Draft

Environmental Assessment

Travis Air Force Base
Burke Property Housing

Submitted by

Travis Air Force Base
Fairfield, California

4 February 1999

Prepared by

Engineering Field Activity West
Naval Facilities Engineering Command
900 Commodore Drive
San Bruno, CA 94066-5006

ACRONYMS

AFB	Air Force Base
AHPA	Archeological and Historic Preservation Act
ARPA	Archeological Resources Preservation Act
BRAC	Base Realignment and Closure
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
EA	environmental assessment
EBS	environmental baseline survey
EIS	environmental impact statement
FH	Family Housing
FONSI	finding of no significant impact
FTA	fire training area
IRP	Installation Restoration Program
LF	landfill
LUFT	leaking underground fuel tank
MFH	Military Family Housing
MSL	mean sea level
MOA	Memorandum of Agreement
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPL	National Priorities List
PCB	polychlorinated biphenyls
RCRA	Resources Conservation and Recovery Act
ROD	Record of Decision
SHPO	State Historic Preservation Officer
USFWS	U.S. Fish and Wildlife Service

DEPARTMENT OF THE NAVY
ENGINEERING FIELD ACTIVITY, WEST
NAVAL FACILITIES ENGINEERING COMMAND
900 COMMODORE DRIVE
SAN BRUNO, CALIFORNIA 94066-5006

FEB 05 1999

IN REPLY REFER TO:

Dear Interested Party,

The Air Force proposes to provide military family housing (MFH) on the 101-acre (41-hectare) Burke Property, which was acquired by the Air Force for that purpose in March 1998. The project would help meet the need for additional military family housing, especially for junior enlisted personnel, that was created by the relocation of personnel to Travis AFB from March AFB, an action approved by the Base Closure and Realignment Commission and evaluated in the Air Force's EIS and Record of Decision (USAF 1994a,b). Currently, personnel that have relocated to Travis AFB reside off-base in surrounding communities, where housing is in short supply and the cost of rent typically exceeds the housing allowances of junior enlisted personnel. Construction of MFH on the Burke Property would enable Air Force personnel and their families to live in closer proximity to their jobs and the schools their children attend, while avoiding the high costs, commuting, and uncertain availability and suitability of off-base housing. On-base housing also provides a supportive community for Air Force families when enlisted personnel are called to duty overseas.

The public review period begins on February 8, 1999 and will extend for approximately 30 days before closing on March 10,1999. All comments must be postmarked on or before March 10in order to be assured consideration in the DEA public review process.

The DEA has been distributed to various federal, state, and local agencies, elected officials, special interest groups, and the public. A limited number of single copies are available at the address listed at the end of this letter. In addition, copies are available at the following libraries for public access: Solano County Public Library, Vacaville Public Library, Suisun City Public Library, and Fairfield-Suisun Community Library.

Pursuant to the Council on Environmental Quality Regulations (40 CFR Parts 1500-1508) implementing the procedural provisions of the National Environmental Policy Act (NEPA), the Department of the Navy has assisted the Air Force in the preparation of the NEPA documentation for construction of MFH on the 101-acre (41-hectare) Burke Property at Travis Air Force Base, California.

The DEA considers two alternative designs for the proposed action, a 281-unit design and a 226-unit design. A no-action alternative is also considered. The 281-unit design would use about 54 acres of the site, and directly impact less than 3 acres of aquatic and wetland habitats. The 226-unit design was developed in response to input from the Fish and Wildlife Service and Corps of Engineers, to further reduce the impact on aquatic and wetland habitats. This alternative would use about 42 acres of the site while impacting less than 1 acre of wetland and aquatic habitats.

The public review period begins on February 8, 1999 and will extend for approximately 30 days before closing on March 10,1999. The comment letters received during the public review process will be considered in developing the Final Environmental Assessment and Finding of No Significant Impact. Please send your comments to:

Commanding Officer, Engineering Field Activity West
Naval Facilities Engineering Command
900 Commodore Drive, San Bruno, CA 94066-5006
(Attention: Mr. Surinder Sikand, Environmental Planning Branch, Code 70311)

SAM DENNIS

Draft Environmental Assessment for Travis Air Force Base Housing

Lead Agency:	U.S. Air Force, Travis Air Force Base
Cooperating Agency:	None
Title of Proposed Action:	Environmental Assessment for Travis Air Force Base Housing
Affected Jurisdictions:	City of Fairfield and County of Solano, California
Designation:	Environmental Assessment

ABSTRACT

In support of previously reviewed, approved, and implemented Base Realignment and Closure (BRAC) actions, Travis Air Force Base (AFB) proposes to construct military family housing on the 101-acre Burke Property on the north side of the base. The use of the property for that purpose was previously reviewed and approved along with the other BRAC actions in an Environmental Impact Statement (EIS), from which this Environmental Assessment (EA) is tiered (40 CFR 1502.20). To meet the BRAC-related housing needs, a design for the construction of 281 units has been developed and is evaluated in this EA. A 226-unit alternative that could minimally satisfy Air Force policies is also considered, along with No Action, in this EA.

This EA focuses on Site Contamination, Biological Resources, and Cultural Resources. For other resource and issue areas, impacts and, where appropriate, mitigation measures associated with the construction of housing on the Burke Property were adequately described in the BRAC EIS and Record of Decision (ROD) (USAF 1994a,b). This EA finds that there are no potentially significant areas of site contamination or cultural resources on the site. With respect to Biological Resources, the 281-unit design would eliminate 2.81 acres of wetland and aquatic habitats, including some areas that may support threatened and endangered species. The 226-unit alternative would eliminate 1.18 acre of wetland and aquatic habitats while avoiding wetlands that may support threatened and endangered species. This EA identifies mitigation measures that, subject to further discussion with the U.S. Fish and Wildlife Service and U.S. Army Corps of Engineers, would mitigate these impacts to less than significance. Other potential short- and long-term impacts associated with the construction and use of housing in proximity to wetland and aquatic habitats on the site would be mitigated to insignificance through measures described in this EA. No other potentially significant environmental impacts are identified for either the Proposed or Alternative projects.

The No-Action alternative would be inconsistent with Air Force policies and the Congressionally approved realignment, which included the construction of new on-base housing. No Action also results in a diminished quality of life for junior-enlisted personnel who must cope with off-base housing that is distant from their place of work, and in short supply, at costs that exceed the housing allowance provided with their salaries. Off-base housing does not provide the community support that military families need when personnel are called to duty.

For Further Information:

Naval Facilities Engineering Command
Engineering Field Activity West
900 Commodore Drive
San Bruno, CA 94066-5006
Attn: Mr. Sam Dennis, Code 7031
Mr. Surinder Sikand
Phone: (650) 244-3007; Fax: (650) 244-3206

February 1999

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EXECUTIVE SUMMARY

INTRODUCTION

This Environmental Assessment (EA) analyzes the potential impacts on the environment resulting from construction of military family housing on the Burke Property, Travis Air Force Base (AFB). This EA is tiered from the Environmental Impact Statement (EIS) for the Realignment of Travis AFB (USAF 1994a,b) and focuses on the substantive issues that could not be fully addressed in that EIS, namely site contamination, biological resources, and cultural resources. This EA has been prepared pursuant to the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) implementing regulations (40 CFR 1500-1508), and Air Force Instruction 32-7061, which implements Directive 32-70 (Environmental Quality).

PURPOSE AND NEED

The purpose of the project is to provide military family housing (MFH) on the 101-acre (41-hectare) Burke Property, which was acquired by the Air Force for that purpose in March 1998. The project would help meet the need for additional military family housing that was created by the relocation of personnel to Travis AFB from March AFB, an action approved by the Base Closure and Realignment Commission and evaluated in the Air Force's EIS and Record of Decision (USAF 1994a,b). Currently, personnel that have relocated to Travis AFB reside off-base in surrounding communities, where housing is in short supply and relatively expensive. Construction of military family housing on the Burke Property would enable Air Force personnel and their families to live in closer proximity to Travis AFB, and to avoid the high costs, uncertain availability and suitability of off-base housing, and commuting associated with residing off-base.

In combination with other on-base housing projects, 281 units on the Burke Property are necessary to fully meet the housing needs associated with the realignment of personnel. Congressional funding for the housing project is contingent upon the construction of a minimum of 226 units on the Burke Property.

PROJECT ALTERNATIVE DESCRIPTIONS

The Proposed Project is to develop housing on the Burke Property. There are two alternative project designs, a 281-unit design and a 226-unit design. The 281-unit design entails construction on about 54 acres of the 101-acre site, avoiding most areas of wetland and aquatic habitats. In response to input from the Fish and Wildlife Service and Corps of Engineers, to further reduce the impact on wetlands and associated endangered species, a Reduced (226-Unit) Housing Alternative has been designed and is fully considered in this document. This alternative would use about 42 acres of the site while avoiding construction in nearly all areas of vernal pools and other wetland and aquatic habitats.

For either alternative the housing would be a mix of 2 bedroom, 3 bedroom, and 4 bedroom units in duplex. The final site plan will also include provisions for recreation (tot lots, playgrounds, and

basketball courts) as well as a trail system. Site utilities will include underground water, sewer, storm sewer, electric power, street lighting, gas, telephone, and cable TV. Peaks from storm runoff will be accommodated by retention basins on site, or on adjacent Air Force property. Street access will be provided at two or three locations from the west, south, and eastern sides of the property.

ENVIRONMENTAL IMPACTS

The EIS for Realignment of Travis AFB and Record of Decision (ROD) concludes that there are no significant unmitigated impacts in resource/issue areas with the exception of Site Contamination, Biological Resources, and Cultural Resources. Impacts and where appropriate, mitigation measures, would apply for other resource areas associated with construction of housing on the Burke Property identified in the EIS and ROD, including dust control measures for short-term air quality impacts. Each of the three areas of primary concern for this EA are discussed below.

With regard to Site Contamination, no significant impacts related to soil and groundwater contamination are anticipated and no mitigation measures would be required. Site investigations indicate that soil or groundwater contamination is unlikely to be present on the Burke Property. Potential off-site sources of contamination are all located hydrologically downgradient or cross-gradient from the site; therefore, the potential for contamination associated with off-site sources of contamination is low. The same conclusions would apply to either the Proposed Project or the Reduced Housing Alternative.

With regard to Biological Resources (sections 3.3 and 4.3 of this document), either the 281-unit design or the 226-unit design would avoid impacts on most areas of wetlands and aquatic habitats. Impacts on non-wetland grassland and eucalyptus woodland habitats are considered insignificant. The 281-unit design would require the grading and/or filling of 2.81 acres of wetlands and aquatic habitats, for which a Nationwide Permit from the U.S. Army Corps of Engineers would be required. The 281-unit design would eliminate two locations where two individual plants of the endangered Contra Costa goldfields were found and one location potentially supporting the vernal pool fairy shrimp, a threatened species. These issues are being resolved in coordination with U.S. Fish and Wildlife Service (USFWS). The 226-unit design substantially reduces the impact on wetlands and aquatic habitats, to 1.18 acres. This alternative avoids the loss of any pools that may support the threatened vernal pool fairy shrimp and one of the two locations for the endangered Contra Costa goldfields; the other (non-wetland) location for Contra Costa goldfields would be eliminated.

For either alternative, remaining impacts that cannot be avoided would be mitigated on- or off-site, based on further discussion with the USFWS and U.S. Army Corps of Engineers, pursuant to the requirements of the Endangered Species Act and Clean Water Act. Other measures are identified in this EA to mitigate the short-term impacts of construction, as well as the long-term impacts associated with the occupancy of the housing development.

With regard to Cultural Resources (sections 3.4 and 4.4 of this document), ground disturbances associated with the proposed construction of family housing on the Burke Property would not have any significant impacts on cultural resources because no properties eligible for listing on the

National Register are present. No mitigation measures would be required. The same conclusions would apply to either the 281-unit design or the 226-unit design alternative.

Other issues have been considered as required under NEPA, with the following conclusions:

- Relevant to Environmental Justice, there would be no adverse effects on minority or low-income populations.
- There would be no unavoidable significant adverse environmental impacts.
- The project would irreversibly commit portions of the Burke Property to residential development while preserving as undeveloped open space other portions that support sensitive wetland and aquatic habitats.
- The project would enhance long-term productivity by reducing the inefficiencies associated with Air Force personnel having to live in surrounding communities rather than on the base.
- Cumulative and indirect impacts associated with the realignment action have been previously addressed through the EIS for Realignment of Travis AFB (USAF 1994a,b). With regard to the new issue areas considered in this EA, the project would have no cumulative impacts. The only indirect impacts are associated with on-site biological resources, and those are addressed in section 4.3 of this document.

PUBLIC PARTICIPATION

The housing project is part of the proposed action that was evaluated in the EIS for Realignment of Travis AFB (USAF 1994a), which included scoping and consideration of public and agency comments on the realignment action, as required by the National Environmental Policy Act. This draft Environmental Assessment will be circulated for public agency review and comment prior to the Air Force's decision on the project.

1 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 PURPOSE OF THE PROPOSED ACTION

The proposed action is to develop on-base family housing on land known as the Burke Property, on the north side of Travis Air Force Base (AFB). The purpose of the proposed action is to provide housing for Air Force personnel and their families that have been relocated from March AFB to Travis AFB as a result of actions taken by the Defense Base Closure and Realignment Commission.

The use of the Burke Property for this purpose was previously analyzed in the Environmental Impact Statement (EIS) for the Realignment of Travis AFB (USAF 1994a) and approved in the Air Force's Record of Decision on the realignment (USAF 1994b). The EIS and Record of Decision are available upon request from Travis AFB (60th AMW/EM at 707-424-3739). This Environmental Assessment (EA) is tiered from the EIS, consistent with Council on Environmental Quality (CEQ) regulations (40 CFR Sections 1502.20, 1502.21, and 1508.28), and focuses on the site-specific environmental issues (see Chapters 3 and 4 of this document) that could not be fully addressed at the time the EIS for Realignment of Travis AFB was prepared, namely site contamination, biological resources, and cultural resources. This EA is intended to inform the Air Force's decision on the design and construction of housing on the Burke Property.

Figures 1-1 and 1-2 show the location of the proposed action. Selection of the Burke Property for new family housing was based on its proximity to existing Travis AFB family housing, land use compatibility, access to utilities, availability for purchase, capability to meet anticipated housing needs, and aesthetics for housing. The Burke Property is contiguous with, and accessible through, existing family housing on Travis AFB. The Air Force purchased the 101-acre (41-hectare) Burke Property in March 1998 and has conducted planning and environmental studies on the site to identify constraints and opportunities for development that will make effective use of land and infrastructure while avoiding significant environmental impacts.

Site selection criteria focus on configuring the housing area construction "footprint" to minimize the impact on the following on-site resources:

- Freshwater ponds and associated wetlands created by previous excavations on the site.
- Vernal pools that provide habitat for migratory birds, rare plants, and invertebrates.
- Other wetland habitats the filling of which would require a Clean Water Act section 404 permit.
- Areas known or likely to support threatened and endangered species.

The proposed action would provide housing units consisting of 2-, 3-, and 4-bedroom units in duplexes for junior enlisted military members and their families. The construction of housing on the Burke Property would, in combination with other on-base housing projects, help meet the

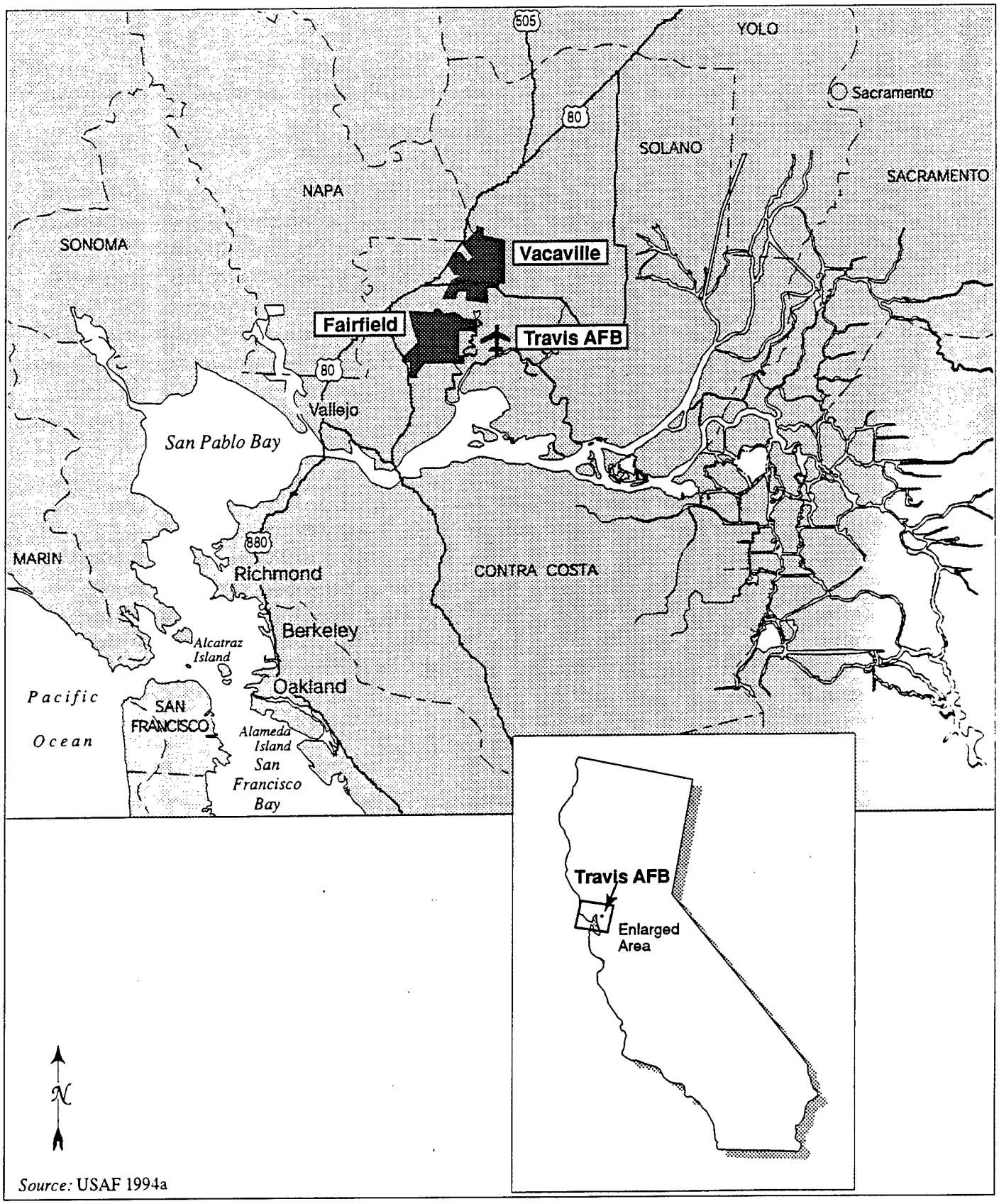


Figure 1-1. Location of Travis AFB

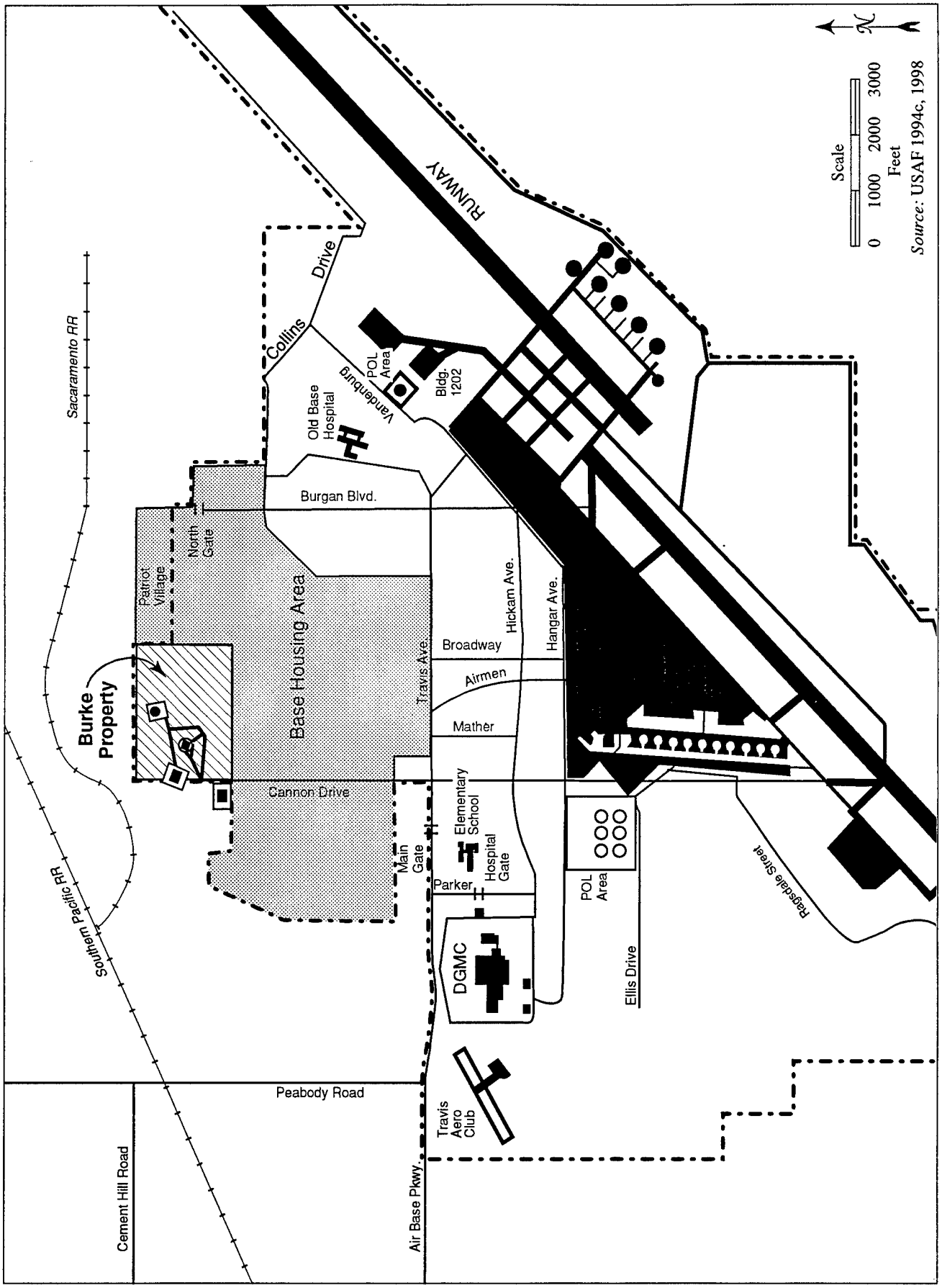


Figure 1-2. Location of Burke Property in Relation to Other Facilities on Travis AFB

goals that have been established and funded by Congress in support of the Base Realignment and Closure (BRAC) process, to provide new housing for the relocated personnel at Travis AFB.

1.2 NEED FOR THE PROPOSED ACTION

Acting under the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), the 1993 Defense Base Closure and Realignment Commission relocated a KC-10 aerial tanker squadron from March AFB to Travis AFB. The realignment action included the transfer of 19 KC-10 aircraft and 1,255 full-time military, part-time drill, and civilian manpower personnel to Travis AFB, necessitating the construction of new facilities, including family housing.

