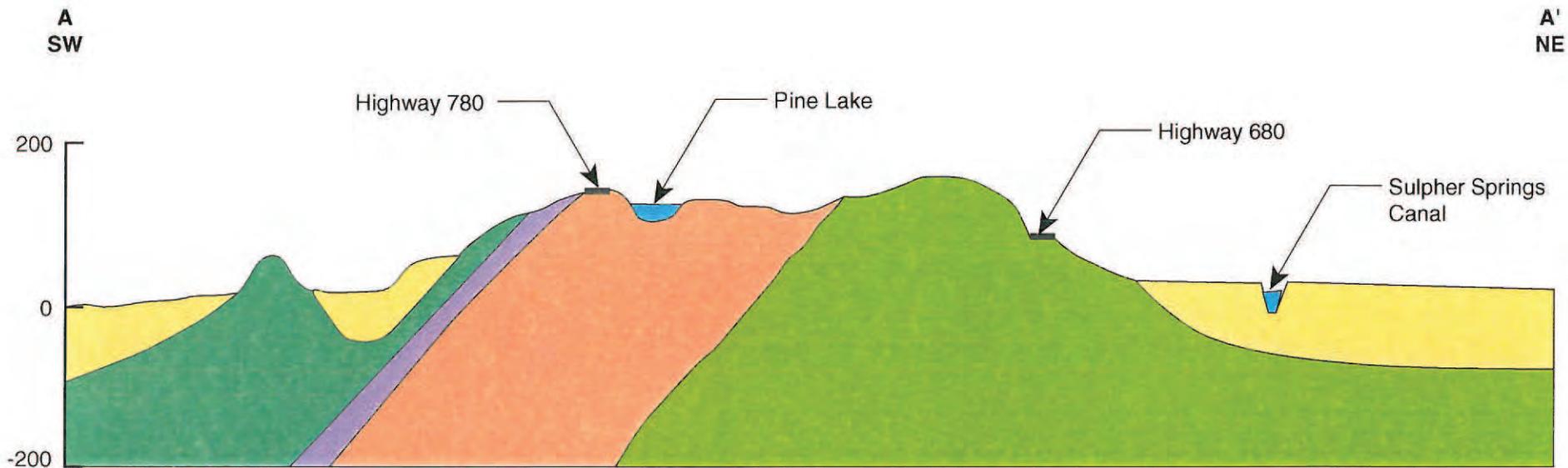
GRAPHIC SCALE IN FEET
 0 400 800 1200 1600 2000 2400

SOURCES: BASIC INFORMATION MAPS, MARCH 1958
 LAND UTILIZATION MAP, MAY 1956
 PRELIMINARY BENICIA ARSENAL REHABILITATION OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

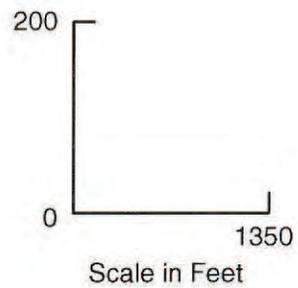
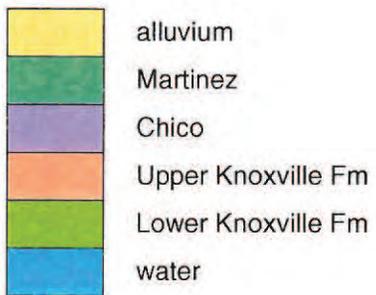
Generalized Geologic Map

Arsenal-Wide Investigation Workplan
 Benicia Arsenal

Army Well of 1872

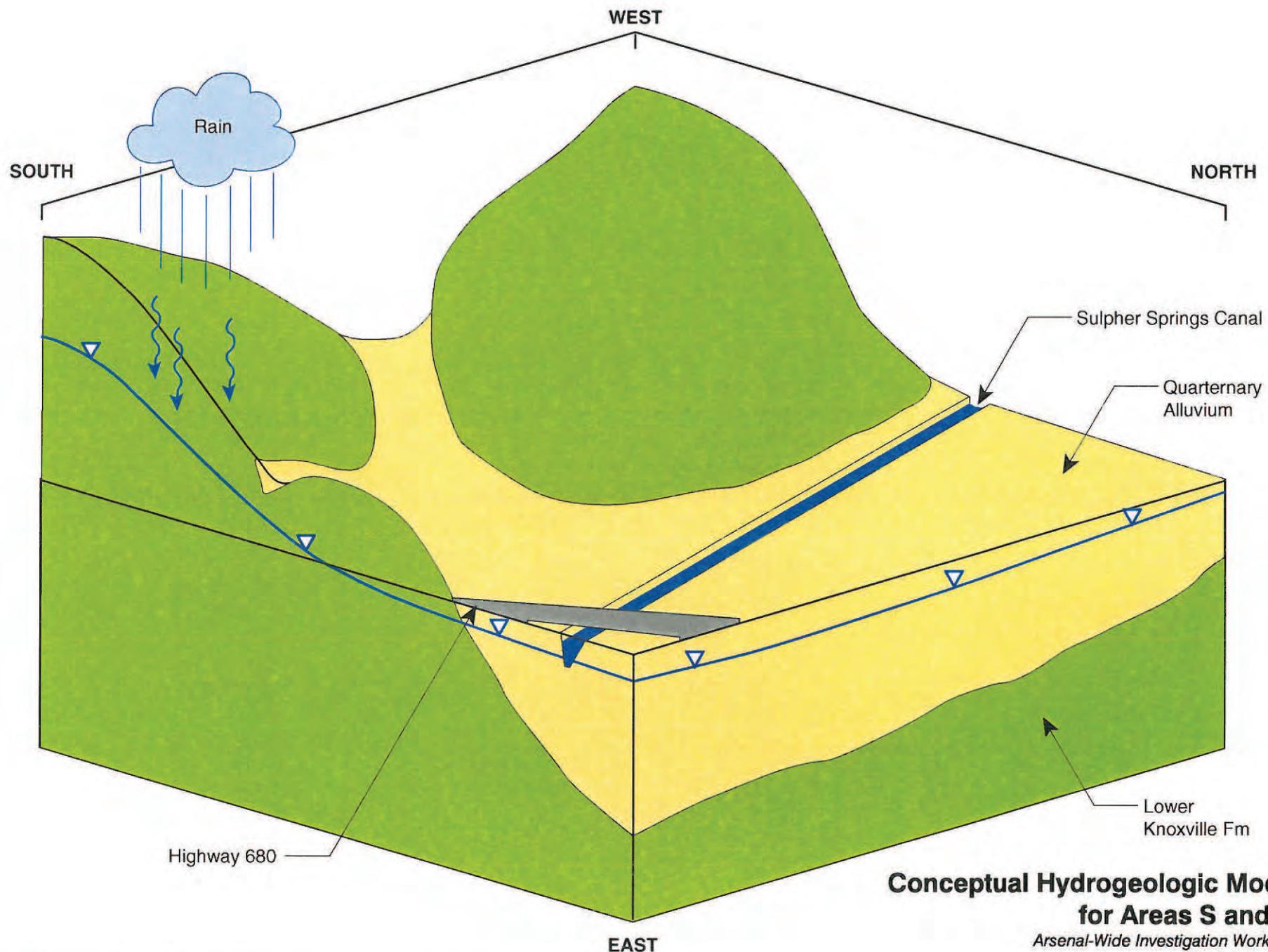


Legend



Schematic Geologic Cross Section A-A'
Areas I, M, and W

Arsenal-Wide Investigation Workplan
Benicia Arsenal



**Conceptual Hydrogeologic Model
for Areas S and W**
Arsenal-Wide Investigation Workplan
Benicia Arsenal

Leaking USTs at some of the sites has impacted soil and groundwater. Locations of groundwater monitoring wells are indicated on Figure 6-2.