New housing must be constructed because Travis AFB does not have adequate housing for junior enlisted military members and their families. The 1997 Housing Market Analysis for Travis AFB (Niehaus 1998) found a deficit of 152 units of military family housing at Travis AFB as of 1997. For FY 2002, the projected deficit without the construction of additional housing would rise to 473 units of military family housing. This deficit consists of long-standing deficiencies combined with the additional requirements associated with relocation of personnel from other installations as part of ongoing base realignment and closure actions. Failure to construct new on-base housing makes it necessary for Air Force families to live off-base, where they experience greater travel distances, housing costs that are generally in excess of the housing allowance provided for junior enlisted personnel, and the uncertain availability of suitable housing.

The Final EIS for Realignment of Travis AFB and Record of Decision (ROD) (USAF 1994a,b) were prepared in accordance with the National Environmental Policy Act (NEPA) and the provisions of the Defense Base Closure and Realignment Act of 1990. The Final EIS assumed that 384 units would be constructed on the Burke Property to alleviate the increased demand for housing associated with the BRAC relocation. This number of new units does not eliminate the longstanding deficit cited above. The Final EIS assessed the potential environmental impacts of the realignment action, including 384 units, on the mission and operation of the base, air quality, geological resources, water resources, biological resources, cultural resources, the base environmental programs, noise, transportation, and socioeconomic concerns (USAF 1994a). No significant environmental impacts were identified for the construction of 384 new housing units and a Record of Decision was filed with the EPA in 1994 completing the NEPA process at that time (USAF 1994b).

The scope for the Burke property was reduced to 281 units by siting 80 units in two other projects on Travis AFB. One of the projects is a 52-unit development that has since been constructed. The other is a 28-unit project that is still in the design process and which may or may not be practicable because of high infrastructure costs. The 281-unit project, in combination with these other two projects, fully meets the BRAC housing requirement.

To meet the housing need and comply with the rules established in the *Air Force Family Housing Guide*, at least 75 percent of the BRAC-required 361 units must be provided. Failure to meet the 75 percent goal would necessitate going back to Congress to reprogram the project, which could result in a loss of funds. Given that 52 units have been constructed, the minimum need for new

housing on the Burke property has been determined to be 226 units. This would allow the Air Force to meet the minimum objective for new housing.

1.3 SCOPING PROCESS AND PUBLIC PARTICIPATION

During the preparation of the EIS for Realignment of Travis AFB, a public scoping meeting was held to obtain input from the general public and agency personnel to assist the Air Force in determining the nature, extent, and scope of significant issues related to the realignment action. Specific areas of concern that were identified included the following (USAF 1994a):

- Concerns generic to all military base closures, realignments, and reuse, including the need to conform with Clean Air Act requirements; to assess impacts on other media such as hazardous waste, water quality, and biological resources; and to coordinate with other federal and state agencies.
- Aircraft noise and potential conflicts with the general land use plans of Suisun City and Fairfield.
- Effects on federally recognized threatened, endangered, and sensitive species.
- Effects on ground and surface water resources, cultural resources, geological resources, flight safety, land uses, and socioeconomic resources.

The EIS for Realignment of Travis AFB addressed the above concerns and evaluated use of the Burke Property for housing in support of the realignment action. Public comments on that action were considered in the Final EIS (USAF 1994a). This Environmental Assessment (EA) is tiered from the EIS, consistent with CEQ regulations (40 CFR Sections 1502.20, 1502.21, and 1508.28), and focuses on the site-specific environmental issues that could not be fully addressed at the time the EIS for Realignment of Travis AFB was prepared. These issues include soil and water contamination, biological resources, and cultural resources.

During the preparation of this EA, representatives of the Air Force have consulted with the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Office of Historic Preservation regarding potential site-specific issues. This draft EA will be circulated for public agency review and comment prior to the Air Force's decision on the project.

1.4 PERMITS AND OTHER REGULATORY COMPLIANCE REQUIRED FOR THE PROJECT

Several permits and other types of regulatory compliance would be required to implement either the 281-unit project or the 226-unit housing alternative. Permits include the following:

- A Nationwide Permit from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act for the placement of fill in jurisdictional Waters of the United States, including wetlands. A Water Quality Certification from the Regional Water Quality Control Board is also required by Section 401 of the Clean Water Act.

- Under Section 402 of the Clean Water Act, a Stormwater Pollution Prevention Plan (SWPPP) would be required as part of a National Pollutant Discharge Elimination System (NPDES) permit issued for the project by the Regional Water Quality Control Board.

Construction of the housing project on the Burke Property is also contingent upon the resolution of endangered species concerns through consultation with the U.S. Fish and Wildlife Service; on the completion of Section 106 Consultation for Cultural Resources; and the Air Force's (SAF/MI) Finding of No Practicable Alternative (FONPA) for any unavoidable losses of wetland habitat.

2 PROPOSED ACTION AND ALTERNATIVES

2.1 ALTERNATIVES DESIGN PROCESS

2.1.1 SITE DESCRIPTION AND ENVIRONMENTAL CONSIDERATIONS

The Burke Property (Figure 2-1) consists of 101 acres (41 hectares) of hilly land, 100 to 160 feet (30 to 48 m) above mean sea level (MSL), that includes several small drainage swales, five permanent ponds that have established in old excavations, and 39 small seasonally wet (vernal) pools, consisting of natural or manmade depressions that are subject to seasonal ponding or inundation. Vegetation on the site is primarily grassland with stands of eucalyptus trees originally planted as windbreaks, and several stands of willows and cottonwoods associated with drainages and ponds. Within the property boundaries but not included in the 101 acres (41 hectares) is a city water treatment plant, several storage tanks, and a sedimentation pond (located on the ridge crest). The site was formerly used for quarrying and the existing ponds are the remains of the quarry operation. The site was also used for grazing, but was rarely plowed or cultivated.

To address environmental issue areas that were not covered in the EIS for Realignment of Travis AFB , the Air Force has conducted site-specific environmental studies as a part of the planning process. These studies include investigating the potential for site contamination; biological resource studies focused on vernal pools and other wetlands and the potential occurrence of endangered species; and a cultural resource survey and analysis. No constraints to site development have been identified with respect to site contamination or cultural resources (see sections 3.2 and 3.4 of this document, respectively). Potential environmental or regulatory constraints are associated with the vernal pools and other wetland habitats on the site (Figure 2-1), which may support threatened or endangered species. As information on the status of these resources has been developed, the design of the housing project has been modified to avoid potential impacts.

2.1.2 PROJECT DESIGN FEATURES

Under either the 281-unit or 226-unit alternative designs, residential development, including houses, roadways, and utilities, would occur primarily on the upland (non-wetland) areas of the site, leaving half or more of the site as undeveloped open space. The final site plan will also include provisions for recreation (tot lots, playgrounds, and basketball courts) as well as a trail system. These amenities may be a part of this project or may be constructed at a later date, depending on availability of funds. Site utilities will include underground water, sewer, storm sewer, electric power, street lighting, gas, telephone, and cable TV. Peaks from storm run-off will be accommodated by retention basins on site, or on adjacent Air Force property. Street access will be required at two or three locations from the west, south, and eastern sides of the property. Streets will be 40 feet (12 m) wide to accommodate on-street parking. Normal site grading will be required. Site design, including grading, will be sensitive to protecting the hydrology of any vernal pools or wetlands that are identified for preservation or mitigation in consultation with the various regulatory agencies involved.

2.1.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

As noted in Chapter 1, the initial EIS for Realignment of Travis AFB concept for Housing on the Burke Property was revised downward from 384 units to 281 units. This reduction enabled the housing development to be sited predominantly on the upland portions of the property, enabling most of the areas of wetlands and open water to be avoided by the development footprint.

2.2 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

A housing design that provides 281 units was developed, and is shown in Figure 2-2. The design avoids most but not all areas of wetlands and open water habitat. In response to concerns from the U.S. Fish and Wildlife Service and Corps of Engineers over potential endangered species and wetlands impacts, a reduced housing alternative was subsequently developed, to provide a minimally adequate number of housing units, while reducing site development impacts. The design of this alternative has been carefully configured to avoid additional areas of vernal pool and other wetland and aquatic habitats that have been mapped in biological surveys conducted during 1998. Figure 2-3 shows this 226-unit Housing Alternative in relation to biological resources of concern (discussed in more detail in section 3.3).

These two alternatives were carried forward for detailed analysis. Table 2-1 provides a summary comparison of the impacts of these two housing alternatives based upon the analysis contained in Chapter 4 of this document. The two alternatives differ with regard to their biological impacts, with the 226-unit alternative impacting less wetland acreage and having a lower potential impact on threatened and endangered species. The impacts of both alternatives were found to be mitigable to insignificant levels as described in Chapter 4.

2.3 NO-ACTION ALTERNATIVE

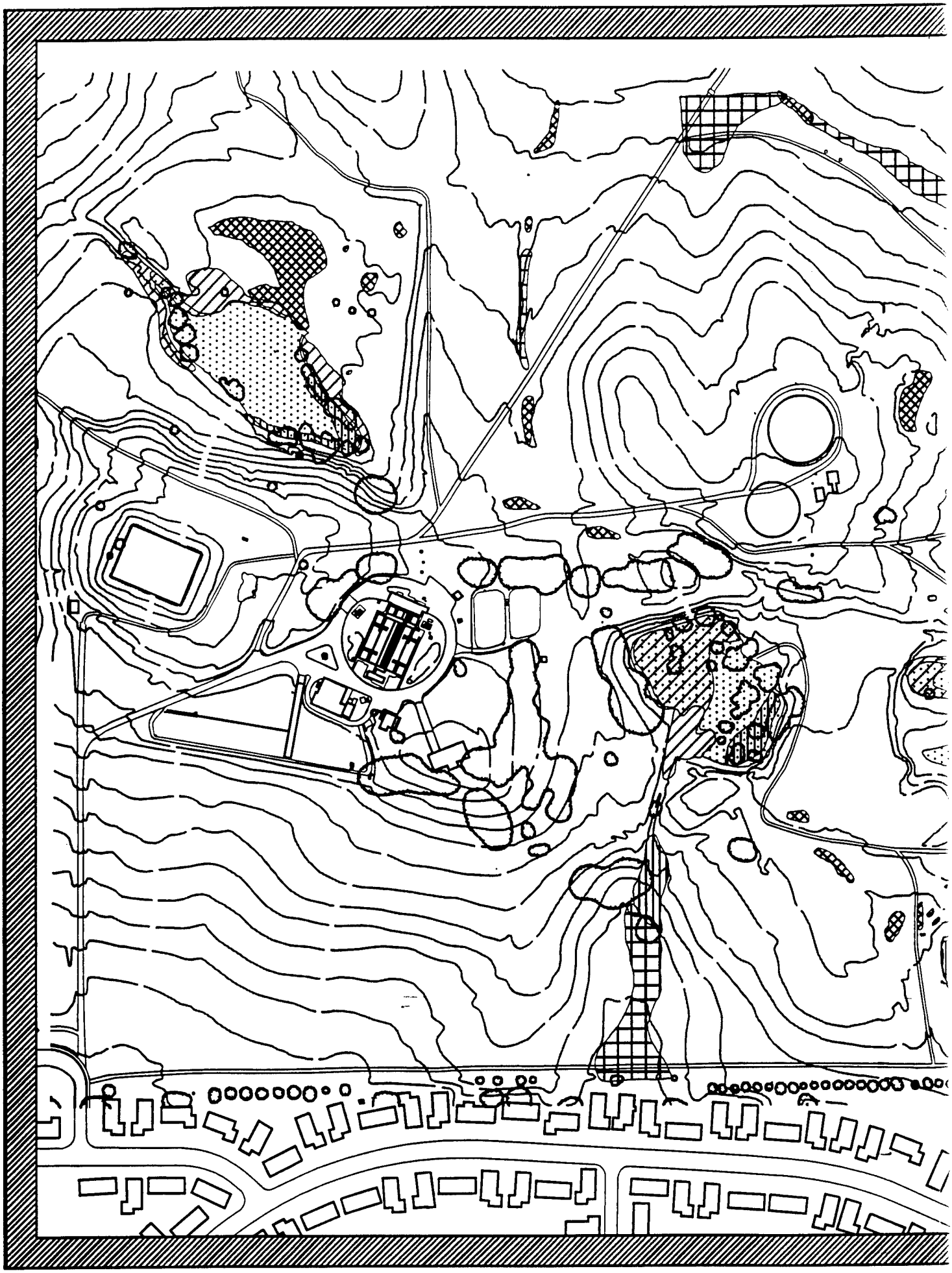
The No-Action Alternative would entail a decision not to construct housing on the Burke Property. As discussed in Chapter 1, failure to provide new on-base family housing that was approved as part of the BRAC realignment actions would result in the continuation of a substantial housing deficit for military families. Currently, personnel that have relocated to Travis AFB reside off-base in surrounding communities, where housing is in short supply and the cost of rent typically exceeds the housing allowances of junior enlisted personnel. Construction of MFH on the Burke Property would enable Air Force personnel and their families to live in closer proximity to their jobs and the schools their children attend, while avoiding the high costs, commuting, and uncertain availability and suitability of off-base housing. On-base housing also provides a supportive community for Air Force families when Air Force personnel are called to duty overseas. The No-Action Alternative's failure to construct MFH would be inconsistent with the BRAC realignment actions approved by Congress, and would result in a diminished quality of life for junior enlisted personnel and their families.

The Air Force has no plans for the Burke Property other than as a site for family housing. If housing is not constructed, in the short term the site would remain in its present condition as

undeveloped open space. Long-term potential uses of the site, other than housing, are unknown, but would be subject to future review under NEPA. It should be noted that uses of the site other than for housing were not contemplated in the EIS for Realignment of Travis AFB (USAF 1994a), and would, accordingly, require full review in all resource-issue areas under NEPA.

Table 2-1. Summary Comparison of Potential Impacts Associated with Alternative Burke Property Housing Designs

Issue Area	*281-Unit Design*	*226-Unit Design*	*Comments*
Soil and Groundwater	No impact	No impact	No soil or groundwater contamination identified on site.
Biological Resources			
Vegetation and Wildlife Habitat	54 acres	44 acres	Total habitat on property is 101 acres.
Wetlands/Waters of the U.S.	2.81 acres	1.18 acres	A total of 14.23 acres of wetlands/Waters of the U.S. identified on site.
Threatened/Endangered Species			
• Contra Costa Goldfields	2 locations	2 locations	A total of 2 locations for this endangered species identified on site (1 plant at each location)
• Vernal Pool Fairy Shrimp	1 potential location	0 potential locations	5 locations identified on site as potential habitat for this threatened species
Cultural Resources	No impact	No impact	No eligible cultural resources identified from the site during surveys or background research.



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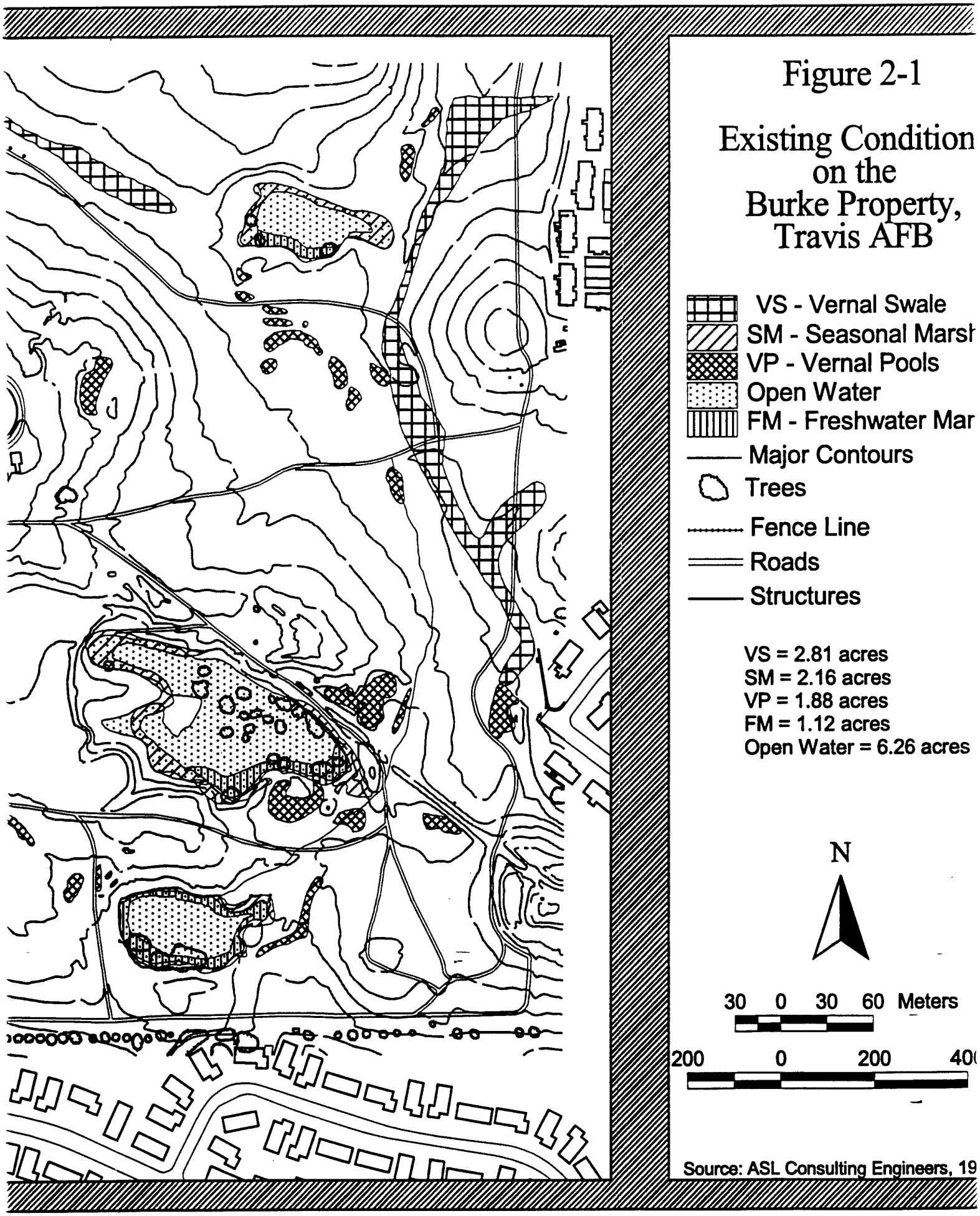
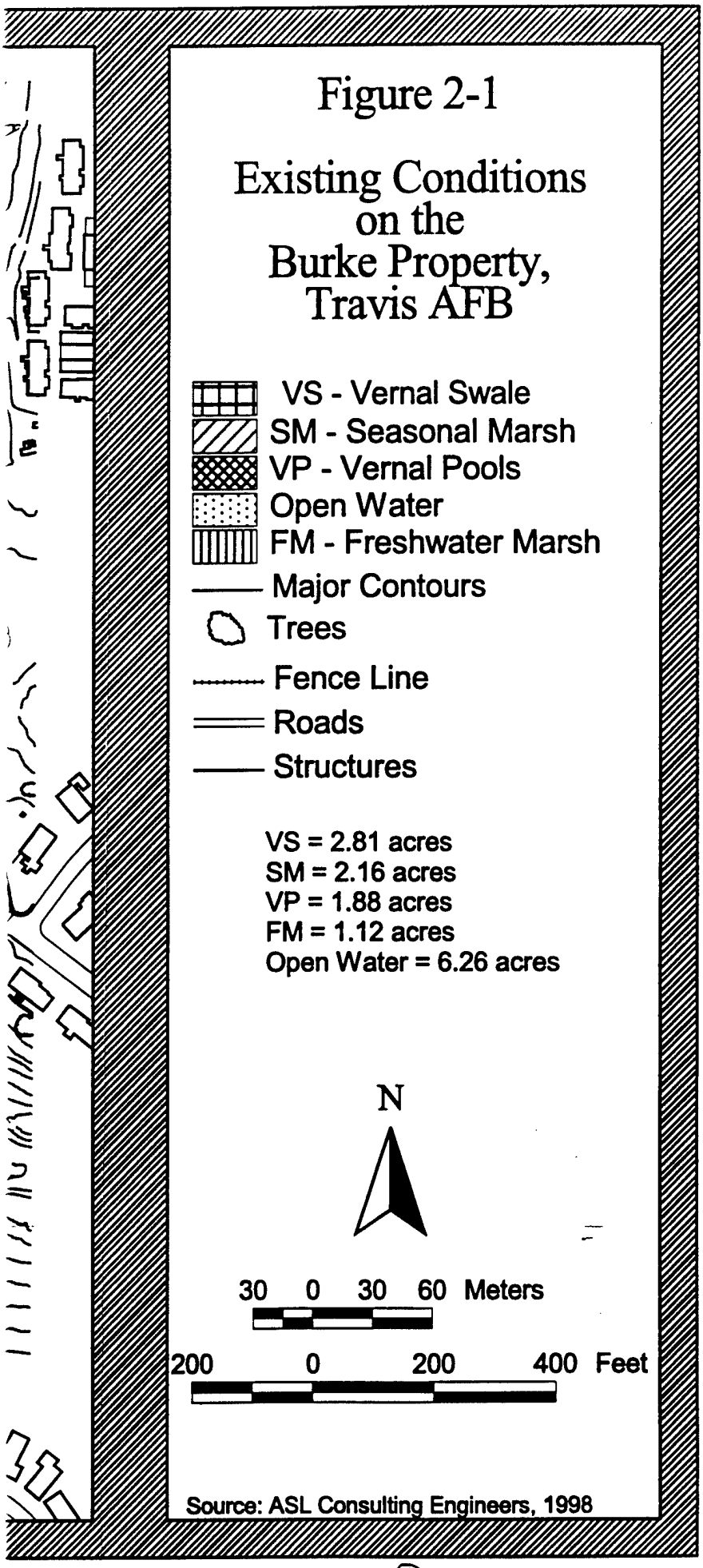
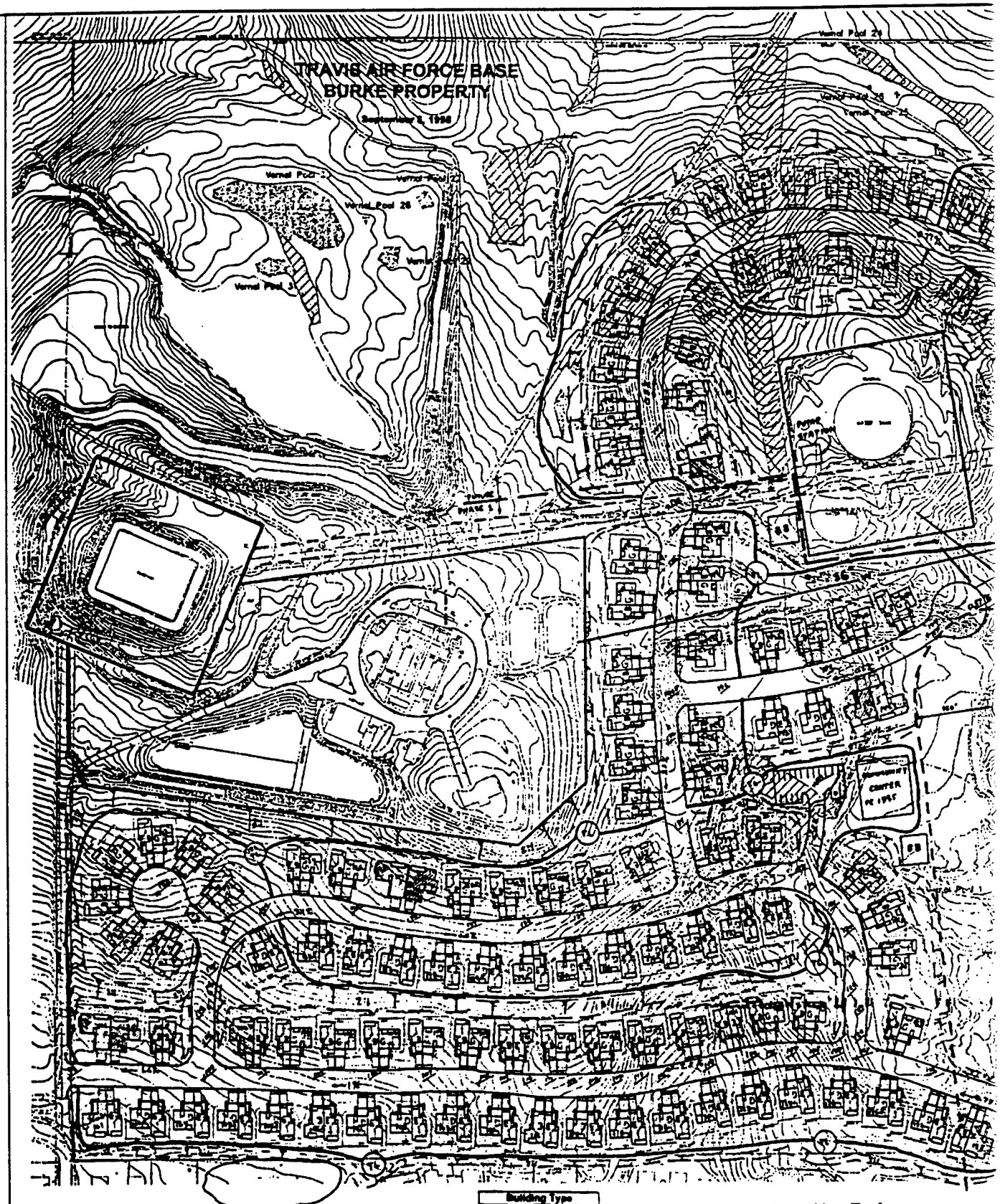


Figure 2-1
Existing Condition on the Burke Property, Travis AFB
VS - Vernal Swale
SM - Seasonal Marsh
VP - Vernal Pools
Open Water
FM - Freshwater Mar
Major Contours
Trees
Fence Line
Roads
Structures
VS = 2.81 acres
SM = 2.16 acres
VP = 1.88 acres
FM = 1.12 acres
Open Water = 6.26 acres
N
30 0 30 60 Meters
200 0 200 400
Source: ASL Consulting Engineers, 19

Figure 2-1

Existing Conditions on the Burke Property, Travis AFB





	Building Type					
	BG	BA	FD	BB	BE	Total Units
Phase I	160	12	8	8	12	200
Future Phase	58	10	2	12	10	92
Total Units	218	22	10	20	22	292

ASL Consulting Engineers
225 West Hospitality Lane
Suite 206
San Bernardino, California 92408

1

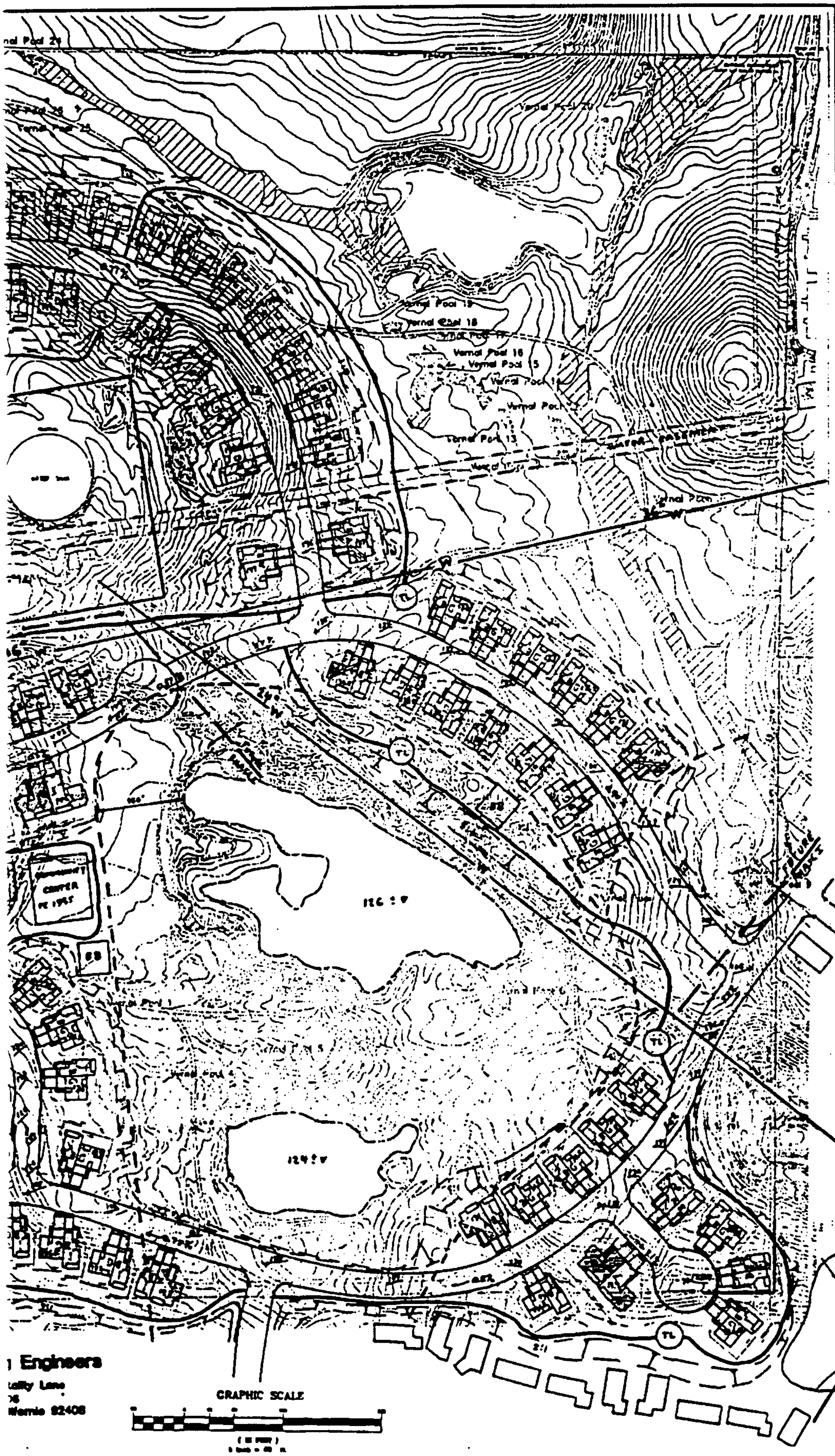


Figure 2-2

**281-Unit Housing Desi
for the Burke Propert
Travis AFB**

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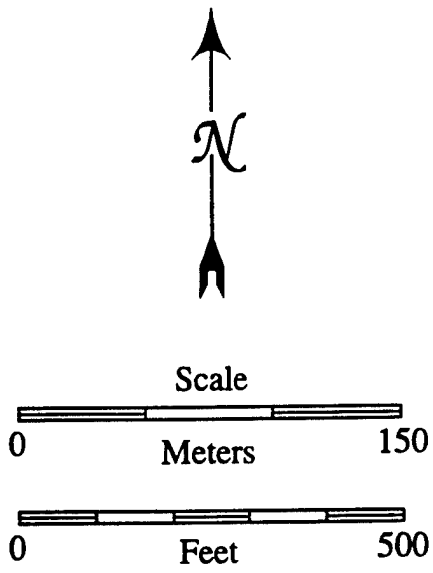
0 Feet 5(

Source: ASL 1998

Figure 2-2

281-Unit Housing Design for the Burke Property, Travis AFB



Source: ASL 1998

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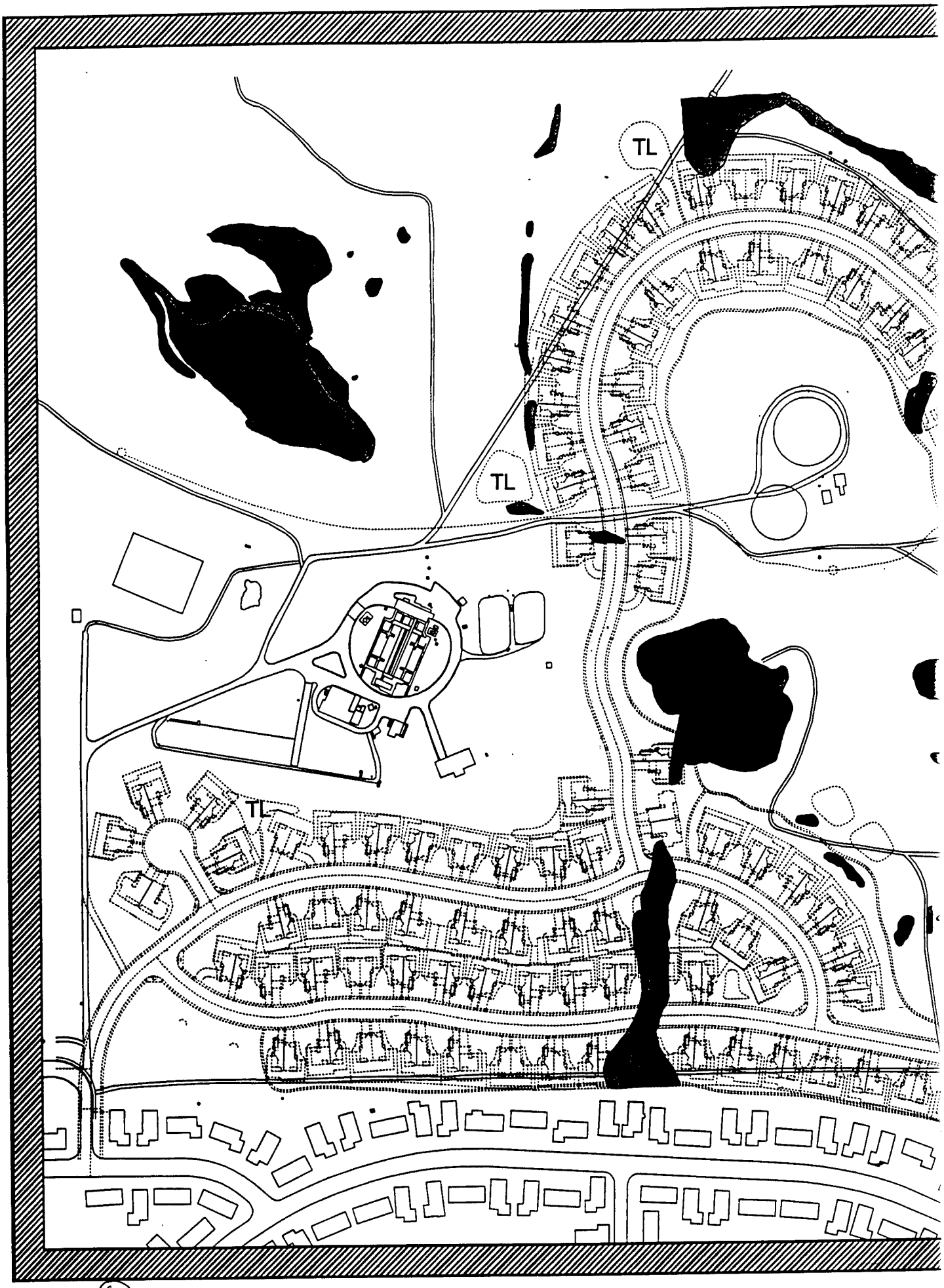
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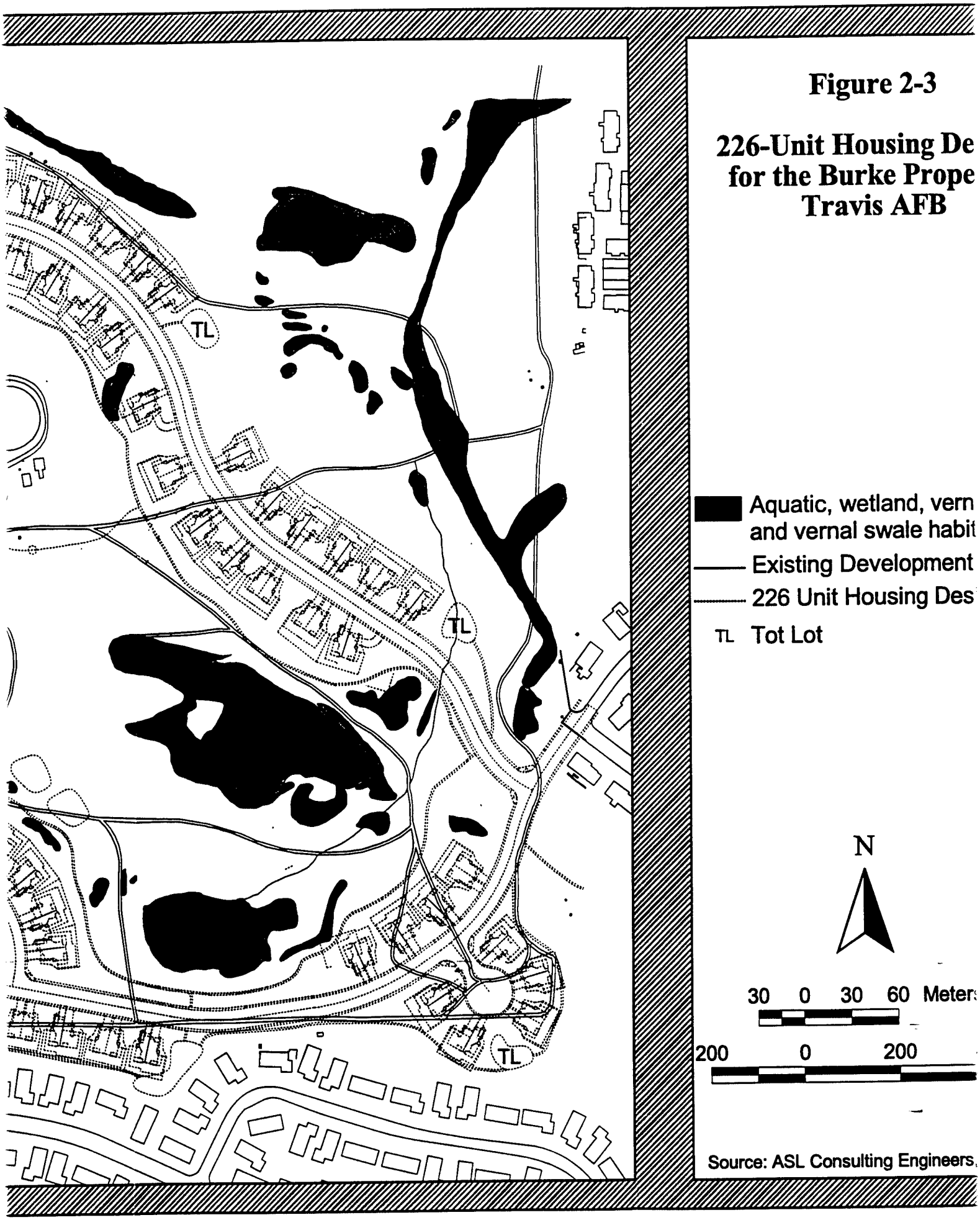


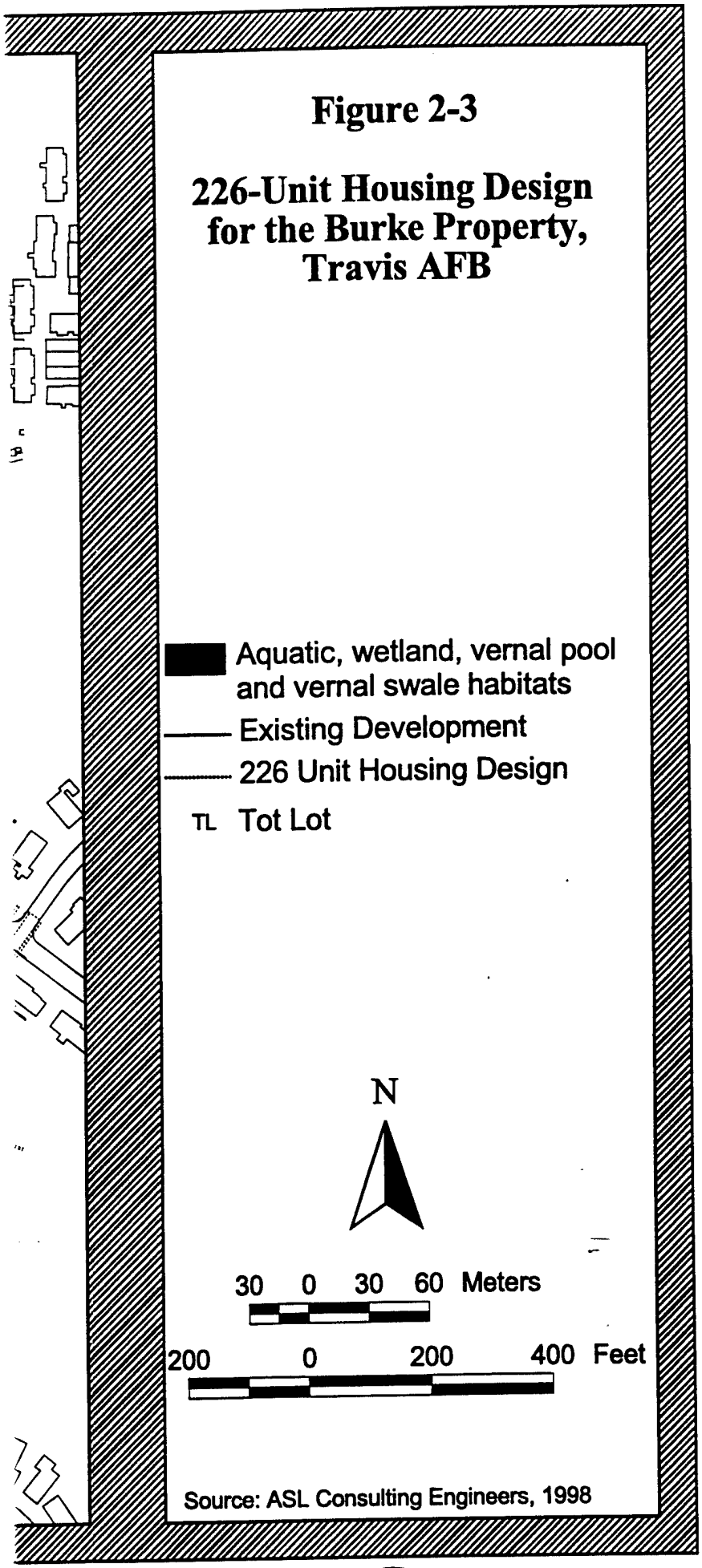
Figure 2-3

226-Unit Housing De for the Burke Prope Travis AFB

(2)

Figure 2-3

226-Unit Housing Design for the Burke Property, Travis AFB



Source: ASL Consulting Engineers, 1998

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter presents relevant resource components of the existing environment (baseline conditions) for Soil and Groundwater (section 3.2), Biological Resources (section 3.3), and Cultural Resources (section 3.4). For resource and issue areas other than those discussed below, and for general background on the environment of Travis AFB, the reader is referred to the EIS for Realignment of Travis AFB (USAF 1994a), the conclusions of which are summarized in Appendix A.

3.2 SOIL AND GROUNDWATER

An environmental baseline survey (EBS) (USAF 1994c) was completed for the Burke Property prior to acquisition by the Air Force, to determine if the site has the potential to have environmental contamination. Environmental contamination means the presence or likely presence of any hazardous substances on the property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the property or into the ground, groundwater, or surface water of the property. The EBS documents the nature, magnitude, and extent of any environmental contamination and assesses the health and safety risks related to the property transaction (USAF 1994c). Except where otherwise noted, the following environmental setting is derived primarily from the EBS.

3.2.1 SITE DESCRIPTION AND HISTORY

The Burke property currently and historically has consisted primarily of unimproved grazing land. The site currently surrounds an 8.3-acre (3.4-hectare) City of Vallejo water treatment plant and a 4.9-acre (2-hectare) Air Force water storage tank compound. Buried water pipelines associated with the water treatment plant traverse the property. A homestead was once present on the property, but the exact location is unclear. An area of earth fill and concrete rubble is present in the east-central portion of the property (USAF 1994c). In addition, five ponds are present in remnants of sandstone borrow pits excavated on the property in the 1930s (USAF 1994c). These ponds have contained surface water throughout 1998 (personal communication, Robert Holmes 1998).

Gentle slopes and small hills characterize the topography of the Burke property. Steep slopes are locally present in the northwest portion of the site and in the vicinity of the borrow pits immediately south of the water tanks. A seep was observed in the south central portion of the site. It is probably fed by seepage from ponded water in a borrow pit upslope. Groundwater is present beneath the site at depths ranging from 8 to 40 feet (2.4 to 12 m) below ground surface. The regional groundwater flow direction is to the south-southeast (USAF 1994c).

3.2.2 POTENTIAL ON-SITE CONTAMINATION

No visible signs of soil contamination or other indications of hazardous materials or waste disposal were noted on the property. The known uses of the property would not have likely contributed to any soil or groundwater contamination (USAF 1994c).

Approximately 1,120 cubic yards (855 cubic meters) of earth material and 23 loads of concrete present on the property were derived during demolition of concrete pads and a wash water pond used prior to an upgrade of the water treatment plant. The concrete pads were used for foundations for steel tanks at the treatment plant. The only known use of the tanks and wash pond concrete was for holding drinking water or drinking water structures. Chemical analysis for heavy metals, regulated under the Resource Conservation and Recovery Act (RCRA), was conducted on the wash water pond concrete and soil material prior to disposal in the fill area. No hazardous concentrations of metals were detected. Analyses did not include other potential contaminants (e.g., solvents or petroleum products) due to the lack of reasonable risk associated with prior use of the concrete and earth material (USAF 1994c).

Other solid waste present on the subject property includes fragments of steel, aggregate rock, asphalt, concrete, terra cotta piping, and a few scattered tires. This solid waste is minimal and does not indicate past disposal of any hazardous materials or waste. No polychlorinated biphenyl (PCB)-containing electrical transformers were observed on the property. No underground or aboveground fuel storage tanks or pipelines are present on the property (USAF 1994c).