6.3 Geologic Factors Influencing Subsurface Investigation

Although no area-specific data on groundwater and geology are currently available, the base of alluvial deposits within Area W is believed to range from 30 to 85 feet bgs. The groundwater table ranges from 10 to 15 feet bgs. Shallow subsurface investigation in this area may be accomplished using hand or power auger tools and/or direct push techniques, to at least the depth of the alluvium. Excavations using a standard backhoe will be possible throughout Area W. If sampling is required below the alluvium, air or mud rotary drilling methods may be required.

6.4 Operational History and Current Land Use and Ownership

Area W contains structures that were erected during World War II and in the early 1950s. Arsenal facilities that were located in this area included a clip, link, and belt plant (later converted to a guided missile shop); transitory shelters; open storage areas; inert materials warehouses; ammunition storage magazines; a rail yard; and toxic and explosive chemical weapon storage magazines (storage igloos). Materials handled in Area W included solid and liquid missile propellant, paints, solvents, oils and lubricants, fuels, and acids. Waste materials generated in Area W were reportedly discharged to septic tanks and to a sanitary sewer. The sanitary sewer led to an open ditch that discharged to Suisun Bay. Some paint spray booth wastes from operations within Area W may have also been discharged directly to ground.

Since Arsenal closure in 1964, numerous businesses have either leased or purchased property within Area W. These businesses include automotive, chemical, construction,

distribution, electrical, fabrication, glassware, manufacturing, petroleum, plastics, retail, transportation, warehousing, and waste management firms. A number of these businesses store and/or use petroleum products and other chemicals. Leaking underground storage tanks have been identified at several of these business locations. A number of these businesses are registered hazardous waste generators.

6.5 FSIPs/SSHPs

As described in Section 2, investigation activities within Area W will be conducted on a site by site basis. The scope and objectives of each investigation are documented in site specific FSIPs. Site specific health and safety protocols are presented in SSHPs. The FSIPs/SSHPs for Area W are attached to this section. As the Arsenal investigation progresses, new FSIPs will be added to this chapter as they are developed and approved. Table 6-1 summarizes the site use categories for Area W. The flysheet preceding the FSIPs/SSHPs lists each FSIP/SSHP in the order of completion.

**Table 6-1
Site Use Categories, Area W**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
174	Booster pump house (firewater)							X			
176	Sanitary services, industrial waste line							X			
177	Compressor Building									X	
194	Septic tank, 4,000-gallon capacity							X			
195	Septic tank, 26,000-gallon capacity							X			
C420	Igloo magazines		X								
C419	Igloo magazines		X								
CL1	Clip, belt, and link plant; guided missile shop		X	X							
CL2	Boiler house										
CL4	Paint Storage	X			X					X	
D503	Igloo magazines		X								
D512	Igloo magazines		X								
D513	Igloo magazines		X								
D516	Igloo magazines		X								
D517	Igloo magazines		X								
D518	Igloo magazines		X								
D519	Igloo magazines		X								
D520	Igloo magazines		X								
D524	Igloo magazines		X								
D525	Igloo magazines		X								
D526	Igloo magazines		X								
D527	Igloo magazines		X								
D528	Igloo magazines		X								
D529	Igloo magazines		X								
DL2	Dunnage equipment building	X									
M2	Firehouse										X
M3	Storage, equipment and tool storage, and smokehouse	X									
M4	Storage, equipment and tool storage, and smokehouse	X									
M8	Storage, equipment and tool storage, and smokehouse	X									
M10	Storage, equipment and	X									

**Table 6-1
Site Use Categories, Area W**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
	tool storage, and smokehouse										
OS36	open storage	X									
OS37	open storage	X									
OS38	open storage	X									
OS39	open storage	X									
OS50	open storage	X									
PL4	Loading platform	X									
PL5	Loading platform	X									
R5	Reservoir (firewater)							X			
Rail yard	Overland of ordnance shipment		X								
SA1	Small arms ammunition storage magazine		X								
SA2	Small arms ammunition storage magazine		X								
T059	Barracks										X
Tank test track/shop	Mechanical performance tests			X							
TS1	Transitory Shelter for Nike missiles		X								
TS2	Transitory Shelter for Nike missiles		X								
TS3	Transitory Shelter		X								
TS4	Transitory Shelter		X								
W1	Inert materials warehouse		X								
W10	Warehouse/storage	X									
W11	Warehouse/storage	X									
W12	Warehouse/storage	X									
W2	Inert materials warehouse		X								
W3	Inert materials warehouse		X								
W4	Inert materials warehouse		X								
W6	Storehouse		X								
W9	Warehouse/storage/ two 30,000-gal fuel tanks	X			X						

Area W - FSIPs/SSHPs

(none completed at this time)

*8.0 Area R –
Revetment / Explosives
Holding Area*

8. AREA R - REVETMENT/EXPLOSIVES HOLDING AREA

A description of Area R follows, including the physical characteristics, operational history, current use of the land, and land ownership. FSIPs and SSHPs for Area R are presented at the end of this section. The FSIPs and SSHPs will be added to the Workplan as they are developed.

8.1 Location

Area R occupies a tract of land of approximately 709 acres. It is bordered on the north, east, and west by the Benicia Arsenal leased property boundary and on the south by Areas S and W (see Figure 8-1). The central and south-central portions of this area are generally flat and are overlain by alluvial deposits (which are described in Area W). The remainder of the area is comprised of low-lying foothills. According to a local resident and former Arsenal employee (personal communication, Buster Byerrum, 1998) the flat areas were covered with several tons of fill material following Arsenal closure.

8.2 Area R Conceptual Geologic Model

Specific geologic and hydrogeologic information is currently not available for Area R. However, based on maps by Dibblee (1980), Sims (1973), and Weaver (1949), the geologic features encountered should be similar to those described for Area S.

8.3 Geologic Factors Influencing Subsurface Investigation

Shallow subsurface investigation in the central and south central portion of Area R (alluvium and fill) may be accomplished using hand or power auger tools and/or direct push techniques, to at least the depth

of the unconsolidated material. Excavations using a standard backhoe will be possible in this portion of Area R. If sampling is required below the unconsolidated material, or in the eastern or western portions of Area R, air or mud rotary drilling methods may be required and excavating may be difficult.