Several contaminated properties are located in the regional vicinity of the site, but it is not anticipated that any of these sites have, or will, adversely impact the subject property (USAF 1994c). Properties with soil and/or groundwater contamination in the vicinity of the Burke property are illustrated on Figure 3.1-1.

Leaking underground fuel tank (LUFT) sites in the vicinity of the site include Cement Hill Ready Mix (site 1), Northwest Pipe (site 3), G&M Towing (site 4), the Area F Tank Farm (site 5), and the North and South Gas Stations (site 6). The closest of these LUFT sites is G&M Towing, which is located approximately 0.5 mile (0.8 km) south (hydrologically downgradient) of the Burke property. These properties had varying degrees of soil and groundwater contamination and are in various stages of assessment or remediation (USAF 1994c).

Travis AFB is listed on the federal National Priorities List (NPL), which is compiled by the EPA to rank properties with the highest priority for cleanup. Sources of contamination on Travis AFB include past hazardous waste disposal and spill sites being investigated and remediated under the Installation Restoration Program (IRP). The IRP directs the identification, investigation, and remediation of waste sites, including cleanups that follow the guidelines of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and RCRA. Based on the EBS (USAF 1994c), the three nearest IRP sites to the Burke property include the former fire training area (FTA-1, site 6) and two former solid waste landfills (LF-1 and LF-2, sites 7 and 8). The fire training area, located over 0.5 mile (0.8 km) south (hydrologically downgradient) of the site, is the closest IRP site (USAF 1994c, 1998). Based on a map entitled "IR Program Sites on Travis AFB"

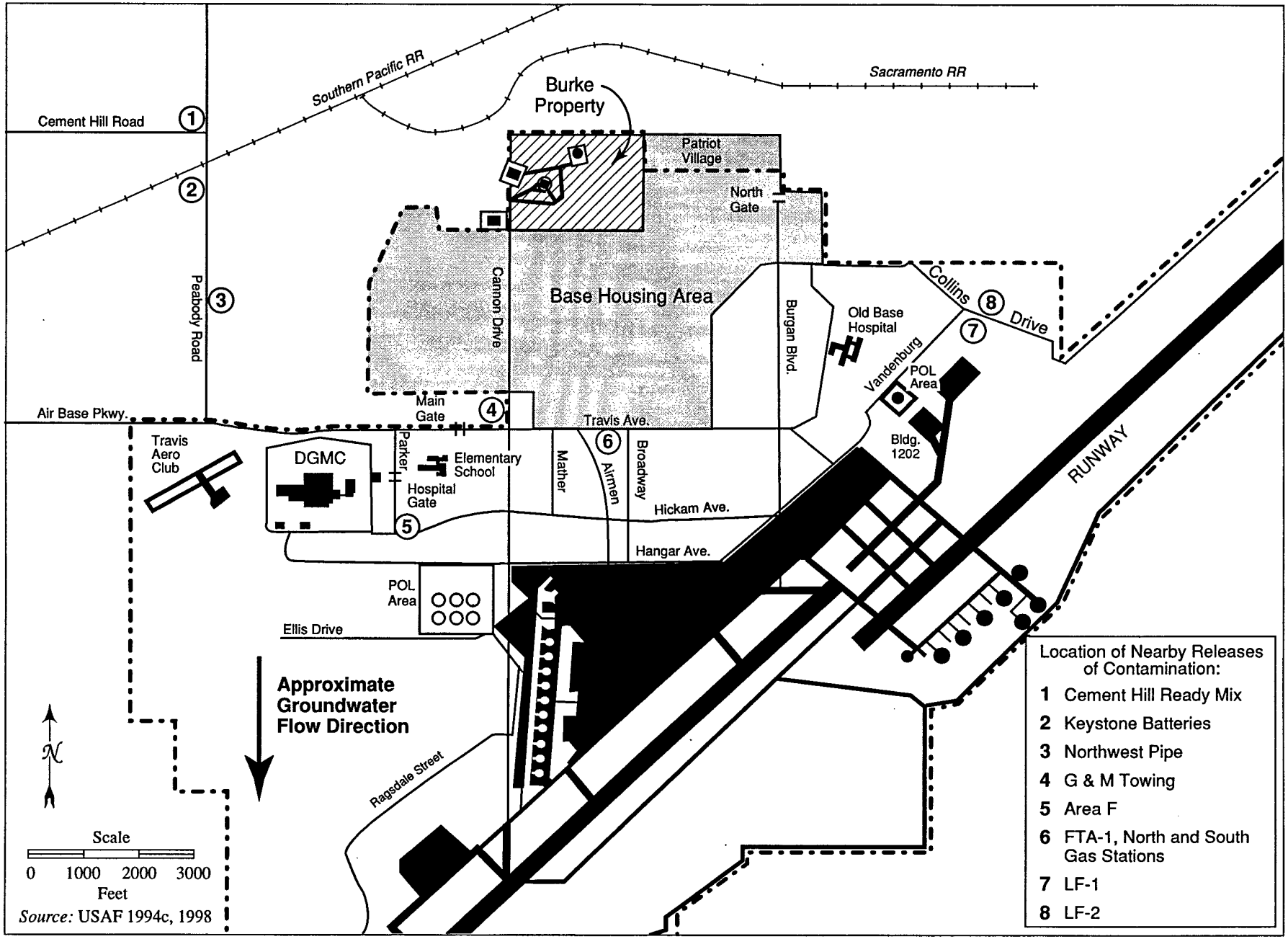


Figure 3-1. Properties with Soil and/or Groundwater Contamination in the Vicinity of the Burke Property

(USAF 1998), this site is responsible for soil contamination in the area. This map also lists the North and South Gas Stations LUFT sites, located adjacent to the fire training area (site 6), as IRP sites and shows a contaminated groundwater plume extending southerly from this area.

None of these properties are anticipated to adversely impact the Burke property due to the location of these sites hydrologically downgradient or cross-gradient from the subject site.

3.3 BIOLOGICAL RESOURCES

3.3.1 INTRODUCTION

The description and analysis of biological resources on the Burke Property is based on a variety of sources, including several field surveys conducted during 1998 and early 1999. These surveys are as follows:

- On May 6-8, 1998, a survey was conducted to identify and map the occurrence of vernal pools and other habitats on the site, and to assess the potential occurrence of rare, threatened, and endangered species. Plant species associated with vernal pools were systematically recorded, and notes were made on the occurrence of plants and wildlife of potential concern (Earth Tech 1998a).

- On September 8 and 16, 1998, vernal pools and other wetland and aquatic habitats potentially subject to regulation under Section 404 of the Clean Water Act (CWA) were systematically delineated in the field using the accepted federal methodology (USACE 1987), and mapped using a global positioning system. Concurrently, the suitability of habitats on the site for the threatened giant garter snake, and the possibility of nesting by golden eagles, were assessed (JSA and Earth Tech 1998a). A field verification of the wetlands on the Burke Property by the Army Corps of Engineers is scheduled for early February, 1999.

- On September 18, 1998, "dry season" samples were collected from vernal pools and analyzed according to U.S. Fish and Wildlife Service guidelines (USFWS 1996) to determine the potential occurrence of rare, threatened, and endangered invertebrates in these pools (JSA and Earth Tech 1998b).

- During the winter of 1998-99, "wet season" sampling of vernal pools is being conducted to confirm the presence/absence of protected species of invertebrates. In addition, a winter survey is being conducted to further assess the potential for occurrence of the California tiger salamander, a federal candidate for listing as threatened or endangered.

- Data from the above surveys have been supplemented by site reconnaissance conducted by Navy and Air Force personnel and contractors during the preparation of this EA.

The following sections describe general vegetation and wildlife habitat features of the site; the occurrence of wetlands and other Section 404 CWA jurisdictional Waters of the U.S.; and the occurrence of rare, threatened, and endangered species.

3.3.2 VEGETATION AND WILDLIFE HABITAT

The Burke Property was used as a sandstone quarry until 25 to 30 years ago and is currently used for grazing. Figure 3-2 shows the distribution of habitats on the site. The most extensive habitat on the project property is non-native grassland, which tends to be dominated by non-native species but is frequently interspersed with native grasses and herbs. Weedy, non-native species, including barleys (*Hordeum* spp.), bromes (*Bromus* spp.), medusa head grass (*Taeniatherum caput-madusae*), and yellow star thistle (*Centaurea solstitalis*) are abundant. Native plants, such as turkey mullein (*Eremocarpus setigerus*), spiny cocklebur (*Xanthium spinosum*) butter-and-eggs (*Tryphisaria eriantha* ssp. *eriantha*), valley castles (*Catilleja attenuata*), blue dicks (*Dichelostemma capitatum* ssp. *capitatum*), blue-eyed grass (*Sisyrinchium bellum*), harvest brodiaea (*Brodiaea elegans* ssp. *elegans*), and crown brodiaea (*B. coronaria*), are also occasionally present.

Seasonal and perennial wetland habitats have developed within borrow areas and excavations resulting from previous quarrying activities. These wetland habitats are discussed in more detail in section 3.3.1 below. At the top of a central hill in the center of the project site are two large water tanks. These water tanks are flushed periodically into some of the wetlands on the east side of the project site (see section 3.3.1). The hill slopes are flanked with five stock ponds, which occupy the former borrow pits of the quarrying activities, and support willows (*Salix* sp.) and Fremont's cottonwoods (*Populus fremontii*). The south side of the hill supports a stand of eucalyptus trees (*Eucalyptus globulus*). One of these eucalyptus trees bears a large raptor nest. West of the eucalyptus grove is a potable water treatment facility. In addition to eucalyptus, other planted trees on the site include plum (*Prunus domesticus*), apricot (*Prunus armenianus*), and velvet ash (*Fraximus velutina*).

The grassland and wooded areas of the site provide habitat similar to what exists elsewhere on Travis AFB and in surrounding undeveloped areas (USAF 1994a). These habitats support insect and small mammal populations and thus provide foraging habitat for larger predators. Common mammals found in the area include California ground squirrel (*Citellus beecheyi*), Suisun shrew (*Sorex sinuosus*), valley pocket gopher (*Thomomys bottae*), house mouse (*Mus musculus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and coyote (*Canis latrans*). Reptiles and amphibians known to inhabit Travis AFB and likely to occur on the Burke Property include western toad (*Bufo boreas*), bullfrog (*Rana catesbeiana*), common garter snake (*Thamnophis sirtalis*), California horned lizard (*Phrynosoma coronatum*), and western skink (*Eumeces skiltonianus*). Noteworthy observations of wildlife on the site include six raptor species: American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), great horned owl (*Bubo virginianus*), northern harrier (*Circus cyaneus*), and golden eagle (*Aquila chrysaetos*) (Earth Tech 1998a).

3.3.3 WETLAND AND AQUATIC HABITATS

Wetlands and other "Waters of the U.S." are protected under Section 404 of the Clean Water Act, which requires a permit from the Corps of Engineers for the placement of fill in these habitats. Four types of wetland habitats, totaling 7.97 acres (3.22 hectares), and 6.26 acres (2.53 hectares) of open water (also a Water of the U.S.) habitat have been identified and mapped within the project

site, as shown on Figure 3-3. These habitats are described below. Acreages of wetland and open water habitats are provided in Table 3-1. Appendix B provides additional detail on these areas.

3.3.3.1 *Freshwater Marsh*

Freshwater marsh occurs within former rock quarry holes in persistently flooded areas and is dominated by bulrushes (*Scirpus* spp.), cattails (*Typha latifolia*), sword plant (*Echinodorus berteroi*), umbrella plant (*Cyperus eragrostis*), and duckweed (*Lemna minor*), with an overstory of willow and Fremont's cottonwood. Clover (*Trifolium* sp.) was also present but was not identifiable because of an absence of flowers.

Table 3-1. Acreage of Wetlands and Other Waters of the United States on the Burke Property

	SIZE	
Habitat Type	*Acres*	*Hectares*
Wetlands		
Freshwater marsh	1.12	0.45
Seasonal marsh	2.16	0.87
Vernal swale	2.81	1.14
Vernal pool	1.88	0.76
Total wetland acreage	**7.97**	**3.22**
Open water	6.26	2.53
Total	**14.23**	**5.76**

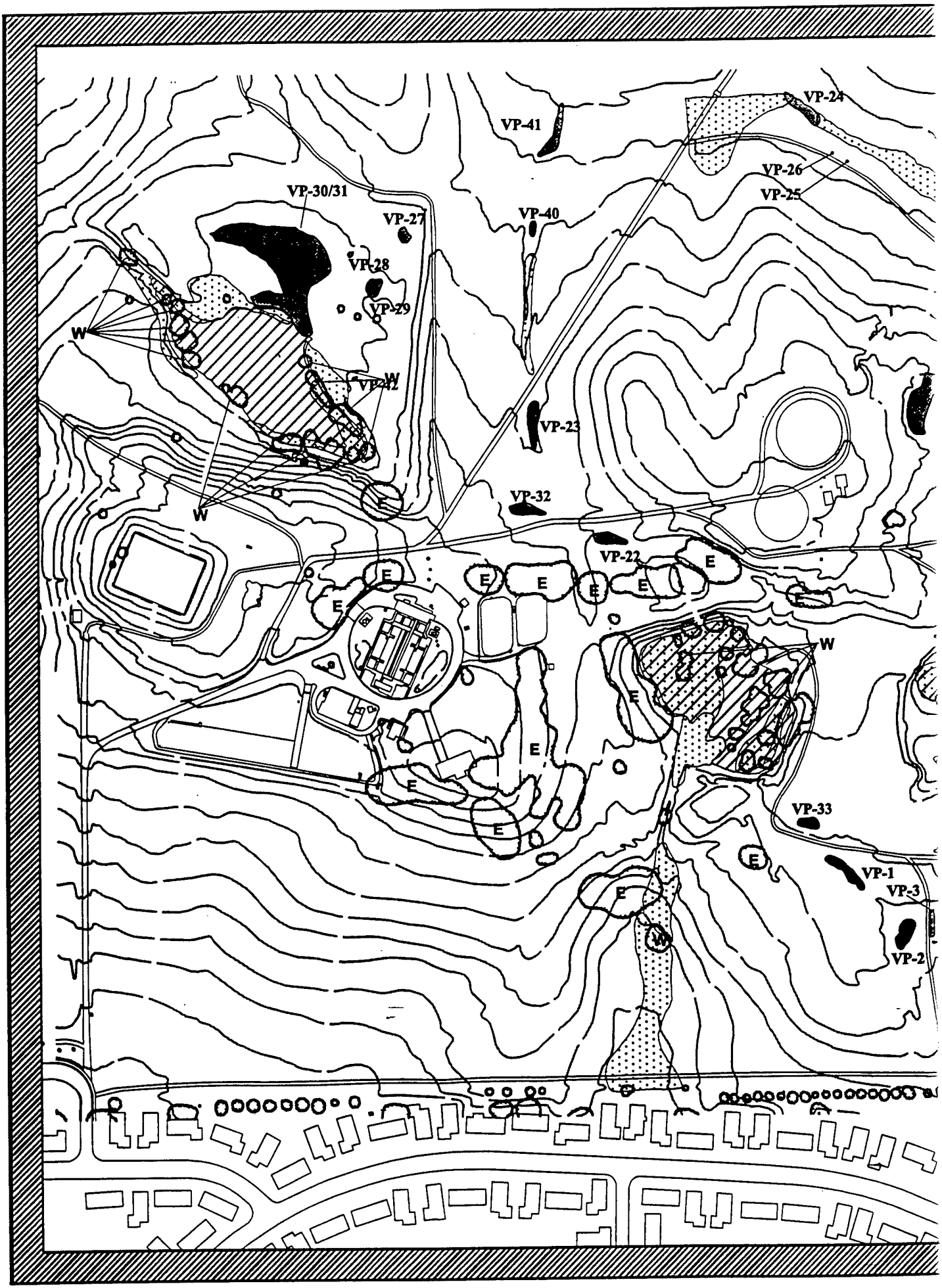
Freshwater marsh is found in all five ponds and on the south side of Pond 1. There are 1.12 acres (0.45 hectare) of freshwater marsh within the project boundaries.

3.3.3.2 *Seasonal Marsh*

Seasonal marsh habitat is present around the edges of the ponds on the project site. This habitat is drier than freshwater marsh and supports vegetation of lower stature, including spike rush (*Eleocharis macrostachya*), Bermuda grass (*Cynodon dactylon*), curly dock (*Rumex crispus*), salt grass (*Distichlis spicata*), and pennyroyal (*Mentha pulchella*). There are 2.16 acres (0.87 hectare) of seasonal marsh within the project boundaries.

3.3.3.3 *Vernal Pool*

Vernal pools are wetlands that occur in shallow depressions where an underlying clay pan or bedrock prevents drainage, resulting in a seasonally ponded habitat that fills during the rainy season but becomes completely dry during the normal summer dry season. Isolated wetlands and waters such as vernal pools may provide habitat for migratory birds and hence fall under the regulatory jurisdiction of the Corps under the Clean Water Act. Vernal pools were originally delineated by Earth Tech in May 1998 when the pools were still moist (Earth Tech 1998a). There are roughly 39 vernal pools (some are connected and may therefore be considered a single pool), providing 1.88 acres (0.76 hectare) of vernal pool habitat on the site. Characteristic species include


VP-41
VP-24
VP-26
VP-25
VP-30/31
VP-27
VP-40
VP-28
VP-29
W
VP-42
VP-23
VP-32
VP-22
E
W
VP-33
VP-1
VP-3
VP-2

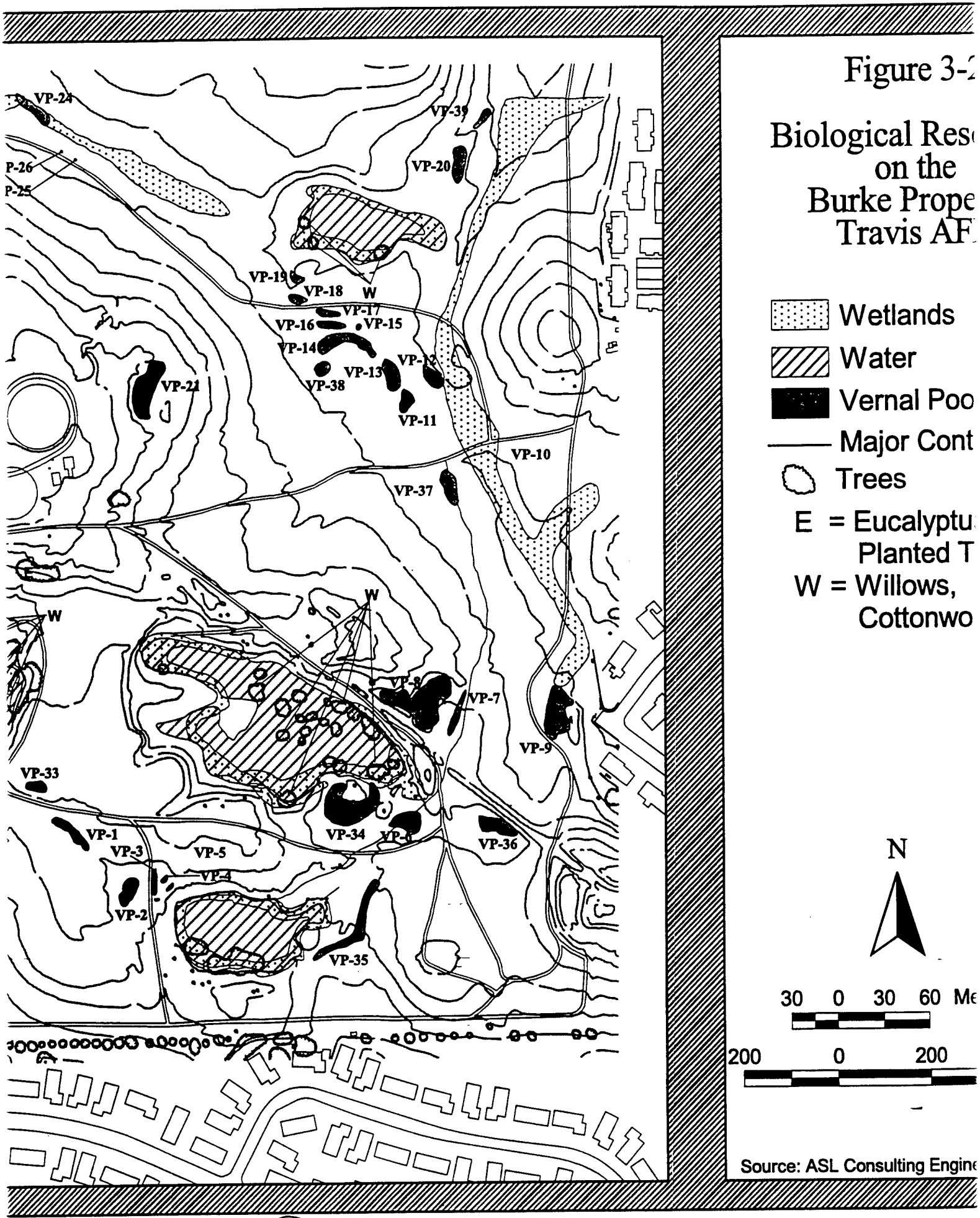


Figure 3-
Biological Res
on the
Burke Prope
Travis AF
Wetlands
Water
Vernal Poo
Major Cont
Trees
E = Eucalyptu
Planted T
W = Willows,
Cottonwo
VP-24
P-26
P-25
VP-39
VP-20
VP-19
VP-18
W
VP-17
VP-16
VP-15
VP-14
VP-13
VP-38
VP-12
VP-11
VP-21
VP-10
VP-37
W
W
VP-8
VP-7
VP-9
VP-33
VP-1
VP-3
VP-5
VP-4
VP-2
VP-34
VP-6
VP-36
VP-35
N
30 0 30 60 Me
200 0 200
Source: ASL Consulting Engine