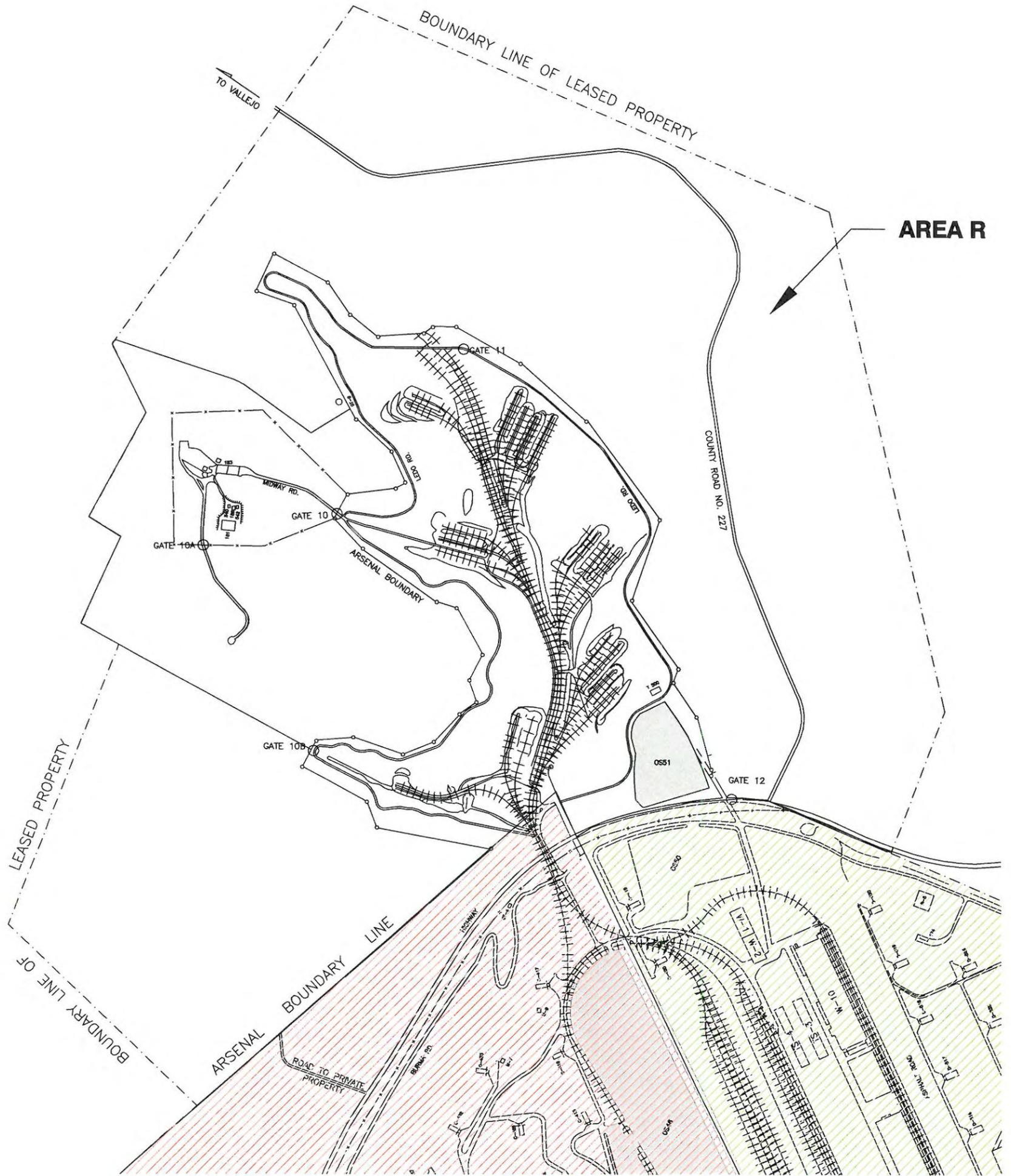
8.4 Operational History and Current Land Use and Ownership

Area R became part of the Benicia Arsenal in 1944. Very few permanent structures were built in this area between 1944 and the time of Arsenal closure in 1964. Arsenal land use in Area R was primarily limited to the temporary storage of explosives on flatbed railroad cars in the Revetment Area, artillery testing, demilitarization, and demolition of damaged and outdated ammunition. Features located in Area R include eighteen earthen revetments constructed around railroad spurs, several ordnance disposal areas, howitzer test tunnels, a firing butt, a concrete powder loading room, and a weapons testing facility. Explosives were routinely burned in Area R.

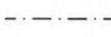
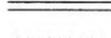
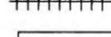
Today, much of Area R remains as undeveloped open space. Pacific Bay Homes is in the process of developing the northwestern portion of Area R (the Tourtelot Property) for residential use. Private industries that occupy portions of Area R include steel, petroleum, welding, plumbing, lumber, and storage firms.

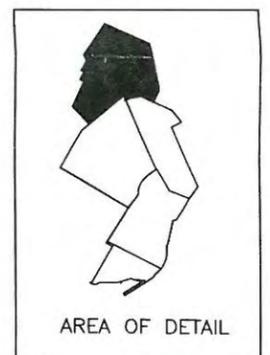
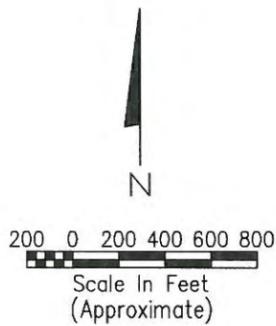
8.5 FSIPs/SSHPs

As described in Section 2, investigation activities within Area R will be conducted on a site-by-site basis. The scope and objectives of each investigation are documented in site specific FSIPs. Site specific health and safety protocol are



LEGEND:

-  Area W - Warehouse Expansion Area of the 1940s
-  Area S - Magazine Storage Expansion Area
-  Water
-  Open Storage Areas
-  Area Boundary Line
-  Arsenal Boundary Line
-  Roads
-  Railroad Tracks
-  Buildings



SOURCE: BASIC INFORMATION MAPS, MARCH 1958
 LAND UTILIZATION MAP, MAY 1956
 PRELIMINARY BENICIA ARSENAL REHABILITATION
 OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

Area R
Revetment / Explosives Holding Area
 Arsenal-Wide Investigation Workplan
 Benicia Arsenal

presented in SSHPs. The FSIPs/SSHPs for Area R are attached to this section. As the Arsenal investigation progresses, new FSIPs will be added to this chapter as they are developed and approved. Table 8-1 summarizes the site use categories for Area R. The flysheet proceeding the FSIPs/SSHPs lists each FSIP/SSHP in the order of completion.

**Table 8-1
Site Use Categories, Area R**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
181	concrete tunnel, howitzer test area		X						X		
182	Test firing butts		X						X		
183	powder loading room		X						X		
540	Test cell block								X		
542	Unknown								X		
Artillery testing area	artillery testing		X						X		
Burning and demolition area	Destruction of old and outdated ammunition		X				X				
Demolition and demilitarization area	Ammunition renovation operations		X								
Demolition and demilitarization area	Primer destruction area						X				
Demolition and demilitarization area	Test tunnel disposal area					X					
Drainage Channels	Drainage							X			
Dynamite burn area	Burning of dynamite						X				
NA	Overtumed ammunition truck area		X								
OS51	Open storage	X									
Small arms ammunition disposal area	Small arms ammunition disposal		X								
Spur A	Ammunition Revetment		X								
Spur B	Ammunition Revetment		X								
Spur C	Ammunition Revetment		X								
Spur D	Ammunition Revetment		X								
Spur E	Ammunition Revetment		X								

**Table 8-1
Site Use Categories, Area R**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
Spur F	Ammunition Revetment		X								
Spur G	Ammunition Revetment		X								
T500	Tool storage	X									
Wells	9 Water wells									X	

Area R - FSIPs/SSHPs

(None completed at this time)

*9.0 Area M Motor Pool
and Historic Ordnance
Storage Area*

9. AREA M - MOTOR POOL AND HISTORIC ORDNANCE STORAGE AREA

A description of Area M follows, including the physical characteristics, operational history, current use of the land, and land ownership. FSIPs and SSHPs for Area M are presented at the end of this section. The FSIPs and SSHPs will be added to the Workplan as they are developed.