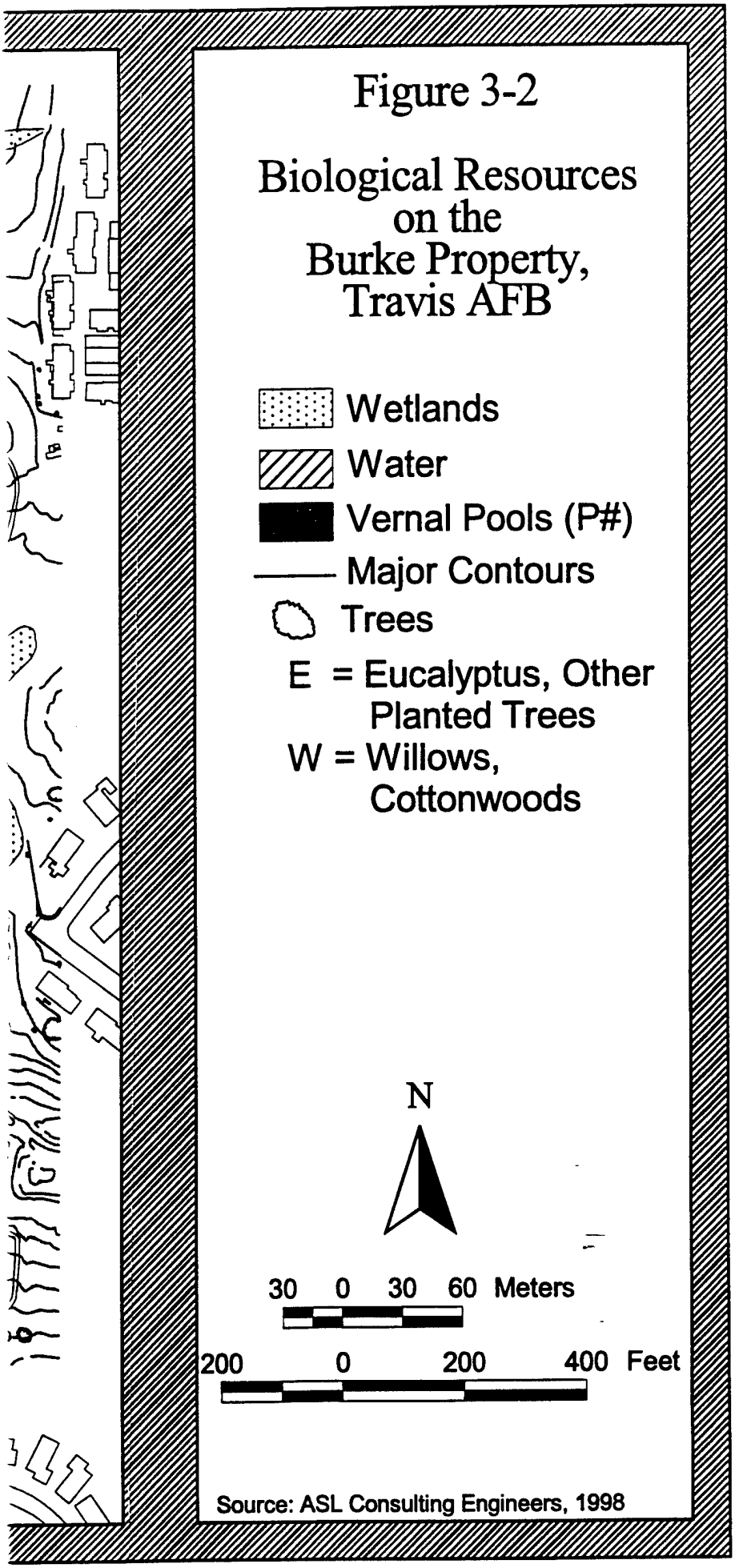
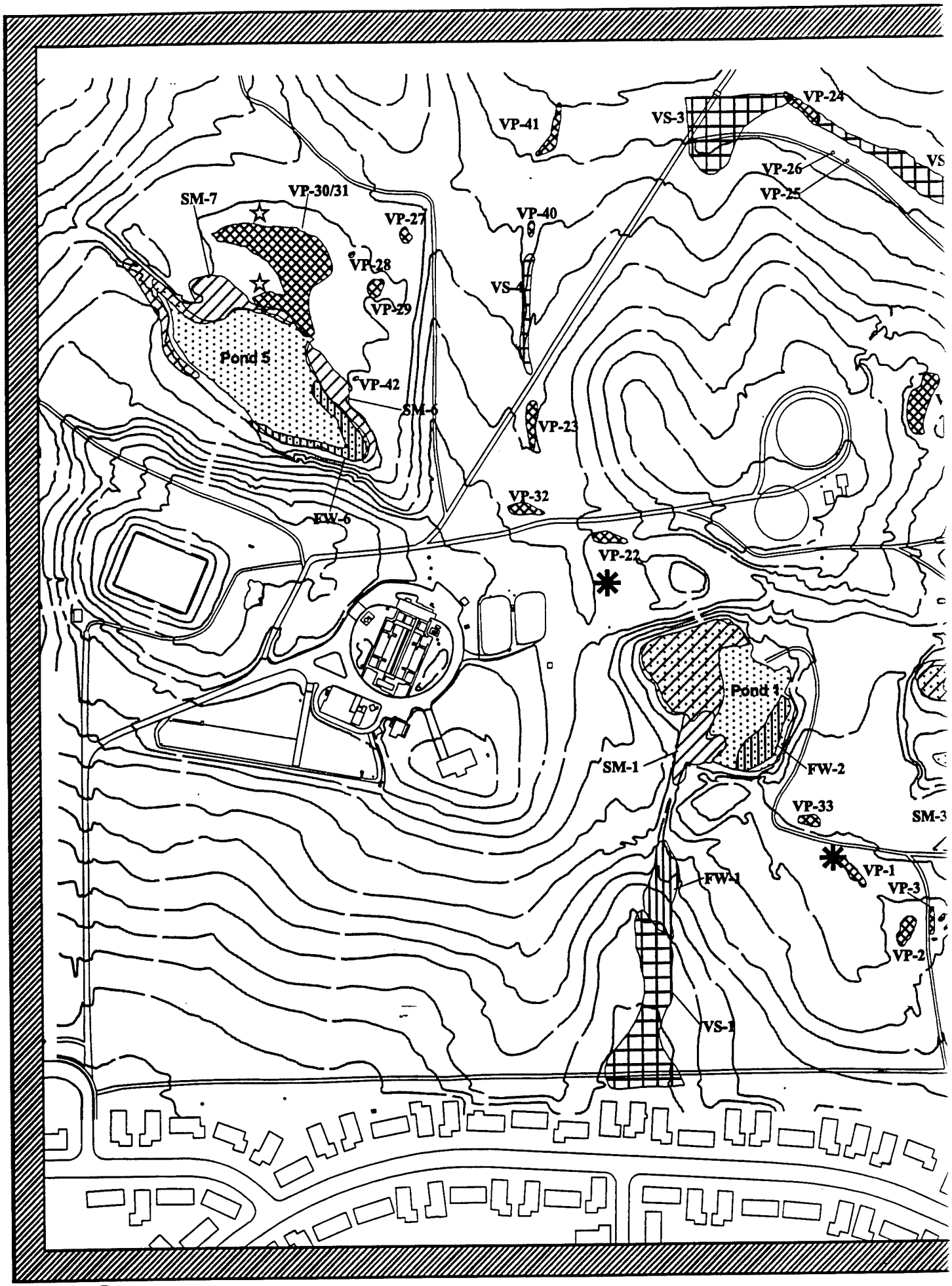


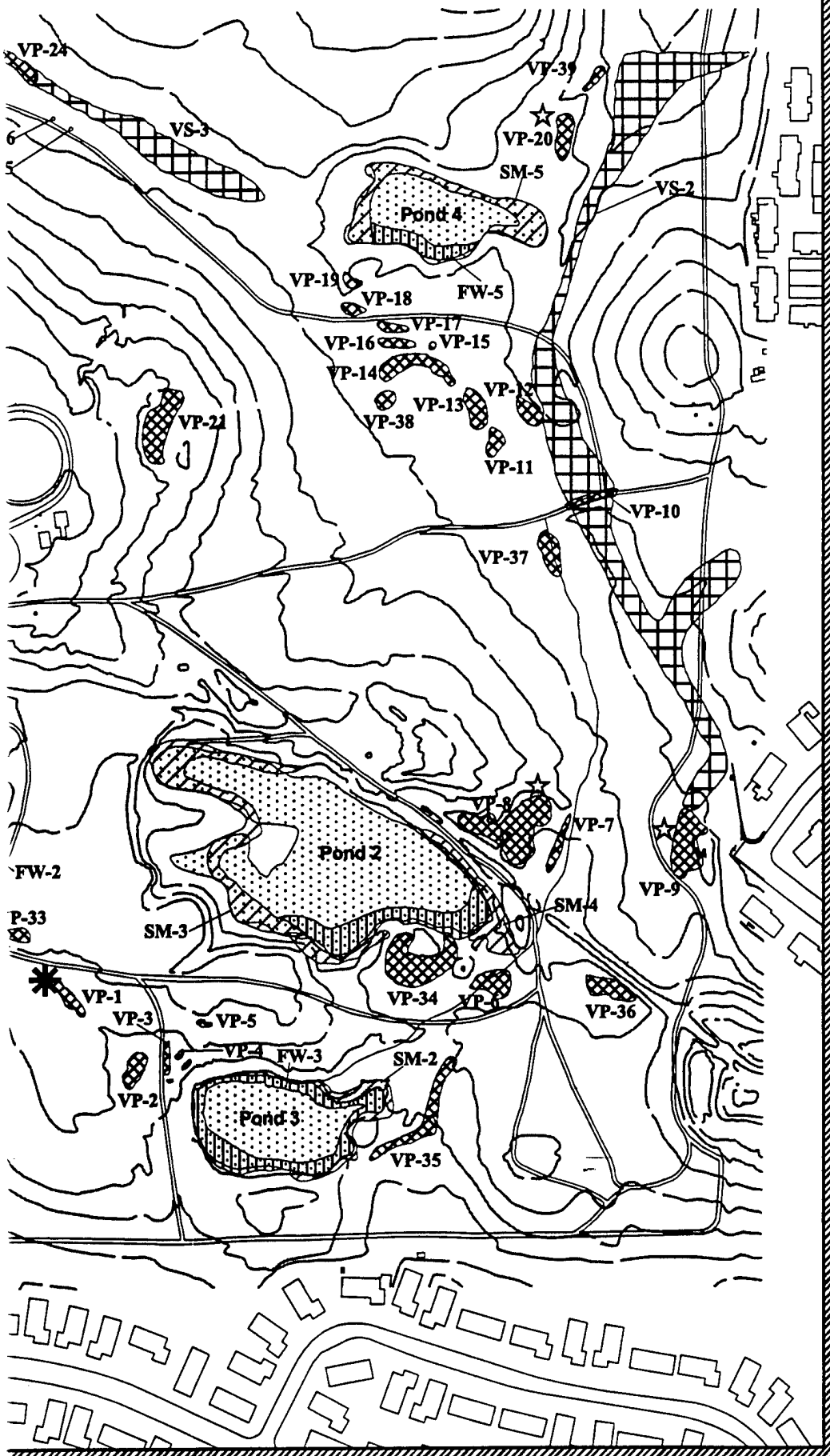
Figure 3-2
Biological Resources on the Burke Property, Travis AFB
Wetlands
Water
Vernal Pools (P#)
Major Contours
Trees
E = Eucalyptus, Other Planted Trees
W = Willows, Cottonwoods
N
30 0 30 60 Meters
200 0 200 400 Feet
Source: ASL Consulting Engineers, 1998


VP-41
VS-3
VP-24
VP-26
VP-25
SM-7
VP-30/31
VP-27
VP-40
VP-28
VS-4
VP-29
Pond 5
VP-42
SM-6
VP-23
VP-32
FW-6
VP-22
Pond 1
SM-1
FW-2
VP-33
SM-3
VP-1
FW-1
VP-3
VP-2
VS-1

1

Figure 3-3

Wetlands and Ot Waters of the US Associated Threat and Endangered S



VS - Vernal Swale
SM - Seasonal Marsh
VP - Vernal Pools
Open Water
FM - Freshwater Marsh
Major Contours

✱ Contra Costa Goldfie (two individual plants)

☆ Possible Vernal Pool Fairy Shrimp

N

30 0 30 60 Mete

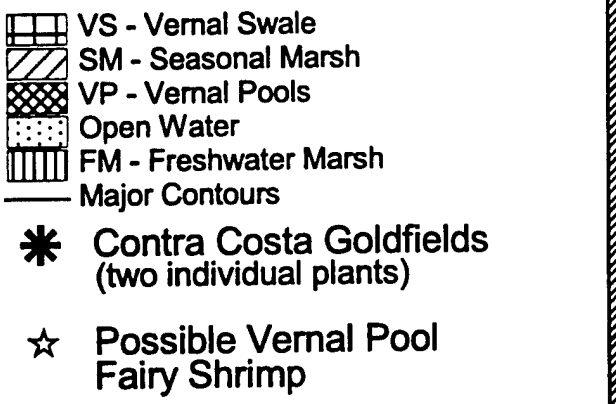
200 0 200

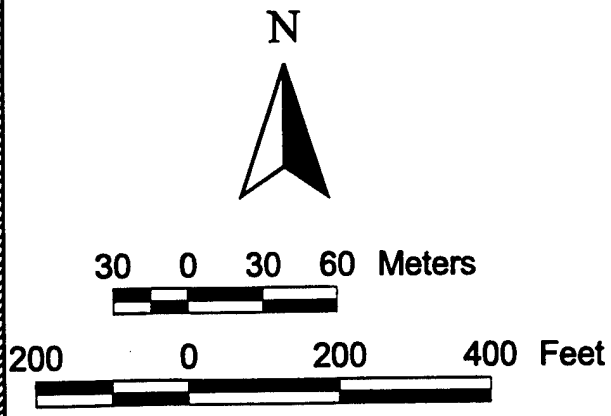
Source: ASL Consulting Engineers

(2)

Figure 3-3

Wetlands and Other Waters of the US and Associated Threatened and Endangered Species





Source: ASL Consulting Engineers, 1998

woolymarbles (*Psilocarphus* sp.), coyote thistle (*Eryngium vaseyi*), hyssop loosestrife (*Lythrum hyssopifolium*), cat's ear (*Hypochoeris* sp.), popcorn flower (*Plagiobothrys* sp.), and hair grass (*Deschampsia danthonioides*). Additional vernal pool species were observed in these pools by Earth Tech during their May 1998 survey, including Fremont's goldfields (*Lasthenia fremontii*), two individual plants of the federally listed endangered Contra Costa goldfields (*Lasthenia conjugens*), and downingia (*Downingia* sp.). Appendix B provides additional information on the plant species associated with individual vernal pools.

3.3.3.4 *Vernal Swale*

Vernal swales are temporary drainage areas, amounting to 2.81 acres (1.14 hectares) on the northern and eastern portions of the proposed project area. The vernal swales are dominated by toad rush (*Juncus bufonius*), Italian ryegrass (*Lolium multiflorum*), and cat's ear. Additional plants observed in the vernal swales by Earth Tech (1998a) during their late wet season survey are listed in Appendix B.

Of the vernal pool and swale habitats discussed above, about 0.84 acre (0.34 hectare) of vernal pool and vernal swale on the east side of the hill is subject to intermittent inundation from the flushing of waterlines at the water tanks on top of the hill (see Figure 3.3-2, VS-2, VP-13, VP-10, VP-37, and VP-11). These vernal pools and swales were observed holding water that was 1.5 feet (0.5 meter) deep on September 16, 1998. Many of the vernal pools and swales on the site have developed in areas previously affected by quarrying activities.

3.3.3.5 *Open Water Habitat*

The five ponds have a combined total of 6.26 acres (2.53 hectares) of open water. Water levels in these ponds decline during the dry season. The areas exposed by the receding water are unvegetated in 1998 after a season of extraordinarily high precipitation except for small patches of clover and Bermuda grass near the margins. These sites would be expected to develop more extensive emergent vegetation in normal years, typical of a freshwater marsh. Isolated waters such as these provide habitat for migratory birds and hence fall within the jurisdiction of the Corps of Engineers as Waters of the United States.

3.3.4 THREATENED AND ENDANGERED SPECIES

This section addresses the occurrence of federally listed threatened and endangered species. These species are protected under the Endangered Species Act (16 U.S.C. Section 1538), which requires the Air Force to consult with the U.S. Fish and Wildlife Service regarding actions that could adversely affect listed or proposed species. Although not legally protected, species that are formally listed as "candidates," based on eligibility for listing, are considered in this section. A final section below considers the occurrence of other sensitive species, including those listed under the California Endangered Species Act, or recognized by the U.S. Fish and Wildlife Service and California Department of Fish and Game as "species of concern," on the site.

Based on the review of existing information on threatened and endangered species in the vicinity of Travis AFB (USAF 1994a), and on the results of site surveys, including focused surveys for

endangered plants and animals (Earth Tech 1998a; JSA and Earth Tech 1998b), and site reconnaissance, the following species are either known to occur on site, or require further investigation to determine their presence/absence.

3.3.4.1 *Contra Costa Goldfields*

The May 1998 survey (Earth Tech 1998a) revealed the presence of two individual plants of Contra Costa goldfields (*Lasthenia conjugens*, federally listed as endangered), in two separate locations on the property. This is an annual plant species that grows in vernal pools and mesic grasslands in Napa and Solano Counties. Contra Costa goldfields was observed in one vernal pool and in a grassland area near disturbance but not associated with its normal habitat (Figure 3.3-2).

3.3.4.2 *California Tiger Salamander*

The California tiger salamander (*Ambystoma californiense*), a candidate (= eligible) for federal listing, was initially considered possible on the site because of that species' affinity for vernal pools and occurrence in similar habitats in other areas (USAF 1994a). A focused survey for this species is being conducted during the winter of 1998-99. As of January 22, 1999, no evidence of its presence on site had been identified. Based on a literature search and review of quad maps, there is very little probability that the tiger salamander is located on the Burke parcel. The nearest known occurrence is over 10 miles away. These considerations, coupled with the fact that most or all of the potential breeding habitat on site is of recent origin resulting from human activities, indicate that the Burke Property is unlikely to support a population of California tiger salamander (personal communication, Robert Holmes 1999).

3.3.4.3 *Giant Garter Snake*

The giant garter snake is federally and state listed as a threatened species. Historically, it was found from Butte County to Kern County (Hansen and Brode 1980). This snake is endemic to contiguous lowland marsh and swamp habitat, including sloughs, ponds, marshes, streams, and irrigation canals on the Central Valley floor. Giant garter snakes feed on small fish, tadpoles, and frogs. The closest known population to the project site is along the eastern fringes of the Sacramento-San Joaquin Delta from Laguna Creek Grove to Stockton, and along the western border of the Yolo Bypass. The freshwater marsh habitat on the site is discontinuous with existing giant garter snake habitat and has been present for only about 20 years; therefore, it has never been contiguous with other giant garter snake habitats. It is outside of the species' historic distribution and no individuals were observed at the project site. These considerations indicate that the Burke Property does not support the giant garter snake or provide habitat for it (JSA and Earth Tech 1998a [Appendix B]). The USFWS agrees with the USAF and its contractors that this snake will not be found on the Burke Property (personal communication, Robert Holmes 1999).

3.3.4.4 *Vernal Pool Fairy Shrimp*

A "dry season survey" to assess the occurrence of rare, threatened, and endangered species of invertebrates in vernal pools on the site was conducted during September 1998 (JSA and Earth

Tech 1998b). The results, included in Appendix B, indicate the possible occurrence of one listed species, the vernal pool fairy shrimp (*Branchinecta lynchi*), a federally listed threatened species, in five locations on the site, at VP-8, VP-9, VP-20, and in two pools at VP-30, as shown on Figure 3-3. This preliminary determination is based on the confirmed occurrence of resting stages (cysts) of fairy shrimp of the genus *Branchinecta* in these pools. These cysts may be those of a common, non-protected species, *Branchinecta lindahli*, but the occurrence of the threatened species remains cannot be ruled out without additional "wet season" sampling, which is occurring during the winter of 1998-99. No evidence was found of another listed species, the endangered vernal pool tadpole shrimp (*Lepidurus packardi*), and the occurrence of another listed species of *Branchinecta*, the endangered *B. conservatio*, is considered unlikely to occur based on the absence of pools with the site characteristics that species requires (Appendix B).

3.3.4.5 *Other Species of Concern*

As described previously, a golden eagle was observed on the site during the May 1998 survey, and a large raptor nest was found in one of the eucalyptus trees on the site. Golden eagles are legally protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). An additional study was conducted to assess the possibility of nesting on the site by golden eagles (JSA and Earth Tech 1998a, provided in Appendix B). The nest in question was carefully evaluated and found to belong to another species, most likely a raven. Hence the occurrence of golden eagles on the site is limited to transient foraging, which is to be expected given their sporadic occurrence in surrounding areas (Appendix B).

3.4 CULTURAL RESOURCES

This section addresses the cultural resources in the area of the proposed construction of family housing for Travis AFB. Both prehistoric and historic resources (including architectural resources) are addressed in this discussion.

3.4.1 Cultural Resources Statues and Significance Criteria

The National Historic Preservation Act (NHPA), Executive Order 11593, Archeological and Historic Preservation Act (AHPA), and Archeological Resources Protection Act (ARPA) are the primary statutes requiring federal agencies to protect cultural resources. The federal criteria for defining if a cultural resource is significant are stated in the eligibility requirements for nomination to the National Register of Historic Places (36 CFR § 60.4), maintained by the National Park Service, Department of the Interior. In order to qualify for the National Register, a property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following eligibility criteria:

A. Association with events that have made a significant contribution to the broad patterns of history; or

B. Association with the lives of persons significant in the past; or

C. Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; or

D. Has yielded, or may be likely to yield, information important in prehistory or history.

The Native American Graves Protection and Repatriation Act (NAGPRA) provides for the disposition of any American Indian human remains and associated grave goods found on federal property to descendants, and requires a 30-day period for assessment in the event human remains are discovered during the course of a federal construction project.

3.4.2 Cultural Setting

Travis AFB lies within the area of central California occupied at the time of European contact by Penutian speaking groups. This area is considered within the range of the Suisun and Talenas tribelets of the Southern Patwin (or Wintuan), although little is known ethnographically about these groups. Many of the early inhabitants of this area established villages adjacent to freshwater marshes and subsisted by hunting, gathering, and fishing. By the time of Spanish contact, the foundations of an agricultural system had already been developed (Earth Tech 1998b). Eventually, the Patwin fell subject to missionization, disease, and disruption by miners and settlers. After malaria and smallpox epidemics of 1833 and 1837 that decimated the indigenous populations, the Southern Patwin had largely abandoned the area. The remaining few descendants of the group are located in the northern part of their former range, in the Sacramento Valley.

Much of the area surrounding the Burke property was cultivated for agricultural products and grazing livestock, first by Mission fathers during the Spanish Mission Period and later by individuals during the Mexican Period and early American Period. The acreage around Travis AFB was not considered prime farmland and was historically used for sheep and cattle ranching and irrigated farming (Earth Tech 1998b). The first Hispanic settlement in Solano County was in 1840, and the first recorded Anglo-American family settled near Travis AFB in approximately 1848. Various homesteads were established in this area until 1942, when the U.S. government selected the property of the present-day Travis AFB as the site for an Army Air Corps base (Earth Tech 1998b). The facility was commissioned as the Fairfield-Suisun Army Air Base in 1943, and was renamed Travis Air Force Base in 1950 in honor of Brigadier General Robert Falligant Travis, former commander of the 9th Heavy Bomb Wing.

The Burke Property is a 101-acre (41-hectare) parcel of unimproved agricultural land located immediately north of Travis AFB. It has been owned by the Burke family since 1872 (Earth Tech 1998b). Maps dating from 1908 to 1941 demonstrate that at least three structures were constructed on the property during the first half of the century (Earth Tech 1998b). The county records and aerial photos of the area indicate that the property has been used for cattle and horse grazing and cropland since the early 1920s. There has also been some mining of soils and sandstone from the property for use as construction fill (Earth Tech 1998b), and the site was used as a landfill by

Kaweah Construction Company in 1993 (USAF 1994c). The property is currently being used for livestock grazing (Earth Tech 1998b).

3.4.3 Burke Property Resources

There are no known NRHP-listed or eligible prehistoric or historic sites on the Burke Property. A 100-percent archeological reconnaissance investigation of the Burke Property was conducted by Earth Tech personnel in 1998. The resulting report (Earth Tech 1998b) is included as Appendix C to this document. The reconnaissance identified the remains of a burned structure as well as tools, a windmill or possible water wheel, introduced trees, and historic debris within the Burke Property (Earth Tech 1998b). No visible remains of the mapped structures built between 1908 and 1941 could be identified. The location of the burned structure corresponds with the location of a "burned house" on a 1953 map, but no information is available regarding the history or occupants of the house (Earth Tech 1998b). Construction, plowing, grazing, quarrying, dumping, fire, and possibly looting have compromised the integrity of the site. Due to its lack of integrity, the site of the burned structure is not considered to qualify for inclusion in the National Register (Earth Tech 1998b).

3.5 ENVIRONMENTAL JUSTICE

Executive Order (EO) 12808, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was issued by the President on February 11, 1994. Objectives of the EO, as it pertains to this EA, include development of federal agency implementation strategies, identification of minority and low-income populations where proposed federal actions have disproportionately high and adverse human health and environmental effects, and participation of minority and low-income populations. The Air Force approach for conducting an environmental justice analysis is presented in "Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP)" (USAF 1997). This analysis has been prepared in accordance with this approach.

The 1990 Census of Population and Housing (U.S. Census Bureau 1990) provides counts of both minority and poverty residents. Minority populations are identified in the census by race (Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; and Other) and as Persons of Hispanic Origin. Poverty status (used in this EA to identify low-income populations) is reported in the census as the number of households with income below the poverty level ($12,764 for a household of four persons in 1989).

The 1990 population of Solano County was 340,421 persons. Whites comprised 66 percent of the population and minority races comprised 34 percent (Blacks, 14 percent; American Indians, Eskimos, or Aleuts, 1 percent; Asians or Pacific Islanders, 13 percent; and Others, 6 percent). Persons of Hispanic Origin comprised 13 percent of the population. Approximately 12 percent of the 113,637 households in the County had incomes that placed them below the poverty level. (U.S. Census Bureau 1990)

The Burke property is located in census tract 2523.09. The 1990 the population of the tract was 7,248 persons. The percentages of minority and low-income populations in the census tract closely parallel those of the County as a whole. Whites comprised 63 percent of the population and minority races comprised 37 percent (Blacks, 12 percent; American Indians, Eskimos, or Aleuts, 1 percent; Asians or Pacific Islanders, 19 percent; and Others, 4 percent). Persons of Hispanic Origin comprised 11 percent of the population. Approximately 7 percent of the 2,234 households in the tract had incomes that placed them below the poverty level. (U.S. Census Bureau 1990)

The Burke property itself is uninhabited, hence it has no minority or low-income populations.

4 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

4.1 INTRODUCTION

This chapter discusses environmental consequences and mitigation measures for those resources described in Chapter 3, including Soil and Groundwater (section 4.2), Biological Resources (section 4.3), Cultural Resources (section 4.4), and Environmental Justice (section 4.5). In addition, this chapter discusses Indirect and Cumulative Impacts (section 4.6), Unavoidable Adverse Impacts (section 4.7), Relationship between Short-term Uses and Enhancement of Long-term Productivity (section 4.8), and Irreversible and Irretrievable Commitments of Resources (section 4.9).

For resource and issue areas other than those discussed below, the reader is referred to the EIS for Realignment of Travis AFB and Record of Decision (ROD) (USAF 1994a,b), which addressed the other resource/issue areas. Appendix A of this document contains a summary of impacts and mitigation measures from the EIS and ROD.

4.2 SOIL AND GROUNDWATER

4.2.1 IMPACTS OF HOUSING ALTERNATIVES

Known past site use does not indicate the likelihood for soil or groundwater contamination to be present on the subject property. In addition, potential off-site sources of contamination are all located hydrologically downgradient or cross-gradient from the site, therefore, the potential for contamination associated with off-site sources of contamination is low. Development of either alternative design for residential housing on the site would not introduce significant sources of soil or groundwater contamination. Based on these findings, no significant impacts related to soil and groundwater contamination are anticipated and no mitigation measures would be required. These conclusions would apply to either of the alternatives being considered.

4.2.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no impacts related to soil and groundwater on the Burke Property. The site is not known or expected to be a source of contamination, and existing conditions on the site would continue for the foreseeable future.

4.3 BIOLOGICAL RESOURCES

4.3.1 IMPACTS OF THE HOUSING ALTERNATIVES

This section will discuss impacts common to both housing alternatives, followed by an evaluation of project specific impacts of the 281 unit and 226 unit housing alternatives. Section 4.3.3 provides a full list of mitigation measures applicable to the housing alternatives. The individual measures in section 4.3.4 are referenced in the appropriate impact sections.

4.3.1.1 *Vegetation and Wildlife Habitat*

For either of the two alternatives, the housing development would be constructed primarily on the elevated, upland portions of the site, which support grassland disturbed by livestock grazing, and planted trees, mostly eucalyptus. Given the abundance of similar habitat in the region (USAF 1994a) and the absence of protected species, the loss of these areas to housing is considered a less-than-significant impact. Some upland areas of the site will remain undeveloped, but will experience noise and activity during construction, and be subject to increasing passive recreational use when the housing is occupied. For the same reasons cited previously, the increased disturbance of these areas that would result from constructing either alternative is considered less than significant.

Construction of the housing project would necessitate grading portions of the site, and the resulting bare soil would be temporarily susceptible to erosion. Eroded sediment could be transported downslope into vernal pools and other wetland habitats, adversely affecting resident plants and invertebrates and potentially reducing the area of ponding. These erosion impacts are mitigable to insignificance, however, through the incorporation of erosion control measures and other best management practices as described below under section 4.3.4 "Mitigations." (Measure C-1 and HP-2.)

4.3.1.2 *Wetland and Aquatic Habitat*

The impacts of the two alternatives on wetlands and other jurisdictional Waters of the U.S. have been calculated by overlaying the perimeter "footprints" of rough grading for each alternative onto the habitats mapped in Figure 3-3. Impacts of the two alternatives differ, as discussed below, although most of the areas of wetlands and other waters would be avoided by either alternative. Small areas where construction-related filling cannot be avoided (see discussion under each alternative below) are unlikely to be ecologically significant, but will require mitigation in conjunction with Section 404 permitting. The project's final design will provide sufficient mitigation by increasing and enhancing remaining wetland acreage on the site. This is included as a mitigation measure C-4 below, although the impacts may be less than significant.

Once the housing project is completed and Air Force families move in, the vernal pools and other wetland habitats would likely be visited by residents interested in nature or engaged in hiking, mountain biking, or other activities. Wildlife use of these areas could be reduced as wildlife may be disturbed by recreational activity. Elimination of cattle grazing on the property and resultant trampling of the wetlands (measure HP-3) would help offset this impact and measure HP-6 would further reduce the potential for impacts by directing foot traffic away from the most sensitive habitats while providing nature watching opportunities.

Construction of the housing project could also modify drainage patterns, resulting in the reduction of runoff or infiltration in some areas, but an increase in other areas. These types of alterations might affect vernal pool species that are adapted to seasonal cycles of inundation and drying, but it is not expected that the larger ponds and associated wetlands that are established in old quarry holes would be strongly affected. Impacts will be avoided or mitigated to insignificance through

the development of site grading and drainage plans that retain existing hydrology for vernal pools (see Mitigation Measures C-3, HP-4 and HP-5, below).

4.3.1.3 *Threatened and Endangered Species*

Contra Costa goldfields, a federally listed endangered species, has been identified from two locations on site. Vernal pool fairy shrimp, a federally listed threatened species, has been identified as possibly occurring at 5 locations on site based on the collection of resting stages (cysts) belonging to the genus *Branchinecta*. For the purposes of this analysis these cysts are assumed to belong to the vernal pool fairy shrimp (*B. lynchi*) rather than its unlisted relative *B. lindahli*. The housing alternatives differ in their potential for impacts on the Contra Costa goldfields and vernal pool fairy shrimp, as evaluated in the following sections.

No other listed or candidate species have the potential to be impacted by construction of either housing alternative. Giant garter snake and California tiger salamander have been determined not to occur on site as discussed in sections 3.3.4.2 and 3.3.4.3, respectively. These species will not be discussed further in this report.

4.3.2 281 UNIT HOUSING DEVELOPMENT

The following discussion identifies impacts specific to this alternative in addition to those described in the preceding sections (4.3.1.1-4.3.1.3) , which describe impacts common to both housing alternatives.

4.3.2.1 *Vegetation and Wildlife Habitat*

Based on an overlay of the rough grading footprint, the 281-unit alternative would require the grading of about 54 acres, the vast majority of which consists of grassland and eucalyptus trees. Impacts on these habitats are not significant, as discussed previously.

4.3.2.2 *Wetland and Aquatic Habitat*

As shown in Table 4-1, a total of 2.81 acres of wetlands and other jurisdictional Waters of the U.S. would be eliminated. Most of the site's vernal pools and other wetlands and aquatic habitats would be avoided (Table 4-1).

Applicable mitigation measures, which include on-site or off-site compensation for affected habitat (measures C-4 and C-5), and measures to protect the sites from direct and indirect impacts (C-1, C-3, HP-1, HP-3, HP-4, HP-5, and HP-6), would mitigate impacts on wetlands to insignificant levels.

Table 4-1. Impacts of the 281-Unit Housing Project on Wetlands and other Waters of the U.S.

Habitat Type	*Total Acreage on Site*	*Impact Acreage (hectares), % of On-Site Acreage Impacted*		*Affected Areas (see Figure 2-2)*
Freshwater Marsh	1.11 (0.45)	0.36 (0.15)	32%	FW-1, 2
Seasonal Marsh	2.14 (0.87)	0.78 (0.32)	36%	SM-1
Vernal Swale	2.81 (1.14)	0.61 (0.27)	22%	VS-1, 4
Vernal Pool	1.88 (0.75)	0.49 (0.20)	26%	VP-1, 7, 8*, 21, 22, 23, 33, 35, 36
Open Water	6.26 (2.53)	0.57 (0.23)	9%	Pond 1
(Total)	14.20 (5.74)	2.81 (1.17)	20%	
* Possible Vernal Pool fairy shrimp location				

4.3.2.3 *Threatened or Endangered Species*

Several vernal pools would be eliminated, including number VP-8, which may support the threatened vernal pool fairy shrimp, and number VP-1, at which the endangered Contra Costa goldfields was found (Figure 3-3). The other location at which Contra Costa goldfields was found would also be eliminated. Impacts on vernal pool fairy shrimp, if present, could be mitigated to non-significance by implementation of the Habitat Protection, Management, and Enhancement measures (Measures HP-1 through HP-6). Impacts on Contra Costa goldfields could be mitigated to non-significance by implementation of Measure C-2, which provides for a resurvey of the site for Contra Costa goldfields and collection of plants and seed from impacted areas for use in on-site or off-site replanting, consistent with input from USFWS.

4.3.3 226 UNIT HOUSING ALTERNATIVE

The following discussion identifies impacts specific to this alternative in addition to those described above in sections 4.3.1.1-4.3.1.3 , which describe impacts common to both housing alternatives.

4.3.3.1 *Vegetation and Wildlife Habitat*

The Reduced Housing Alternative would require grading on a smaller portion of the site, about 44 acres. As for the Proposed Action, most of this is grassland and eucalyptus trees, the loss of which is not considered significant.

4.3.3.2 *Wetland and Aquatic Habitat*

This alternative avoids the construction of housing in several areas that support vernal pools and other wetland and aquatic habitats. Thus this alternative has a much smaller impact, eliminating 1.18 acres (Table 4-1) of these habitats, compared to the Proposed Action.

Table 4-2. Impacts of the 226-Unit Alternative Housing Project on Wetlands and other Waters of the U.S.

Habitat Type	*Total Acreage (hectares) on Site*	*Impact Acreage (hectares), % of On-Site Acreage Impacted*		*Affected Areas (see Figure 2-3*
Freshwater Marsh	1.11 (0.45)	0.20 (0.08)	18%	FW-1
Seasonal Marsh	2.14 (0.87)	0.10 (0.04)	5%	SM-1
Vernal Swale	2.81 (1.14)	0.62 (0.25)	22%	VS-1, 3, 4
Vernal Pool	1.88 (0.75)	0.26 (0.11)	14%	VP-1, 21, 22, 23, 25, 26, 35, 36
Open Water	6.26 (2.53)	0.00 (0.00)	0%	None impacted
(Total)	14.20 (5.74)	1.18 (0.48)	8%	

Applicable mitigation measures, which include on-site or off-site compensation for affected habitat (measures C-4 and C-5), and measures to protect the sites from direct and indirect impacts (C-1, C-3, HP-1, HP-3, HP-4, HP-5, and HP-6), would mitigate impacts on wetlands to insignificant levels.

4.3.3.3 *Threatened or Endangered Species*

This alternative avoids all of the pools, including VP-8, that could support the threatened vernal pool fairy shrimp. Both locations where Contra Costa goldfields was found (one individual at each location) would be impacted by this project as well as by the 281-unit project. Indirect impacts on vernal pool fairy shrimp, if present, could be mitigated to non-significance by implementation of the Habitat Protection, Management, and Enhancement measures (Measures HP-1 through HP-6). Impacts on Contra Costa goldfields could be mitigated to non-significance by implementation of Measure C-2, which provides for a resurvey of the site for Contra Costa goldfields and collection of plants and seed from impacted areas for use in on-site or off-site replanting, consistent with input from USFWS.

4.3.4 MITIGATION MEASURES

The principal means of mitigating the loss of environmental resources at the Burke site is avoidance. Impacts that cannot be avoided would be mitigated by resource replacement or enhancement. The layouts of the proposed action (281 units) and alternative (226 units) evaluated in this EA have been configured to minimize the impacts on vernal pools, wetlands, and other

aquatic habitat. The 281-unit design would occupy about 54 percent of the property but would impact less than 3 acres of wetlands and other Waters of the U.S., representing about 20 percent of total acreage of these resources on site (see above Table 4-1).

The 226-unit design would reduce impacts on wetlands even further, affecting about 44 percent of the property and 1.18 acres (8 percent) of the wetlands and other Waters of the U.S. on site. Significantly, the 226-unit design allows avoidance of virtually all the vernal pool habitat including VP-8, a site where vernal pool fairy shrimp may occur. It also enables avoidance of Pond 1, a large former quarry site that supports willows and cottonwoods. To mitigate direct or indirect impacts on vernal pools and associated species, mitigation on a one-to-one basis is proposed. This could be accomplished by on-site wetland creation or enhancement, by contribution to a wetland mitigation bank in the region, or by a combination of these approaches.

The following mitigation measures apply to both the 281-unit and 226-unit housing designs.

CONSTRUCTION-RELATED MITIGATION

C-1 Prior to construction, a Stormwater Pollution Prevention Plan for construction, meeting the requirements of the Clean Water Act, would be prepared incorporating best management practices to minimize wind and water erosion from the site and deposition of sediment in wetlands. This plan would incorporate requirements identified as necessary to protect especially sensitive areas by the Corps of Engineers and USFWS. The plan would be finalized after approval by the Regional Water Quality Control Board.

C-2 A resurvey of the site would be made during the spring season prior to construction to verify the location, areal extent, and population size of the Contra Costa goldfields (which may vary considerably from year to year due to its annual habit). Consistent with input from USFWS, plants and seedbank would be collected from these sites for use in inoculating suitable habitat on site or at a mitigation site at Travis Air Force Base.

C-3 Where new road construction would interfere with vernal pool water sources, box culverts will be placed in the roads to allow unimpeded drainage and act as access corridors for small mammals and amphibians. The culverts will be installed in such a way that the upper surface of the culvert bottom is buried a minimum of 6 inches below the existing grade. This will allow an accumulation of soil over the concrete bottom and will minimize the potential of the culvert becoming a barrier to the movement of aquatic species and wildlife.

C-4 On-site wetland creation could be incorporated into project design to offset unavoidable impacts on wetlands. For example, because the drainage swale below pond #1 would be filled to allow development of both the proposed and alternative projects, it is proposed that the outlet of pond #1 be shifted away from its current position by excavating a broad, flat channel that drains eastward into pond #2 during high rainfall events. This would allow development of a constructed vernal swale/wetland mitigation area on the east side of the pond. This new drainage would be designed to maximize the vernal swale wetland

habitat created. A concrete outlet weir with locking weir boards will be incorporated into the upper pond to allow control of the water height in pond #1 and the discharge into pond #2. Three artificial seasonal pools will be constructed in the new swale area as well.

C-5 Wetland habitat impacts that cannot be compensated for by wetland creation or restoration on site, will be mitigated by either off-site restoration or by contribution to a regional mitigation bank.

HABITAT PROTECTION, MANAGEMENT AND ENHANCEMENT

HP-1 Weed and insect control will be conducted consistent with management goals to protect vernal pool resources. Use of herbicides and insecticides in common areas outside of fenced yards will be conducted exclusively by the Air Force or contractors directed by the Air Force. All such use will be subject to evaluation and approval by the base entomologist and will be consistent with the protection of wetland values, especially the protection of vernal pool species. Should mosquito or other insect pest control be required it will be implemented using the best management practices consistent with vernal pool protection. If threatened or endangered aquatic species are confirmed on site, pest management practices will be identified consistent with their protection and recommended practices provided to USFWS for review.

HP-2 Revegetation and erosion control plantings outside the housing landscaping footprint will maximize the use of native plant species drawn from the site's "natural" plant community. Some non-native "naturalized species" common to the area may be used for initial erosion control. No new exotic invasive grasses or other plants will be used. A planting list of species native to the local region and offering wildlife habitat values such as native perennial grasses, oaks (*Quercus* spp.), willows, cottonwoods, wild buckwheat (*Eriogonum* spp.), ceanothus (*Ceanothus* spp.), toyon (*Heteromeles arbutifolia*), and manzanita (*Arctostaphylos* spp.) species will be developed with USFWS. Plantings will be concentrated near the swale areas in the north and northeastern portion of the site and adjacent to the ponds to enhance habitat value. Plantings of native trees will also be made in proximity to existing eucalyptus as part of a long-term management plan to eventually replace the eucalyptus trees with mature native tree species such as oaks and gray (=digger) pine (*Pinus sabiniana*). Appropriate native plants will be incorporated into the landscape plans.

HP-3 Cattle grazing will be excluded from the pools and from the site in order to allow the undeveloped portion of the site to develop a more natural plant cover.

HP-4 The current practice of discharging the water tanks directly into the vernal pools will be discontinued. Discharged water will be collected and routed to pond #2 or a combination of pond #2 and the created swale area.

HP-5 Unnatural sources of water that have the potential to enter any vernal pools will be minimized. Landscaping practices will emphasize water savings and trickle or drip irrigation to conserve water and reduce runoff from artificial irrigation.

HP-6 To direct foot or bike traffic away from the most sensitive sites while providing some nature watching opportunities, a jogging/bike/foot trail will be constructed through the undeveloped portion of the property. Trails may be paved with asphalt, gravel, wood chip, pine bark, or similar materials for stability. Elevated boardwalks will be provided where low seasonally wet areas are crossed (e.g., vernal swales) allowing unimpeded drainage while minimizing impact of foot and bike traffic on sensitive wetlands. Use of off-road vehicles will be prohibited within all undeveloped areas of this housing development.

4.3.5 NO-ACTION ALTERNATIVE

With the No-Action Alternative, the Burke Property would remain as undeveloped land. The Air Force has no plans or alternative uses for the site other than housing. As such, existing habitats on the site would be expected to remain in their current condition for the foreseeable future, at least until an alternative use other than housing is identified and implemented. Future decisions regarding alternative land uses would be subject to review under NEPA.

4.4 CULTURAL RESOURCES

4.4.1 IMPACTS OF HOUSING ALTERNATIVES

Impacts on cultural resources are considered significant if a property listed on or eligible for listing on the National Register of Historic Places would be physically damaged or altered, would be isolated from its historic context or setting, or if elements of the project would introduce elements out of character with the property or its setting.

The archaeological investigation for the Burke Property (Appendix C) has been forwarded to the SHPO. Based on the site survey and background research (Appendix C), the report concluded that no NRHP-listed or eligible prehistoric or historic resources are located on the Burke Property. Consequently, construction of family housing on the Burke Property would not have any significant impacts on cultural resources and no mitigation measures would be required.

This impact assessment applies for both the proposed action and the Reduced Housing Alternative.

4.4.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no action would be taken to develop housing on the Burke Property, and there would be no impacts related to cultural resources.

4.5 ENVIRONMENTAL JUSTICE

The only adverse environmental impacts identified in the analyses conducted for this EA are the direct impacts on biological resources located *within* the boundaries of the Burke property. The Burke property is uninhabited, hence no minority or low-income populations would be affected by on-site biological impacts. Furthermore, no adverse environmental impacts would occur *outside* the Burke property. Hence, no adverse effects on minority and low-income populations would

occur as a result of implementation of either alternative, and no mitigation measures would be required.

4.6 INDIRECT AND CUMULATIVE IMPACTS

Indirect and cumulative impacts associated with the realignment action as a whole were addressed in the EIS for the Realignment of Travis AFB and found to be beneficial in the case of certain types of socioeconomic impacts, and otherwise insignificant with the implementation of several mitigations as identified in Appendix A of this document (USAF 1994a). Beneficial socioeconomic impacts were anticipated in the areas of population, employment, and housing, but this conclusion assumed that new housing would be constructed on the Burke Property. For the new issue areas examined in this EA, resource-specific impacts conclusions are as follows:

- There are no indications of site contamination on the Burke Property, and consequently, no potential indirect or cumulative effects. Construction of housing on the property would not contribute significantly to base-wide contamination problems.

- Mitigation for site-specific biological resource impacts would take into account and mitigate for any on- and off-site indirect impacts, as well as regional cumulative impacts on the affected resources–wetlands and associated endangered species, based on input from the U.S. Fish and Wildlife Service and Corps of Engineers.

- There are no site-specific direct, indirect, or cumulative impacts associated with cultural resources on the Burke Property.

4.7 UNAVOIDABLE ADVERSE IMPACTS

There are no significant unavoidable adverse impacts. All potentially significant impacts would be mitigated to less-than-significant levels.

4.8 RELATIONSHIP BETWEEN SHORT-TERM USES AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Implementation of the proposed or alternative project designs would have a positive effect on long-term productivity by enabling Air Force personnel to live more closely to Travis AFB and reducing the costs and inefficiencies associated with commuting from off-base locations.

4.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Implementation of the proposed or alternative project designs would irreversibly commit portions of the Burke Property to residential development, while leaving significant areas as undeveloped open space that would continue to support valuable wetland habitats.

5 REFERENCES

5.1 REFERENCES CITED

Earth Tech. 1998a. May 1998 Vernal Pool Endangered Plant Survey and Vernal Pool Delineations, Northern Parcel, Travis Air Force Base, California. Report dated June 23, 1998. Available from Travis AFB.

_____. 1998b. Archaeological Investigation for the Burke Property. Prepared for Travis AFB. Available at the EFA West offices.