9.1 Location

Area M occupies a rectangular shaped tract of land consisting of approximately 400 acres. It is bounded on the north by the drainage canal adjacent to Area W, on the east by Suisun Bay, on the south by Area I, and on the west by the Arsenal boundary and Area S (see Figure 9-1).

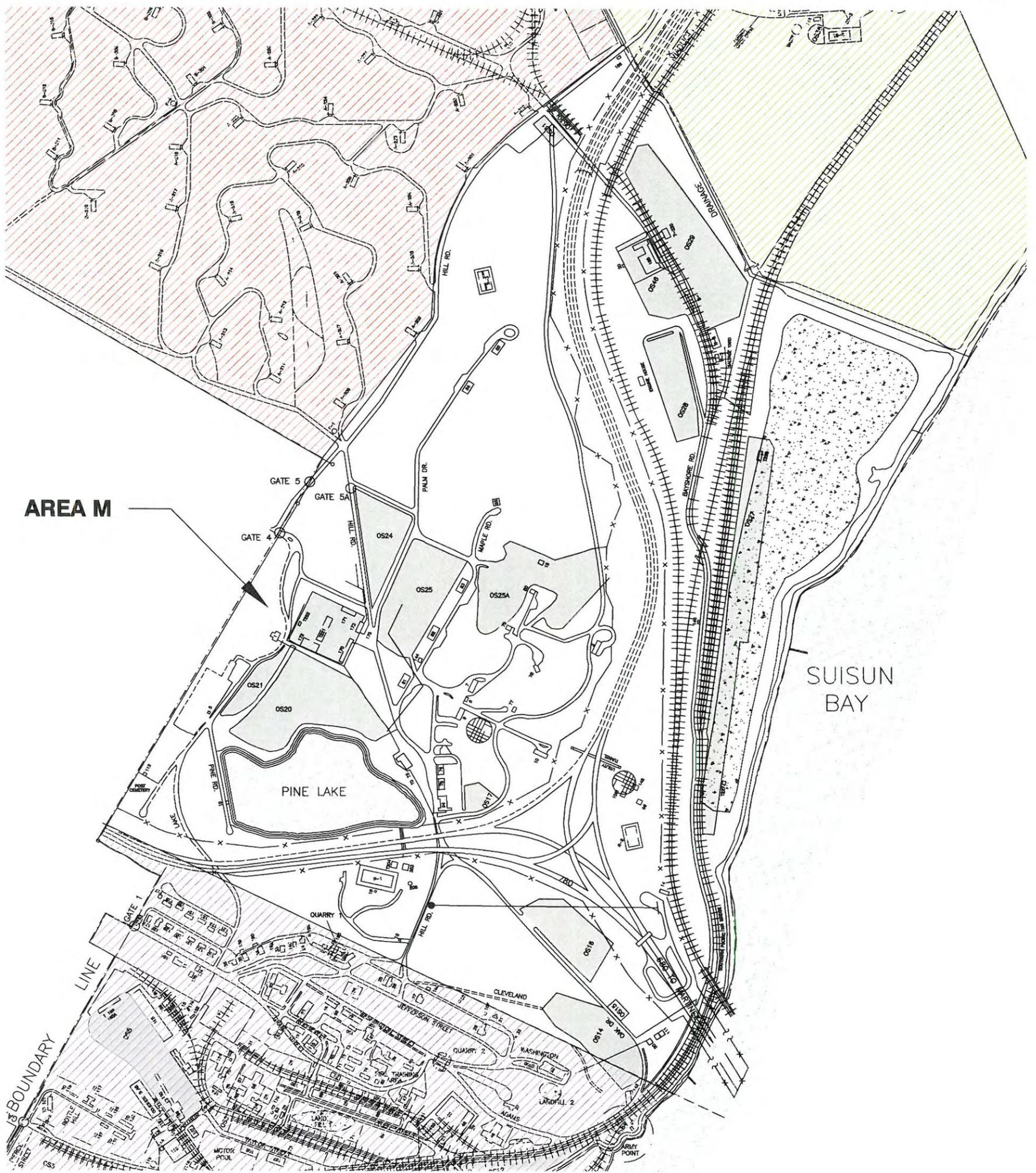
9.2 Area M Conceptual Geologic Model

The general topography of the area includes low-lying foothills covering the southern, western, and northern portions, with a relatively deep alluvial deposit along the northeastern boundary between Areas M and W. The foothills reach a maximum elevation of approximately 200 feet above msl on the west side. Soil and near-surface material has been highly disturbed and varies in thickness. The thickness varies from no overburden to an expected thickness of tens of feet, depending on historical construction activities. As discussed previously, tidal flats and marshlands exist within the Suisun Bay. Several of these marshlands have since been filled in and developed. Such is the case in Area M, where historic marshland near the boundary of Areas M and I, has been replaced with fill material.

The geology is comprised of steeply dipping, mudstone, shale, siltstone, and sandstone beds of the Chico and Knoxville

formations. Alluvial deposits along the northeast boundary of Area M represent channel deposits placed by Sulphur Springs Creek Channel and marsh/near shore deposits of Suisun Bay. Additionally, CalTrans disposed of spoil material excavated during construction of Highway 680 in Area M. Highway 680 spoil was deposited in the northeastern portion of Area M near the boundary of Areas W and M, and on the land which now houses the current Exxon refinery.

Figure 9-2 presents a schematic geologic cross-section (A-A') through Areas I, M, and W. The location of cross-section A-A' is shown on Figure 6-2. The surface representation of cross-section A-A' is presented in Figure 6-2 in Section 6. In 1872, the Army attempted to develop a water source by drilling a well in Area M, near the border between Areas M and I. During drilling, groundwater was first encountered at a depth of 960 feet. Drilling continued until the well was 1,407 feet deep. However, this water was determined to be unfit for human consumption and the well was blocked off to a depth of 960 feet using cement, sand, and grain sacks. Water at the 960-foot depth contained organic matter and was considered "unfit for food" (Cowell, 1963). This well was only used to produce water for boilers and irrigation. Although the well installed in 1872 did not identify groundwater until a depth of 960 feet, there have been several monitoring wells installed at the Arsenal by private parties. An environmental investigation conducted in the northeastern portion of Area M (Aqua Science Engineers, Inc., 1997) identified groundwater at a depth of approximately 14 feet bgs. Based on field data collected from monitoring wells, the shallow water may be brackish.



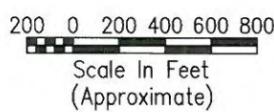
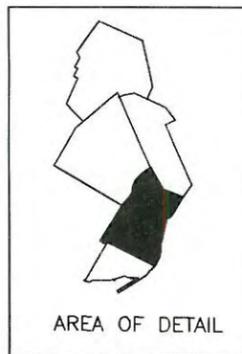
AREA M

SUISUN BAY

PINE LAKE

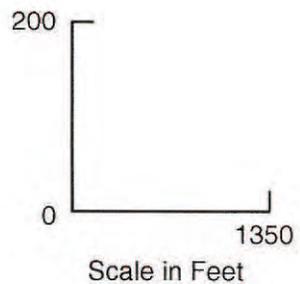
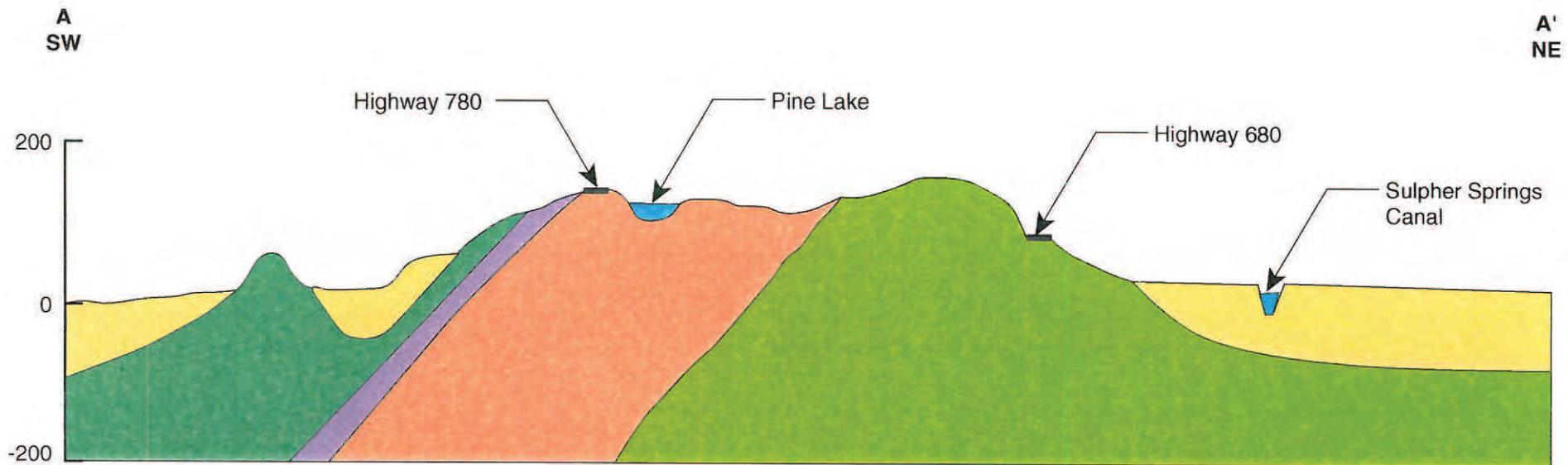
LEGEND:

- | | | | |
|---|--|---|--------------------|
|  | Area W - Warehouse Expansion Area of the 1940s |  | Landfill |
|  | Area I - Industrial / Manufacturing Area |  | Sandstone Quarries |
|  | Area S - Magazine Storage Expansion Area |  | Water |
|  | Open Storage Areas | | |
|  | Arsenal Boundary Line | | |
|  | Area Boundary Line | | |
|  | Road | | |
|  | Railroad Tracks | | |
|  | Building | | |



SOURCE: BASIC INFORMATION MAPS, MARCH 1958
 LAND UTILIZATION MAP, MAY 1956
 PRELIMINARY BENICIA ARSENAL REHABILITATION
 OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

Area M
Motor Pool and
Historic Ordnance Storage Area
 Arsenal-Wide Investigation Workplan
 Benicia Arsenal



Schematic Geologic Cross Section A-A'
Areas I, M, and W

Arsenal-Wide Investigation Workplan
Benicia Arsenal

One well drilled in the foothills immediately west of the thick alluvial beds and Highway 680 identified shallow water in a sandstone bed at 18 feet bgs.

At the Toyota Motor Sales facility in the southern portion of Area M, two USTs have been removed and 6 groundwater monitoring wells were installed for site characterization. The groundwater flow direction at this facility is to the south toward the bay and the depth to groundwater ranges from 2 to 24 feet bgs. Solano County has granted closure for this UST site and all of the wells have been destroyed.

A portion of the Exxon refinery is present on the northeast portion of Area M. Numerous groundwater monitoring wells have been installed as part of Exxon's monitoring program. Test results indicate that some of the monitoring wells have been impacted with volatile organic compounds (VOCs).

9.3 Geologic Factors Influencing Subsurface Investigation

Shallow subsurface investigation will be possible using hand or power auger tools or by excavation using a standard backhoe in the extreme southern, eastern and northeastern portions of Area M in the alluvial deposits and artificial fill. However, in areas where concrete rubble or rock spoils were used for fill material, drilling or excavating may be difficult.

The remainder of Area M consists of mudstone, shale, siltstone, and sandstone of the Upper and Lower Knoxville Formations, which occasionally outcrop. Air or mud rotary drilling methods may be required in these areas and excavation using a standard backhoe may be difficult. However, subsurface investigation using hand or power auger tools will be possible in areas where a soil horizon has been established.

9.4 Operational History and Current Land Use and Ownership

For nearly 100 years, Area M was used primarily for ammunition, powder, and ordnance storage. A number of ammunition storehouses, powder magazines, and explosives storage igloos were located in Area M.

The motor pool, which was initially located in Area I, was moved to Area M in 1945. It was later moved back to Area I, and then in 1953 moved again to Area M, where it remained until deactivation of the Arsenal. Motor pool facilities included repair shops, washracks, parts storage facilities, and a service station.

The major industrial activity that was conducted within Area M was tire rebuilding, which included retreading, recapping, and repairing. The recapping that was done in this area reportedly involved the use of solvent-based adhesives. A dumpsite was reportedly located adjacent to the tire rebuilding facility.

Two quarries, which provided the sandstone used to build some of the original Benicia Arsenal structures, are located within Area M. These two quarries were later used as disposal sites, along with a landfill that was located within Area M. Waste materials that were disposed at these sites reportedly included containers of industrial wastes. Waste gasoline was reportedly burned in pits within the Area M landfill, and detonation of ordnance reportedly occurred at some of the disposal sites. Ordnance detonation may have also been conducted on the Suisun Bay tidal flats adjoining Area M.

Open space within Area M was utilized for storage and maintenance of vehicles and artillery. Much of the area continues to remain as undeveloped open space. Four reservoirs, including Pine Lake, that were used to store water for fire-fighting purposes and for domestic use were located in Area M.

Since transfer of ownership to the City of Benicia in 1965, much of Area M has been developed by Benicia Industries, Inc. as an industrial park. Major occupants include Exxon, the City of Benicia, The Marcus Company, A.B.C. Towing, Inc., and Benicia Foundry and Iron Works, Inc. A significant portion of the land within Area M has been used for construction of the freeway corridors for Highway 680 and Highway 780. Toyota Motor Sales Co. utilizes the portion of Area M located adjacent to Suisun Bay for vehicle storage.