JSA (Jones & Stokes Associates) and Earth Tech. 1998a. Draft Wetland Delineation and Surveys for Selected Wildlife Species on a Proposed Project Site for Travis Air Force Base, California. Report dated November 1998. Prepared for Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas. Available from Travis AFB.

_____. 1998b. Draft Dry Season Surveys for Special-Status Shrimp Species at Travis Air Force Base, California. Report dated November 1998. Prepared for Air Force Center for Environmental Excellence, Brooks Air Force Base, Texas. Available from Travis AFB.

Niehaus, Robert D. (Inc.). 1998. 1997 Housing Market Analysis, Travis Air Force Base, California. Final Report, September 1998. Prepared for Travis AFB.

U.S. Air Force (USAF). 1998. Map entitled "IR Program Sites on Travis AFB".

_____. 1997. Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP). November.

_____. 1994a. Environmental Impact Statement: Realignment of Travis Air Force Base, California. Department of the Air Force, Air Mobility Command. June.

_____. 1994b. Record of Decision: Realignment of Travis Air Force Base, California. July.

_____. 1994c. Final Environmental Baseline Survey, Family Housing Child Development Center, Travis Air Force Base, California. Prepared by the Department of the Air Force Air Mobility Command. January.

U.S. Army Corps of Engineers (USACE). 1987. Corps of Engineers Wetland Delineation Manual. Environmental Laboratory, U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS. Tech. Rpt. Y-87-1.

U.S. Census Bureau. 1990. Census of Population and Housing.

U.S. Department of the Navy (Navy). 1998. Preliminary Information for 281 Units of New Family Housing at Travis Air Force Base, CA. Prepared by EFA West, Naval Facilities Engineering Command, San Bruno, CA. September.

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APPENDIX A

PREVIOUS EIS ANALYSIS OF BURKE PROPERTY HOUSING PROJECT (USAF 1994a,b)

In 1993, the Defense Base Closure and Realignment Commission recommended the realignment of aircraft, missions, and personnel from March Air Force Base (AFB) to Travis AFB. The environmental consequences of the resulting "BRAC" actions, including the construction of new family housing for relocated personnel, were evaluated in an environmental impact statement (EIS) (USAF 1994a). The BRAC actions and EIS findings and mitigation measures were adopted in the subsequent Record of Decision (ROD) by the Air Force (USAF 1994b).

The family housing (FH) project on the Burke Property that was evaluated as part of the BRAC EIS was a conceptual plan that consisted of 384 units that would, together with infrastructure and ancillary facilities, have occupied about 75 percent of the Burke Property. The FH alternative projects currently proposed would have fewer units and smaller development footprints than were analyzed in the BRAC EIS. As a result, impacts are generally reduced relative to the BRAC EIS analysis.

The following is a summary of the environmental impacts and mitigation measures previously identified in the BRAC EIS and Record of Decision (ROD) for the construction of FH on the Burke Property (USAF 1994a,b), as part of the BRAC relocation action. Additional information contained in these documents is hereby incorporated by reference.

AIR RESOURCES

Short-term construction-related impacts would be potentially significant, while long-term impacts associated with the occupation of FH would be insignificant. For short-term construction impacts, such as fugitive dust, mitigation measures would include general management practices, such as the application of approved soil stabilizers and revegetation of disturbed areas as quickly as possible. To reduce fugitive dust during grading, the contractor would water active sites at least twice daily.

The 1990 Clean Air Act Amendments state that a federal agency cannot support an activity unless the agency determines that the activity will conform to the most recent EPA-approved State Implementation Plan (SIP) within the region of the proposed action. This means that federally supported or funded activities will not (1) cause or contribute to any new ambient air quality standard violation, (2) increase the frequency or severity of any existing standard violation, or (3) delay the timely attainment of any standard, interim emission reduction, or other milestone. The project region (the San Francisco Bay Area Air Basin) is a moderate nonattainment area for CO. However, the U.S. Environmental Protection Agency (EPA) provides no classification on the severity of the O_3 nonattainment condition (since it was a O_3 maintenance area, but recently did not attain this standard). However, for purposes of determining project conformity, it is assumed that the region has a moderate nonattainment

status for O_3. Consequently, the realignment action would conform to the most recent EPA-approved SIP if its annual emissions remain below 50 tons of volatile organic compounds (VOC) or 100 tons of nitrogen oxides (NO_x). All components of the realignment action, including housing were evaluated in a Conformity Applicability Analysis. The analysis concluded that the proposed conformity-related emissions would not exceed the conformity thresholds and therefore the actions would conformity to the SIP.

GEOLOGICAL RESOURCES

No significant site-specific or cumulative impacts to soils, topography, or from seismicity are expected to occur. Approximately 50 acres of land would be disturbed to construct proposed FH facilities. Soils would be displaced during construction and be susceptible to erosion until vegetation is reestablished on disturbed areas. Erosion by water or wind would be mitigated through the use of standard best management practices during construction. Although the proposed site has slightly steeper slopes than other areas of the base, only minor leveling would be required and impacts to the topography would be insignificant. Excavated soil will not be stockpiled in areas where runoff from stockpiles could impact vernal pools. The design of structures would be required to meet all of the building codes established for this area, minimizing the risk of earthquake damage.

WATER RESOURCES

Impacts to surface and subsurface water resources could occur due to construction of facilities, paved surfaces and increased demand for potable water. Construction of FH would alter natural drainage of the site. Impacts to surface water during construction would not be significant with mitigation for sediment impacts such as storm water management plans, erosion control methods, and spill prevention and response plans. Less than 0.1 percent of the groundwater basin, would be disturbed and covered for FH, which would have an insignificant impact on the groundwater recharge system. The construction contractor would be responsible for providing water for construction uses. Construction activities would create a short-term adverse, insignificant impact on water resources.

Addition of new FH would result in an increase in a local increase in domestic water use. The increase in domestic water use is small when compared with the increase in industrial water use associated with the realignment action as a whole. The inability of the water supply to meet the demand is a significant cumulative impact that is a operations limitation rather than an environmental impact. Modifications to the water supply and distribution system and water conservation devices could be incorporated into the design phase of the project as needed.

NOISE AND LAND USE

No significant site-specific or cumulative impacts were identified for the BRAC action, including new FH construction. Construction of the new FH would take place within 200 feet of existing base residences and would occur during daytime hours when on-base ambient noise levels are generally higher. At a distance of 200 feet, the construction noise would attenuate to approximately 78 dBA, consistent with noise levels associated with aircraft operations.

Additionally, buildings normally attenuate 20 to 30 dBA with windows closed. With this level of noise attenuation, construction noise levels in these buildings would be consistent with ambient or baseline levels, thus, having no significant adverse impacts.

Potential control measures would include the placement of noise barriers or temporary berms around construction sites to further attenuate noise generated from construction equipment.

ENVIRONMENTAL PROGRAMS

The construction of new housing could temporarily increase the use of hazardous materials and the amount of hazardous waste being generated at the base. These increases would contribute to cumulative increases associated with the BRAC actions, but would not be significant.

Residential solid waste would increase proportionately with the increase in on-base resident personnel. Increase in solid waste disposal associated with BRAC actions individually and cumulatively was determined to not have a significant impact on the amount of waste received by the local landfill. Therefore the increase in residential solid waste, which represents a small percentage of the overall increase in solid waste disposal, would not be significant. The Air Force will establish a curbside recycling program or designation of a recycling drop-off point in the FH area to mitigate the increase in solid waste.

The construction and use of additional housing would increase the amount of wastewater generated by the base. A revised wastewater contract with the Fairfield-Suisun Treatment Plant will be required to accommodate the expected increase, but no significant impact on wastewater treatment facilities would occur.

SOCIOECONOMICS

Construction of additional FH units would help alleviate on- and off-base housing pressures, a beneficial impact. Based on the ROD, potential impacts on local school districts from relocating Air Force personnel to new FH on the Burke Property could be mitigated through notifying local school district managers as far in advance as possible of enrollment increases or decreases. No adverse cumulative impacts are associated with the BRAC actions.

TRANSPORTATION

Impacts to transportation at and around Travis AFB could be caused by the movement of construction equipment and the increase in traffic from construction workers and additional base personnel. An adverse and locally significant short-term impact, which is a cumulative result of current and past changes in the base workforce, would result from increased peak-hour traffic causing inconvenience in accessing the base. Measures proposed to mitigate impacts to the transportation network include implementation of ride-share programs (Regulation 13 Transportation Control Measures) and encouraging construction workers to use alternate entrance gates. After construction of additional on-base housing is complete, the

impacts from traffic accessing the base would be insignificant and vehicle trips would be reduced since additional personnel would be residing on the base.

APPENDIX B
Surveys for Selected Wildlife Species, Wetland Delineation, and Plants Associated with Vernal Pools at Travis AFB, California

Dry Season Surveys for Special-Status Shrimp Species at Travis Air Force Base, California

January 1999

ABSTRACT

Soil samples collected in September 1998 from 34 potential habitat sites were analyzed to assess the presence of special-status fairy shrimp and tadpole shrimp species at Travis Air Force Base, near Fairfield, Solano County, California. Soil samples were collected only from habitat judged to be suitable for special-status shrimp species. Some vernal pools and swales present were not sampled because of short ponding durations, permanent innundation, or water flow that would not support special-status shrimp species. Soil samples were examined in the laboratory by sieving the material through screens. The portion of each sample retained in the screens was dissolved in a brine solution to separate the organic material, which was then examined under a microscope to identify shrimp cysts. Cysts from the fairy shrimp genus *Branchinecta* were found in samples from five vernal pools, and no tadpole shrimp cysts were found. Cysts from the genus *Branchinecta* were identifiable only to genus level because of the cyst character overlap among species. Wet season sampling surveys were initiated in December 1998 to provide species-level identification in accordance with U.S. Fish and Wildlife Service protocol.

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1.0 INTRODUCTION

Travis Air Force Base (AFB), south of Fairfield, Solano County, California, is proposing construction of housing facilities on the Burke property, a recently acquired parcel of land north of the base (Figure 1). The 101-acre property is a hilly area dominated by non-native grassland vegetation. The area also supports a number of vernal pools previously identified in a May 1998 survey by Earth Tech (Earth Tech, 1998) and delineated in a September 1998 wetland delineation by Jones & Stokes Associates (Jones & Stokes and Earth Tech 1998). Vernal pools are seasonally inundated pools that can support habitat for fairy and tadpole shrimp, including several sensitive species.

In support of the planning process for the proposed construction, Earth Tech contracted Jones & Stokes Associates to perform a dry season shrimp survey that would assess the potential presence of special-status shrimp.

Jones & Stokes Associates analyzed soil samples collected on September 18, 1998 from 34 potential habitat sites to assess the presence of special-status shrimp. Jones & Stokes Associates will submit this report and all other pertinent materials and information to the U.S. Fish and Wildlife Service (USFWS), the California Academy of Sciences, and the California Department of Fish and Game, as required by the USFWS guidelines for a protocol-level survey.

2.0 BACKGROUND

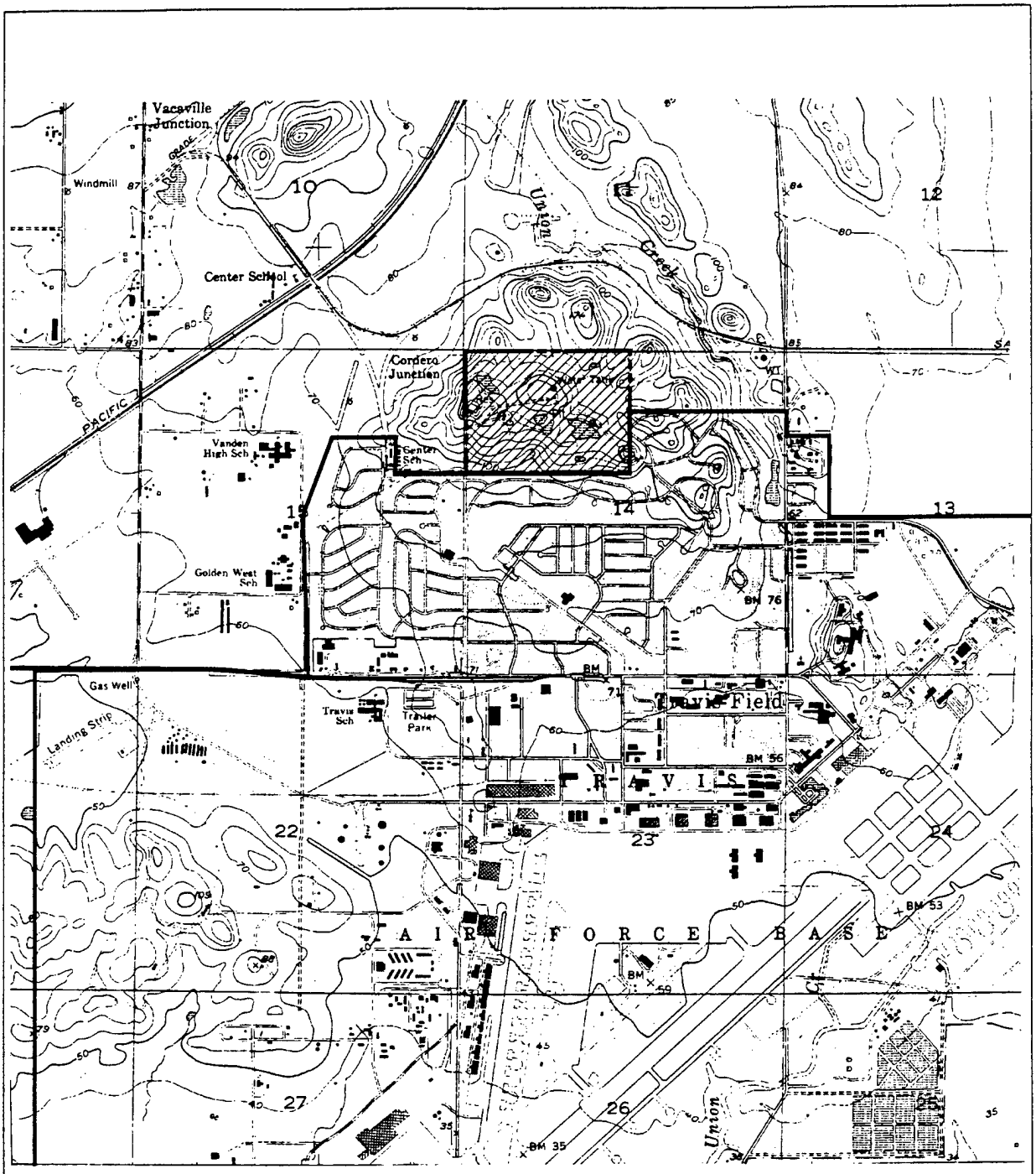
2.1 DEFINITIONS

For the purpose of this report, special-status shrimp are defined to include shrimp species in the following categories:

- Shrimp listed as threatened or endangered under the federal Endangered Species Act (50 Code of Federal Regulations [CFR] Part 17.11 for listed animals and various Federal Register notices for proposed species) and

- Other shrimp species meeting the definition of rare or endangered species under the California Environmental Quality Act (CEQA) (CEQA Guidelines, Section 15380).

For the purpose of this study, potential special-status shrimp habitat is defined as seasonal wetlands of sufficient size (depth and area) or supporting specific vegetation that indicate the potential for ponding for a sufficient duration to allow special-status shrimp species to complete their life cycles and to maintain water temperatures conducive to special-status shrimp species.



Burke Property

Travis AFB Boundary

SCALE IN FEET

0 1100 2200

Source: USGS 1953 Elmira 7.5' Quadrangle (photorevised 1980)

Vicinity Map

Figure 1

Travis/003

2.2 SPECIES ACCOUNTS

Three special-status shrimp species (*Branchinecta conservatio, B. lynchi*, and *Lepidurus packardi*) have the potential to occur at the proposed project site. In addition, one other species likely to be listed (*Branchinecta* "mid-valley") and two non-listed species (*B. lindahli* and *Linderiella occidentalis*) are known from the proposed project vicinity.

Branchinecta conservatio

Branchinecta conservatio is federally listed as an endangered species. This species is reported from large (greater than 5,000 square meters [m^2]) and deep (greater than 15 centimeters [cm]) turbid alkaline pools. This species of fairy shrimp has an extremely disjunct distribution; *Branchinecta conservatio* is known from Tehama and Butte counties, in the northern part of the Sacramento Valley, Solano County at the Jepson Prairie, and Merced County in the San Joaquin Valley near Haystack Mountain.

Branchinecta lynchi

Branchinecta lynchi is federally listed as a threatened species. This shrimp species is found in vernal pools throughout the Central Valley and western Riverside County in California and near Medford, Oregon. This fairy shrimp species occurs in neutral to slightly alkaline vernal pools and rock outcrop pools along the interior Coast Ranges.

Branchinecta "mid-valley"

Branchinecta "mid-valley" is a recently discovered fairy shrimp species that is currently being described by Dr. Denton Belk and Dr. Michael Fugate (Belk pers. comm.). This species has been collected in eastern Solano County, southern Sacramento County, and northeastern San Joaquin County, with isolated populations in Merced, Madera, and Fresno counties. This species can complete its life cycle in as little as 9 days; consequently, it can use smaller vernal pools. This species meets the California Environmental Quality Act definition of rare or endangered species. Although it has no official federal status at this time, this species may be listed as threatened or endangered by the USFWS after the formal species description is published (Goettle pers comm.).

Lepidurus packardi

Lepidurus packardi is federally listed as an endangered species. This tadpole shrimp species is found in vernal pools throughout the Sacramento Valley and is documented to occur in Solano County. Typically, *Lepidurus packardi* is green in color, but may be mottled with brown in highly turbid water. *Lepidurus packardi* is omnivorous and generally forages on the bottoms of pools in dense vegetation.

Tadpole shrimp tend to be slow growing and are usually collected after the vernal pool has been ponded for 30 days.

Branchinecta lindahli

Branchinecta lindahli is a common fairy shrimp with no legal status. This fairy shrimp is common in alkaline habitats throughout the western United States and northern Mexico. It typically occurs in pools that are turbid, alkaline or slightly saline, and often ringed with salt grass (*Distichilis* sp.). *B. lindahli* may be opportunistic, as it is common in a wide variety of artificial habitats, such as bulldozer scrapes, roadside ditches, and railroad toe-drains.

Linderiella occidentalis

Linderiella occidentalis is a common fairy shrimp from vernal pools throughout the Central Valley and Coast Ranges of California. Unlike most *Branchinecta*, which are typically white, *L. occidentalis* is white and green with red markings. *L. occidentalis* tends to emerge later than the *Branchinecta* species and is typical of vernal pools that are inundated for at least 30 days. The cysts of *L. occidentalis* are densely spinose and accumulate debris, making detection of the cysts from soil samples difficult. *L. occidentalis* was originally proposed for listing under the Endangered Species Act and was withdrawn from the proposal in 1995.

3.0 METHODS

3.1 FIELD METHODS

Soil samples were collected from potential special-status shrimp habitats at the proposed project site according to USFWS (1996) Interim Survey Guidelines to Permittees. A hand trowel was used to collect approximately 1 liter of soil total from two transect lines through each potential habitat and from the deepest portion of each potential habitat.

Potential habitat for fairy and tadpole shrimp in California includes vernal pools, ponded areas within vernal swales, rock outcrop ephemeral pools, playas, alkali flats, and salt lakes (Eng et al. 1990). Other types of depressions that hold water of a similar volume, depth, area, and for a similar duration and seasonality as vernal pools and swales also may be potential habitat. However, these other depressions are typically artificial habitats and are unvegetated. Examples include railroad toe-drains, roadside ditches, abandoned agricultural drains, ruts left by heavy construction vehicles, and depressions in fire breaks (Eng et al. 1990).

Pool volume is important in determining potential shrimp habitat because deeper pools with a large surface area can more easily maintain their dissolved oxygen levels. Similarly, deep pools will pond long enough to allow the shrimp to

complete their life cycle. The species that are of concern in this study require a mean ponding depth of 15.0 to 19.7 cm and a mean ponding area of at least 67 m^2 (Helm 1998) (Table 1).

Table 1. Duration, Depth, and Area Requirements for Special-Status Shrimp Species with Potential to Occur in Study Areas

Species	Mean Days to Maturity	Mean Ponding Depth (cm)	Ponding Area (m^2)
Branchinecta lynchi	18	15.0	527
Branchinecta conservatio	36.5	19.7	27,865
Branchinecta "mid-valley"	26.3	10.1	67
Lepidurus packardi	38.1	15.2	1,828

cm = centimeter
m^2 = square meter

Source: Helm 1998

Common wetland plant species that co-occur with the shrimp species, which have potential to occur within the proposed project areas, generally require the same hydrological conditions. Therefore, the presence of these plant species within a potential habitat would imply a greater potential for a population of these shrimp to be present. These plants include *Eryngium vasei*, *Downingia* sp., *Lasthenia* sp., *Eleocharis macrostachya*, *Psilocarphus* sp., *Isoetes* sp., *Lilaea* sp., and *Gratiola* sp.

Pools that are dominated by vernal pool plant species that require short inundation periods will have hydrology that cannot support shrimp. These plants include *Hordeum geniculatum, H. leporinum*, *Juncus bufonius*, *Lasthenia freemontii*, *Leontodon* sp., *Pogogyne* sp., *Ranunculus muricatus*, *Poa annua*, *Lolium multiflorum*, and *Trifolium* sp. Vernal pools and swales at the Travis AFB project site that were judged not to pond long enough or to be sufficiently deep to support special-status shrimp species were not sampled. These sites were VP-15, VP-25, VP-26, VP-28, VP-38, VP-40, VS-1, VS-3, and VS-4 (Figure 2).

Conversely, wetland habitats that support plant species that need water year-round cannot support special-status shrimp species because the shrimp's cysts must dry out before they can hatch. These plants include *Typha* sp., *Salix* sp., *Populus* sp., *Lemna minor*, and *Cypera* sp.