9.5 FSIPs/SSHPs

As described in Section 2, investigation activities within Area M will be conducted on a site by site basis. The scope and objectives of each investigation are documented in site specific FSIPs. Site specific health and safety protocol are presented in SSHPs. The FSIPs/SSHPs for Area M are attached to this section. As the Arsenal investigation progresses, new FSIPs will be added to this chapter as they are developed and approved. Table 9-1 summarizes the site use categories for Area M. The flysheet proceeding the FSIPs/SSHPs lists each FSIP/SSHP in the order of completion.

**Table 9-1
Site Use Categories, Area M**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
1	Hospital							X			X
2	Magazine; Storehouse		X								
3	Magazine; Storehouse		X								
7	Ordnance storehouse, indoor firing range		X						X		
8	Ammunition/Radio Shop		X	X							
9	Ordnance storehouse; ammo shop and utilities		X								
10	Magazine; Storehouse		X								
12	Magazine; Storehouse & CVM storage		X								
13	Magazine; Storehouse		X								
14	Magazine; Storehouse		X								
15	Powder magazine		X								
16	Water, Pumphouse (R-1)									X	
17	Water, Booster pump house									X	
19	Water, Pumphouse (R-1)									X	
20	Boiler house									X	
30	Unknown								X		
50	Paint shop			X							
75	Magazine; Storehouse		X								
76	Magazine; Storehouse		X								
77	Magazine, Underground		X								
78	Magazine, Underground		X								
79	Magazine, Underground		X								
80	Magazine, Underground		X								
81	Magazine; Storehouse		X								
82	Magazine; Storehouse		X								
83	Magazine; Storehouse		X								
84	Magazine; Storehouse		X								
85	Magazine; Storehouse		X								
86	Magazine, Underground		X								
94	Field office, storage										X
96	Shell loading and storage		X								
111	Heavy equipment shop			X							

**Table 9-1
Site Use Categories, Area M**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
112	Water, Booster pump house									X	
136	Unknown								X		
144	warehouse office, P.E.	X									
146	Surveillance shelter -- septic tank							X			X
146	Surveillance shelter; RR dispatch office										X
148	Tool shed	X									
155	Field office; tire recapping			X							X
170	Auto parts and office			X							
171	Vehicle shop			X							
172	Vehicle repair and maintenance			X							
173	Office										X
175	Gasoline service station				X						
185	Unknown								X		
186	Unknown								X		
193	Unknown								X		
203 (at R-1)	Water chlorination									X	
208 (at R-1)	Water, Pump house									X	
Artesian well	Water, irrigation, boiler water, other non-potable uses									X	
Camel Barns	Lab										X
Canal including tide gates	Water, Tidewater control, stormwaters							X			
Cistern	Water, Potable									X	
Dumpsite	Dumpsite					X					
Engine house	Unknown								X		
Motor pool to Suisun Bay	Water, untreated sewage and stormwater line; gravity outfall							X			
NA	Landfill					X	X				
NA	Small arms firing range								X		
OS14	Open storage	X									
OS15	Open storage	X									

**Table 9-1
Site Use Categories, Area M**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
OS16	Open storage	X									
OS16	Open storage and Lab	X									
OS17	Open storage	X									
OS20	Open storage, maintenance, civilian parking	X		X							
OS21	Open storage, maintenance	X		X							
OS24	Open storage	X									
OS25	Open storage	X									
OS25A	Disposal of ammunition and possibly CWM	X	X								
OS27	Open storage	X									
OS28	Open storage; maintenance	X		X							
OS29	Open storage; maintenance	X		X							
OS30	Open storage	X									
OS31	Open storage	X									
OS46	Open storage	X									
Quarry #1	Building material; landfill					X					
Quarry #2	Building material; potential landfill					X					
R1	Water, Fire-fighting									X	
R2	Water, Potable									X	
R3	Water, Fire-fighting									X	
R4	Water (Pine Lake)									X	
Salvage yard	Salvage yard			X							X
T198	Office, steel storage slab										
T221	Garage vehicle maintenance			X							
T222	Steam cleaning			X							
T226	Office										X
T227	Portable field office										X
T228	Box shop	X									
TO73	Recreation and storage building, photo lab	X							X		

**Table 9-1
Site Use Categories, Area M**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
Vicinity of powder magazine #2	Primer destruction, ordnance disposal		X								
vicinity of quarry #2 (alternative location)	Primer destruction, ordnance disposal		X								
W1	Warehouse	X									
W2	Warehouse	X									
W7	Warehouse, Salvage and general storage	X									
W8	Gas cylinder storage	X									

Area M - FSIPs/SSHPs

(None completed at this time)

*10.0 Magazine Storage
Expansion Area*

10. AREA S - MAGAZINE STORAGE EXPANSION AREA

A description of Area S follows, including the physical characteristics, operational history, current use of the land, and land ownership. FSIPs and SSHPs for Area S are presented at the end of this section. The FSIPs and SSHPs will be added to the Workplan as they are developed.

10.1 Location

Area S occupies a trapezoidal shaped tract of land of approximately 500 acres. It is bounded on the north by the Arsenal boundary and Area R, on the east by the drainage canal adjacent to Area W, on the southeast by Area M, and on the south and west by the Arsenal boundary (see Figure 10-1).

10.2 Area S Conceptual Geologic Model

The topography of Area S includes low-lying foothills covering most of the area, with a relatively deep alluvial deposit along the northeastern boundary. The foothills reach a maximum elevation of approximately 420 feet above msl near the former western Arsenal boundary line. Surface drainage in Area S is to the northeast, towards Sulphur Springs Creek Channel.

Figure 10-2 presents a schematic geologic cross-section (B-B') that includes Area S. The location of cross-section B-B' is shown on Figure 6-2. The geology is composed of southwesterly steeply dipping, mudstone, shale, siltstone, and sandstone beds of the Knoxville formation. The alluvial deposits along the northeast boundary represent channel deposits placed by Sulphur Springs Creek Channel. Soil and alluvial deposits in the canyons of the foothills can vary in thickness from several inches near the top of the hills, to an expected maximum of 15 or 16 feet at the base of the drainage areas.

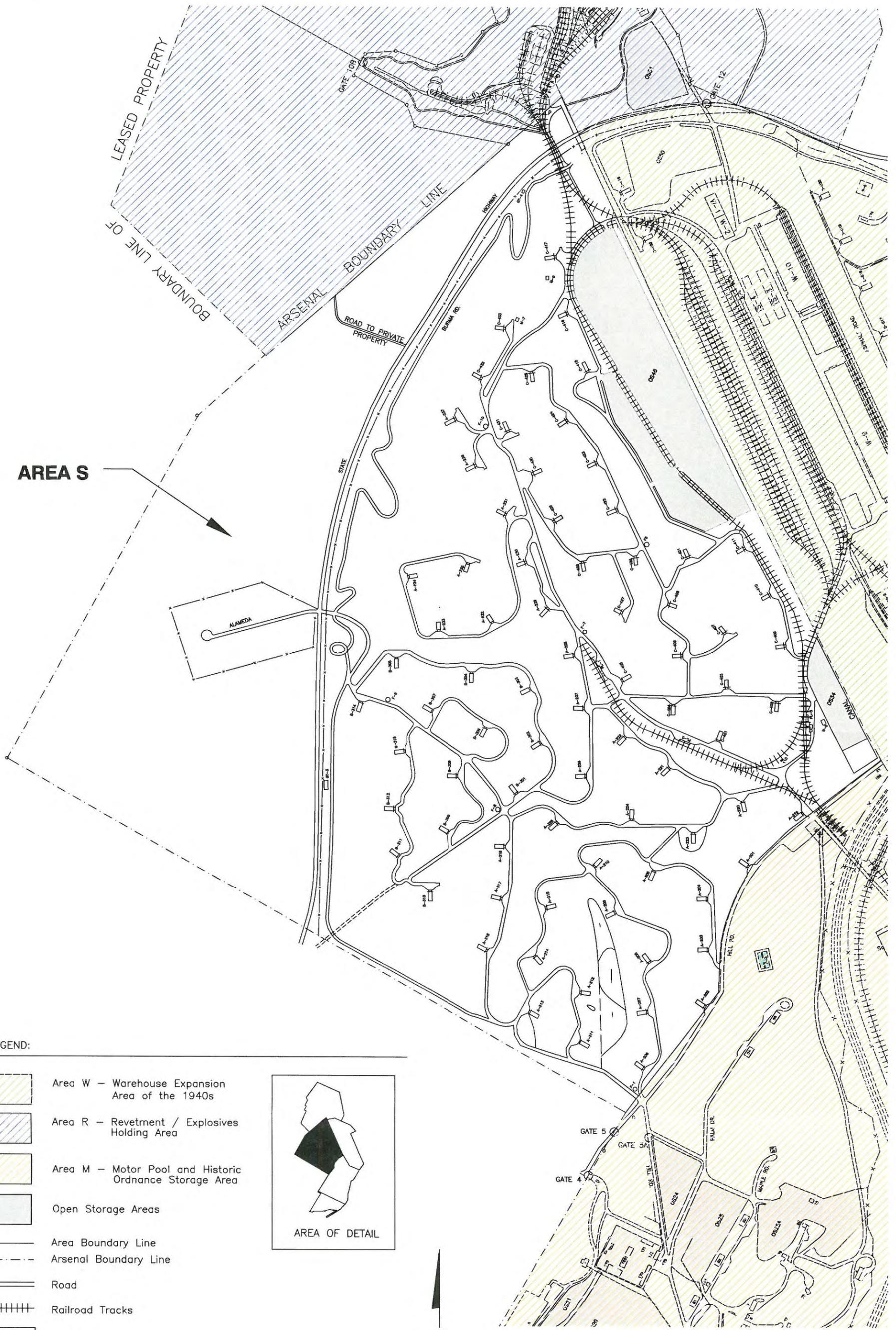
The drilling log for a domestic well installed near the northern extent of the area, immediately west of East 2nd Street, identifies approximately 3 feet of soil overburden on top of mudstone, claystone, and shale. Shallow groundwater was identified at approximately 70 feet bgs.

10.3 Geologic Factors Influencing Subsurface Investigation

Shallow subsurface investigation in the extreme eastern portion of Area S (alluvium and fill) may be accomplished using hand or power auger tools and/or direct push techniques to at least the depth of the unconsolidated material. Excavations using a standard backhoe will be possible in this portion of Area S. The western portion of Area S consists of mudstone, siltstone, shale, and sandstone of the Lower Knoxville formation. If sampling is required below the unconsolidated material or in the western portion of Area S, air or mud rotary drilling methods may be required and excavating may be difficult.

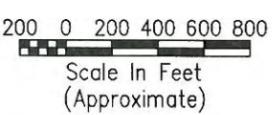
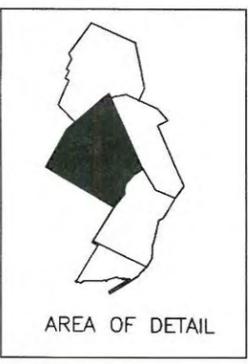
10.4 Operational History and Current Land Use and Ownership

Area S houses over 100 former underground storage igloos that were used for artillery projectile, aerial bomb, and guided missile storage. Other features located within Area S include a firing range; ordnance burn/disposal areas; railroad loading platforms; two former NIKE missile launch sites; an armored vehicle test track with an associated repair shop; and two open storage areas. The open storage areas were used for automobile parts, trucks, and material storage. Vehicle derusting,



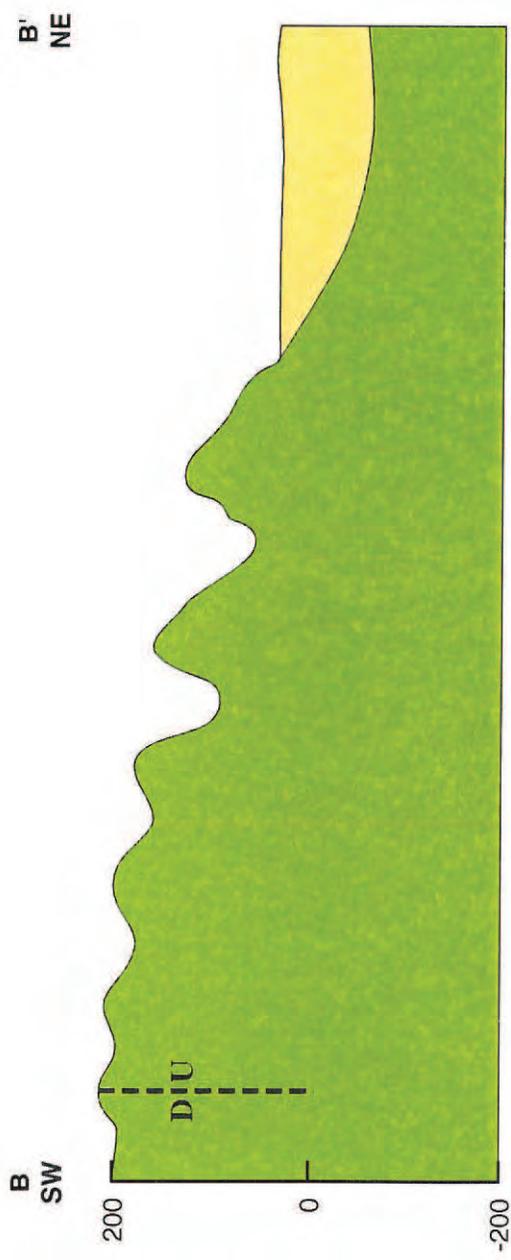
LEGEND:

-  Area W - Warehouse Expansion Area of the 1940s
-  Area R - Revetment / Explosives Holding Area
-  Area M - Motor Pool and Historic Ordnance Storage Area
-  Open Storage Areas
-  Area Boundary Line
-  Arsenal Boundary Line
-  Road
-  Railroad Tracks
-  Building

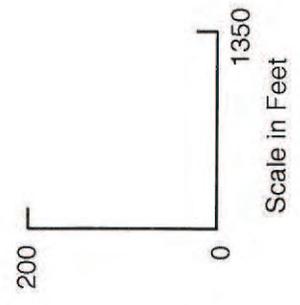
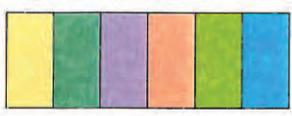


SOURCE: BASIC INFORMATION MAPS, MARCH 1958
 LAND UTILIZATION MAP, MAY 1956
 PRELIMINARY BENICIA ARSENAL REHABILITATION
 OF MAINTENANCE BLDGS. PLOT PLAN, AUGUST 1950

Area S
Magazine Storage Expansion Area
 Arsenal-Wide Investigation Workplan
 Benicia Arsenal



Legend



**Schematic Geologic Cross Section B-B'
Area S**
Arsenal-Wide Investigation Workplan
Benicia Arsenal
FIGURE 10-2

painting, fueling, and lubrication activities are believed to have taken place in the open storage areas.

Area S is currently owned by Exxon. The eastern half of the area contains the Exxon oil refinery and the western half is generally unimproved land, with the exception of the Benicia City Yard (presumably a lease from Exxon).

10.5 FSIPs/SSHPs

As described in Section 2, investigation activities within Area S will be conducted on a site by site basis. The scope and objectives of each investigation are documented in site specific FSIPs. Site specific health and safety protocol are presented in SSHPs. The FSIPs/SSHPs for Area S are attached to this section. As the Arsenal investigation progresses, new FSIPs will be added to this chapter as they are developed and approved. Table 10-1 summarizes the site use categories for Area S. The flysheet proceeding the FSIPs/SSHPs lists each FSIP/SSHP in the order of completion.

**Table 10-1
Site Use Categories, Area S**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
A201	Large size igloos		X								
A202	Large size igloos		X								
A203	Large size igloos		X								
A204	Large size igloos		X								
A205	Large size igloos		X								
A206	Large size igloos		X								
A207	Large size igloos		X								
A208	Large size igloos		X								
A209	Large size igloos		X								
A210	Large size igloos		X								
A211	Large size igloos		X								
A212	Large size igloos		X								
A213	Large size igloos		X								
A214	Large size igloos		X								
A215	Large size igloos		X								
A216	Large size igloos		X								
A217	Large size igloos		X								
A218	Large size igloos		X								
A219	Large size igloos		X								
A220	Large size igloos		X								
A221	Medium size igloos		X								
A223	Medium size igloos		X								
A224	Medium size igloos		X								
A225	Large size igloos		X								
A226	Medium size igloos		X								
A227	Medium size igloos		X								
A228	Medium size igloos		X								
A229	Medium size igloos		X								
A230	Medium size igloos		X								
A231	Medium size igloos		X								
A232	Medium size igloos		X								
A233	Medium size igloos		X								
A234	Medium size igloos		X								
A235	Medium size igloos		X								
A236	Large size igloos		X								
A237	Large size igloos		X								
B301	Medium size igloos		X								
B302	Medium size igloos		X								

**Table 10-1
Site Use Categories, Area S**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
B303	Medium size igloos		X								
B304	Medium size igloos		X								
B305	Medium size igloos		X								
B306	Medium size igloos		X								
B307	Medium size igloos		X								
B308	Large size igloos		X								
B309	Large size igloos		X								
B310	Large size igloos		X								
B311	Large size igloos		X								
B312	Large size igloos		X								
B313	Large size igloos		X								
B314	Large size igloos		X								
C401	Medium size igloos		X								
C402	Large size igloos		X								
C403	Medium size igloos		X								
C404	Medium size igloos		X								
C405	Medium size igloos		X								
C406	Medium size igloos		X								
C407	Medium size igloos		X								
C408	Medium size igloos		X								
C409	Medium size igloos		X								
C410	Medium size igloos		X								
C411	Medium size igloos		X								
C415	Large size igloos		X								
C416	Large size igloos		X								
C417	Large size igloos		X								
C421	Medium size igloos		X								
C422	Medium size igloos		X								
C423	Medium size igloos		X								
C424	Large size igloos		X								
C425	Large size igloos		X								
C426	Medium size igloos		X								
C427	Medium size igloos		X								
C428	Medium size igloos		X								
C429	Medium size igloos		X								
C430	Medium size igloos		X								
C431	Large size igloos		X								
C432	Large size igloos		X								

**Table 10-1
Site Use Categories, Area S**

DOD Facility ID	DOD use	Storage and warehouse areas	Ordnance and Ammunition Handling and Storage Facilities	Maintenance, Repair, Paint Facilities and Carpenter shops	Fuel Facilities	Landfill and Dumpsites	Burnsites	Septic, Sewer, and Storm drains	Misc.	Potable water facilities and utilities	Offices, Barracks, Hospitals, Firehouses
C433	Large size igloos		X						X		
Elliptical formation	Unknown					X			X		
Firing range/Demolition area	Demolition of ammunition/test firing of .45 and .50 caliber weapons										X
M7	Quarters										
M9	Railroad tool house	X							X		
Mound near A218	Unknown										
Nike missile site 1	Defense		X								
Nike missile site 2	Defense		X								
OS34	Vehicle, weapons storage and maintenance		X								
OS46	Vehicle, weapons storage and maintenance		X								
PL1	Loading platforms	X									
PL2	Loading platforms	X									
PL3	Loading platforms	X									
Tank test track and repair shop	Off-road testing and adjustment of armored vehicles			X							
W5	Target storage shed	X									

Area S - FSIPs/SSHPs

(None completed at this time)

11.0 References

11. REFERENCES

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Appendix A

**BROWN AND
CALDWELL**

Attachment A—Site Safety and Health Plan Acknowledgment

Employee Name

Project Name

Project Location

Project Number

Statement of Acknowledgment/Emergency Information

I hereby certify that I have read and that I understand the safety and health guidelines contained in the Benicia Arsenal General Site Safety and Health Plan (SSHP) and the Site-Specific SSHP for the site named above.

Employee Name	Employee Signature	Emergency Info /Relationship	Phone Number
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Name of Site Safety Officer Receiving This Form

Signature of Site Safety Officer

Date

NOTE: Send completed form to Health and Safety Director.
06/98

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**BROWN AND
CALDWELL****Attachment B—Site Safety and Health Plan
Site Activity and Safety Briefing**

Name of Site Safety Officer

Signature of Site Safety Officer

Project Name

Project Location

Project Number

Who attended the briefing?

Names of Brown and Caldwell Employees

Names of Subcontractor(s) Employees

What items were discussed?

- | | |
|--|--|
| <input type="checkbox"/> Site Safety and Health Plan | <input type="checkbox"/> Hazardous Site Conditions/Activities |
| <input type="checkbox"/> Specific Accident/Incident | <input type="checkbox"/> Changes/Solutions to Specific Accident(s) |
| <input type="checkbox"/> Protective Equipment to be Used | <input type="checkbox"/> Location of Emergency Telephone Number |
| <input type="checkbox"/> Emergency Hospital Route | <input type="checkbox"/> Work Schedule |
| <input type="checkbox"/> Other _____ | |

Do any items require assistance from BC Health and Safety staff? (If yes, describe the item and type of assistance required and contact the Health and Safety staff directly.)

YES NO

NOTE: Place a copy of the completed form in the project file.

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