Vernal swale VS-2 was not sampled because the substrate is scoured. Scouring indicates that the flow in the swale is so strong that tadpole shrimp and fairy shrimp could not inhabit that habitat, because the shrimp would be carried away in the current to ponded areas. Because tadpole shrimp and fairy shrimp are so

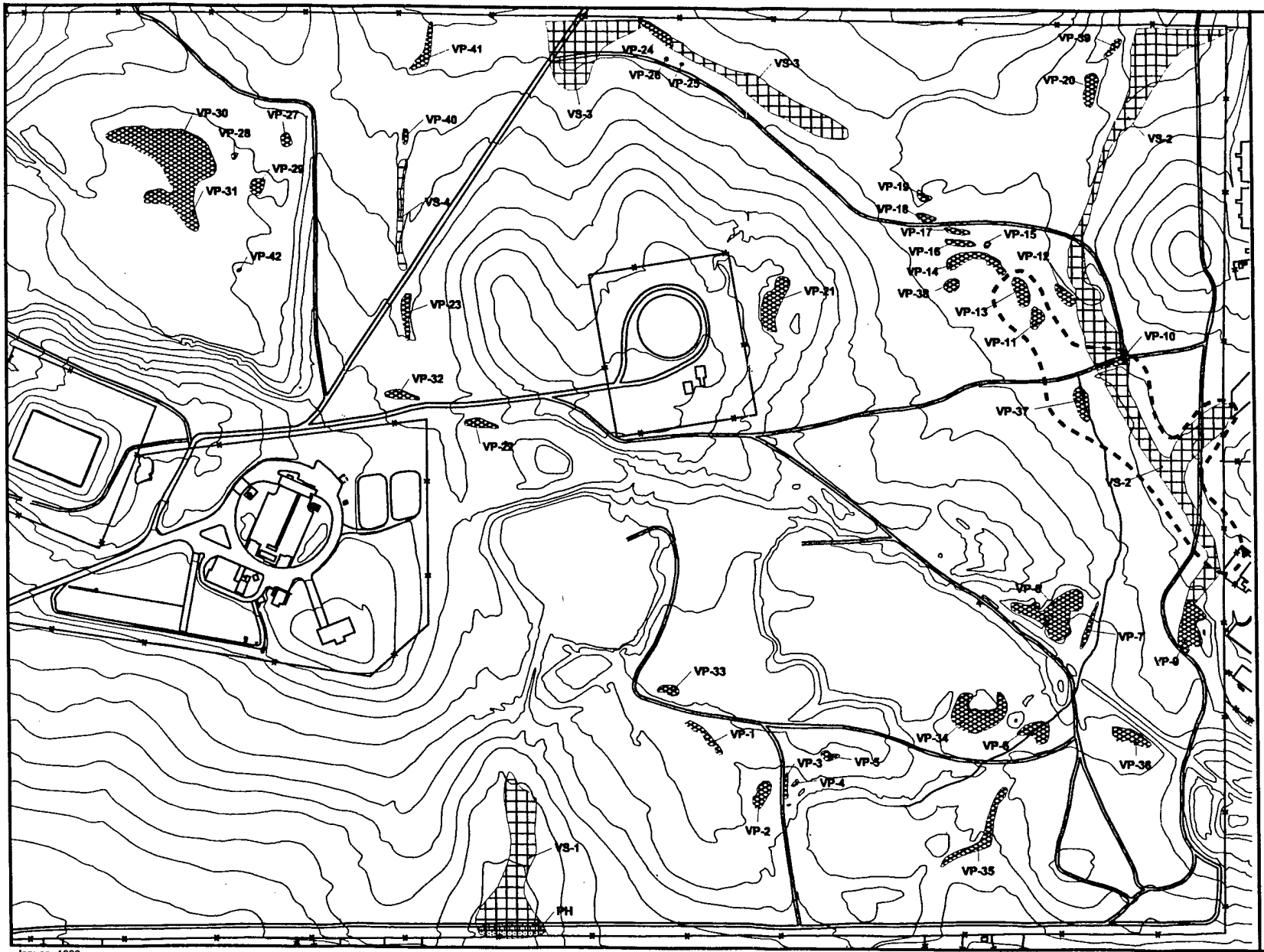


Figure 2
Potential Special-Status Shrimp Habitat

Legend

- Disturbed Vernal Pool and Swale Area
- VS - Vernal Swale
- VP - Vernal Pools
- PH - Other Potential Habitat

N
W E
S

100 0 100 200 Feet

soft bodied, strongly flowing water would be harmful to them. Typically tadpole shrimp and fairy shrimp are not found in flowing swales.

Vernal pools VP-10, VP-11, VP-13, and VP-37 were not sampled because they held water at the time of the soil collection. These vernal pools are on the east side of the hill and are subject to intermittent inundation from the flushing of waterlines at the water tanks on top of the hill and are identified as "disturbed vernal pools" in Figure 2. These vernal pools were observed holding water 0.5 meter deep on September 16, 1998. Dry sampling was not possible in these wetlands because wet special-status shrimp cysts at warm temperatures are susceptible to fungal infection and disintegration during collection.

All sampled potential habitats identified according to the numbers assigned to them by Earth Tech (Earth Tech 1998) and additional habitats identified and numbered by Jones & Stokes Associates (Jones & Stokes Associates 1998, Earth Tech 1998) are depicted in Figure 2.

3.2 LABORATORY ANALYSIS

Soil samples were prepared for examination in the laboratory by dissolving the clumps of soil in water and sieving the material through 500-, 300-, and 150-micrometer pore size screens. The small size of these screens ensures that the eggs from the shrimp species will be retained. The portion of each sample retained in the screens was dissolved in a brine solution to separate the organic material from the inorganic material. The organic fraction was then examined under a microscope.

Scanning electron micrographs and reference specimens were used to identify shrimp cysts to the lowest justifiable taxon. Cysts from the genus *Branchinecta* were identifiable to genus level only because of the cyst character overlap among species and the potential for four species, *B. conservatio*, *B. lindahli*, *B. lynchi*, and *Branchinecta* "mid-valley", to occur in this region. Cysts from the tadpole shrimp *Lepidurus packardi* can be superficially confused with flatworm cocoons. However, by breaking the cyst and examining the cross section of the cyst shell, *Lepidurus* cysts can be separated by their thicker shell and the columnar middle layer that is lacking in the thinner shelled flatworm cocoons.

4.0 RESULTS AND DISCUSSION

4.1 SITE DESCRIPTION

The proposed project site is a former sandstone quarry that has been abandoned for 25 to 30 years. The site, dominated by upland, non-native weedy grasses and large patches of medusa head grass (*Taeniatherum caput-medusae*), yellow starthistle (*Centaurea solstitialis*), turkey mullein (*Eremocarpus setigerus*), and spiny cocklebur (*Xanthium spinosum*), is currently used for grazing.

At the top of a hill in the center of the project site are two large water tanks. The hill supports a stand of eucalyptus trees (*Eucalyptus* sp.) on the north side. The hill slopes are flanked with five stock ponds, which occupy the former borrow pits of the quarrying activities and support groves of willows (*Salix* sp.) and Fremont's cottonwoods (*Populus fremontii*).

Vernal Pools

Vernal pools on site were originally identified by Earth Tech in May 1998 when the pools were still moist (Earth Tech 1998). The pools were delineated in September 1998 by Jones & Stokes Associates to total 1.86 acres of vernal pool habitat on the site. Vernally inundated areas supported characteristic species, including woollymarbles (*Psilocarphus* sp.), coyote thistle (*Eryngium vaseyi*), hyssop loosestrife (*Lythrum hyssopifolium*), cat's ear (*Hypochoeris* sp.), popcorn flower (*Plagiobothrys* sp.), and hair grass (*Deschampsia danthonioides*). Additional vernal pool species observed in these pools during the May 1998 survey include Fremont's goldfields (*Lasthenia fremontii*), the federally listed as endangered Contra Costa goldfields (*Lasthenia conjugens*), and downingia (*Downingia* sp.).

Vernal Swales

Vernal swales are seasonally inundated drainages that hydraulically link wetlands. The site supports 2.81 acres of vernal swale habitat on the north and eastern portions of the proposed project area. The vernal swales are dominated by toad rush (*Juncus bufonius*), Italian ryegrass (*Lolium multiflorum*), and cat's ear (*Hypochoeris* sp.). Additional plants were observed in the vernal swales by Earth Tech (1998) during their late wet season survey, including hyssop loosestrife, willow-herb (*Epilobium* sp.), red maids (*Calandrinia ciliata*), knotweeds (*Polygonum* sp.), and docks (*Rumex* sp.).

4.2 SURVEY RESULTS

Shrimp cysts were identified from five vernal pools of the 34 potential habitat sites sampled on the proposed project site. All cysts were identified as the genus *Branchinecta*. No *Lepidurus* cysts were found in any of the samples. The specific findings are shown in Table 2. The occupied pools are VP-8 and VP-9 in the southeast corner of the proposed project site, VP-20 in the northeast corner, and VP-30 and VP-31 in the northwest corner.

Table 2. Shrimp Cysts Found in Pools Sampled in Study Area
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Site Number	*Branchinecta* (cysts/100 milliliters)	Co-occurrent Vegetation
Vernal Pool (VP)		
VP-1	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-2	0	*Eryngium vasei* *Psilocarphus* sp.
VP-3	0	*Eryngium vasei*
VP-4	0	*Hordeum* sp. *Juncus bufonius* *Lasthenia* sp. *Leontodon* sp. *Lolium multiflorum*
VP-5	0	*Hordeum* sp. *Juncus bufonius* *Lasthenia* sp. *Leontodon* sp. *Lolium multiflorum*
VP-6	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-7	0	*Eryngium vasei*
VP-8	20	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-9	5	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-10	Not sampled due to inundation	Not sampled
VP-11	Not sampled due to inundation	Not sampled
VP-12	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-13	Not sampled due to inundation	Not sampled
VP-14	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-15	Not sampled due to insufficient ponding period	*Hordeum* sp. *Juncus bufonius* *Lasthenia* sp. *Leontodon* sp. *Lolium multiflorum*

Table 2. Shrimp Cysts Found in Pools Sampled in Study Area
Page 2 of 3

Site Number	*Branchinecta* (cysts/100 milliliters)	Co-occurrent Vegetation
VP-16	0	*Eryngium vasei*
VP-17	0	*Eryngium vasei* *Eleocharis macrostachya*
VP-18	0	*Eryngium vasei* *Psilocarphus* sp.
VP-19	0	*Eryngium vasei*
VP-20	5	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-21	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-22	0	*Eryngium vasei*
VP-23	0	*Hordeum* sp. *Juncus bufonius* *Leontodon* sp. *Lolium multiflorum*
VP-24	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-25	Not sampled due to insufficient ponding period	*Hordeum* sp. *Lolium multiflorum*
VP-26	Not sampled due to insufficient ponding period	*Hordeum* sp. *Leontodon* sp. *Lolium multiflorum*
VP-27	0	*Eryngium vasei* *Psilocarphus* sp.
VP-28	Not sampled due to insufficient ponding period	*Juncus bufonius* *Leontodon* sp. *Lolium multiflorum*
VP-29	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-30	35	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-31	25	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-32	0	*Eryngium vasei*
VP-33	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.

Table 2. Shrimp Cysts Found in Pools Sampled in Study Area
Page 3 of 3

Site Number	*Branchinecta* (cysts/100 milliliters)	Co-occurrent Vegetation
VP-34	0	*Eryngium vasei*
VP-35	0	*Hordeum* sp. *Leontodon* sp. *Lolium multiflorum*
VP-36	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-37	Not sampled due to inundation	Not sampled
VP-38	Not sampled due to insufficient ponding period	*Hordeum* sp. *Jancus bufonius* *Lasthenia* sp. *Leontodon* sp. *Lolium multiflorum*
VP-39	0	*Eryngium vasei* *Eleocharis macrostachya* *Psilocarphus* sp.
VP-40	Not sampled due to insufficient ponding period	*Hordeum* sp. *Juncus bufonius* *Leontodon* sp. *Lolium multiflorum*
VP-41	0	*Hordeum* sp. *Lolium multiflorum*
VP-42	0	*Lolium multiflorum*
Vernal swale (VS)		
VS-1	Not sampled due to insufficient hydroperiod	*Hordeum* sp. *Juncus bufonius*
VS-2	Not sampled due to scouring	*Hordeum* sp.
VS-3	Not sampled due to insufficient hydroperiod	*Hordeum* sp. *Juncus bufonius*
VS-4	Not sampled due to insufficient hydroperiod	*Hordeum* sp. *Juncus bufonius*
Other potential habitat (PH)		
PH	0	No botanical indicators of hydrology present

It cannot be determined from observation of the cysts if these samples contain a federally listed species. It is unlikely that *Branchinecta conservatio* occurs at this site. *B. conservatio* generally requires large, turbid vernal pools, such as Olcott Lake at the Jepson Prairie Preserve near the south east side of TAFB. However, sites where the cysts were recovered are considered suitable for *Branchinecta* "mid-valley", *B. lindahli*, and *B. lynchi*. A wet season survey to collect and identify adult shrimp species was initiated in December 1998, in accordance with the USFWS survey protocol guidelines (1996).

5.0 REFERENCES

Bates, L., 1977. *Soil survey of Solano County, California.* U.S. Department of Agriculture and University of California Agricultural Experiment Station.

Earth Tech, 1998. *Vernal Pool Endangered Plants Survey and Vernal Pool Delineation for Northern Parcel (Burke Property), Travis Air Force Base, California.*

Helm, B.P., 1998. Biogeography of eight large branchiopods endemic to California. Pages 124 -139 in C.W. Witham, E.T. Bauder, D. Belk, W.F. Ferrin, Jr., and R. Ornduff (editor), *Ecology, Conservation, and Management of Vernal Pool Ecosystems-Proceedings from a 1996 Conference.* California Native Plant Society.

Jones & Stokes Associates and Earth Tech, 1998. *Wetland Delineation and Surveys for Selected Wildlife Species on a Proposed Project Site for Travis Air Force Base, California.*

U.S. Fish and Wildlife Service, 1996. *Interim survey guidelines to permittees for recovery permits under the Endangered Species Act for the listed vernal pool branchiopods.*

APPENDIX A

DATA FORMS

U.S. Fish and Wildlife Service

Dry Season Survey

Note: Please fill out the required information completely for each site visit.

This form is being submitted to serve as part of the 90-day report: ___✓___ no _____ yes

Required color slides and/or photographs for the project site are included: ___✓___ no _____ yes

Date: 9/18/98 Time: 8:23 AM County: Solano Quad: Elmira

Collector(s): D. Christopher Rogers Permit #: PRT-795934

Site/Project Name: Travis AFB Pool #: see subsequent sheets

Township: T5N Range: R1W Section: 14 38°15' lat. 122°5' long.

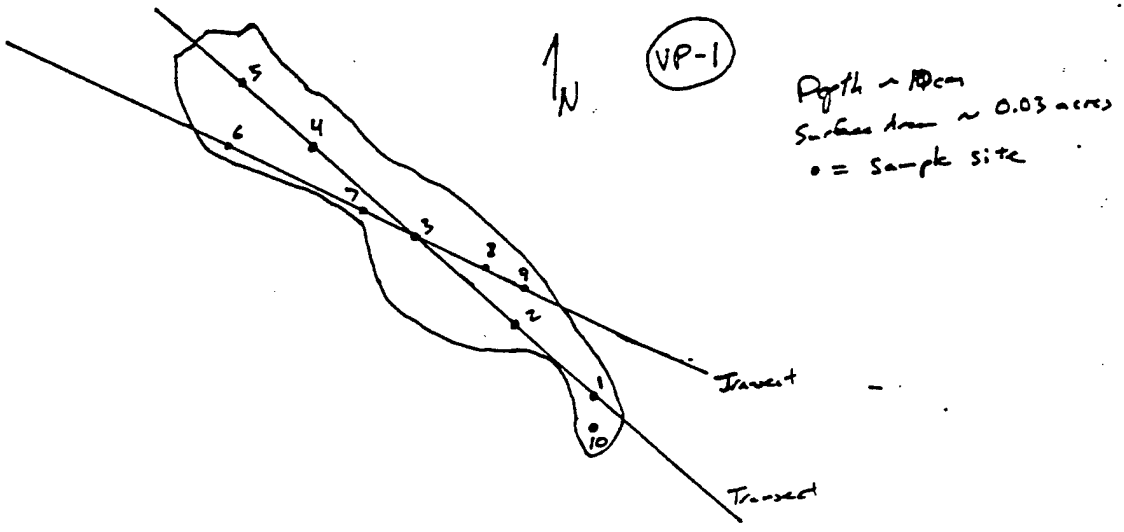
Habitat Condition: (circle where appropriate)

- undisturbed disturbed: tire tracks garbage discing/plowing
- ungrazed grazed: (cattle) horses sheep other_____
  light (moderate) heavy
- land use of habitat: Grazed by cattle; former sandstone quarry

Pool Bottom Surface: (circle where appropriate)
hardpan (claypan) cobbly/rocky lava flow other_____

Pool Depth: _____cm (estimated maximum) Surface Area: _____m^2 (estimated maximum)
see subsequent sheets

Sketch of pool and transects showing:
- scale
- indication of North
- sampling locations



(USF&WS rev 4-96)

Fish and Wildlife Service Vernal Pool Data Sheet
Dry Season Survey
Soil Analysis

Note: Please fill out the required information completely for each site visit.

Sample ID	Sample Volume(ml)	Genus (/species)	# Cysts (or None)	Cyst Dens (#/100ml)
VP-8-6	5 ml	Branchinecta sp.	4	20
VP-9(all)	100 ml	Branchinecta sp.	5	5
VP-20(all)	100 ml	Branchinecta sp	5	5
VP-30-8	6.5 ml	Branchinecta sp.	2	35
VP-30-9	25 ml	Branchinecta sp.	9	35
VP-30-4	40 ml	Branchinecta sp.	14	35
VP-31-9	40 ml	Branchinecta sp.	10	25
VP-31-9	40 ml	Branchinecta sp.	9	25
No other soil samples contained shrimp cysts				

Voucher Specimens

Cysts shall be stored dry and shall be preserved according to the standards of the institution in which they will be accessioned.

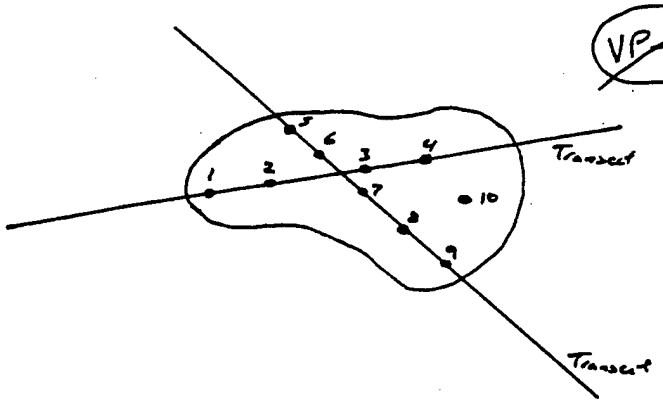
Genus (/species)	# Cysts	Catalog/Accession #	Pool #
Branchinecta sp	4	Not yet available from museum	6
"	5	"	9
"	5	"	20
"	35	"	30
"	19	"	31

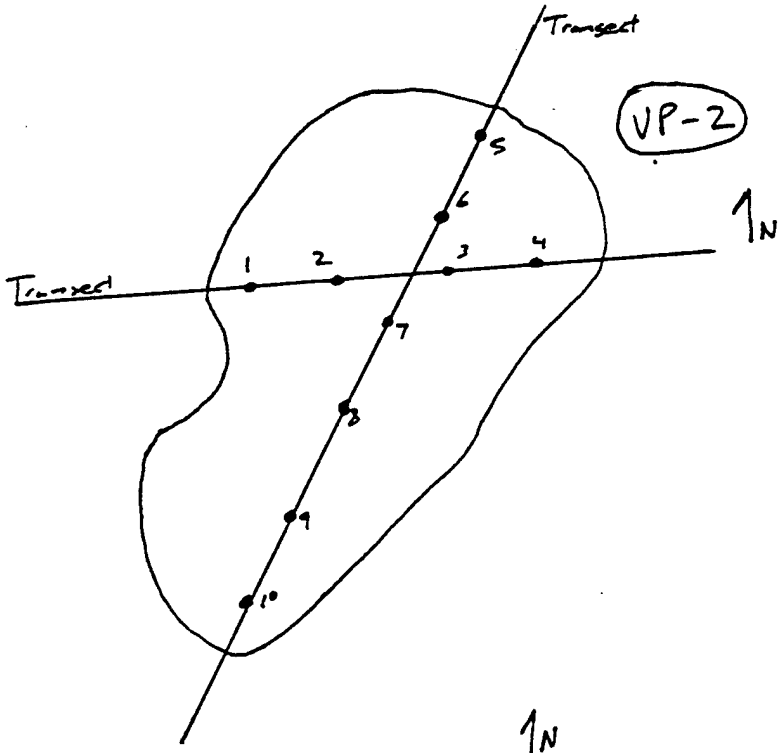
(USF&WS rev. 4/96)

VP-33

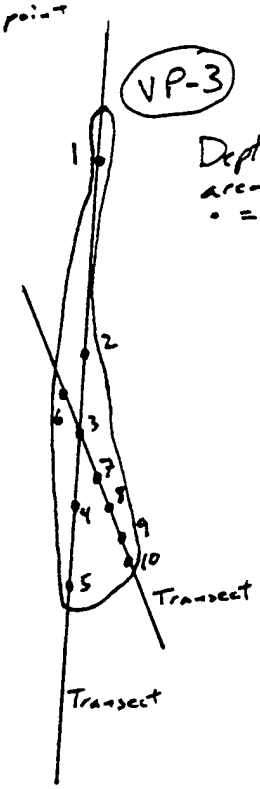
VP-1A

Depth ~ 10cm
area = 0.02 acres
• = sample point

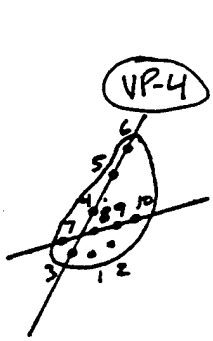




Depth ~ 15cm
area = 0.03
• = sample point

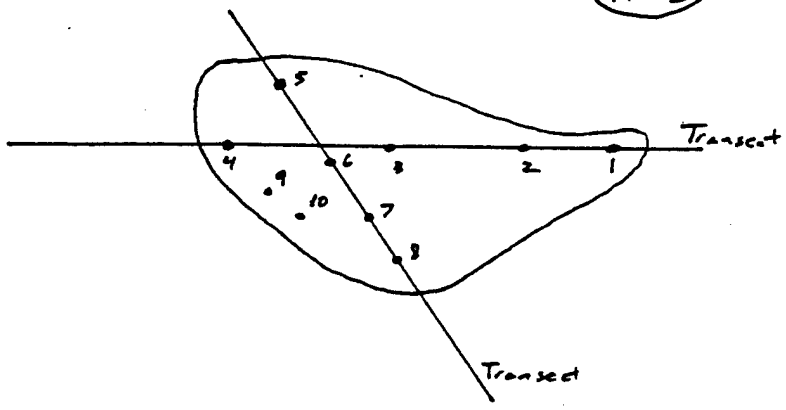


Depth ~ 10cm
area = 0.01
• = sample point



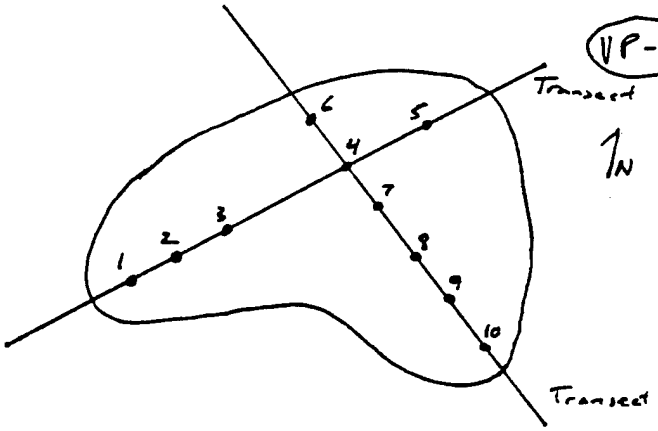
Depth ~ 8cm
area = 0.003 acres
• = sample point

VP-5



Depth ≈ 10cm
Area = 0.01 acres
• = sample point

VP-6

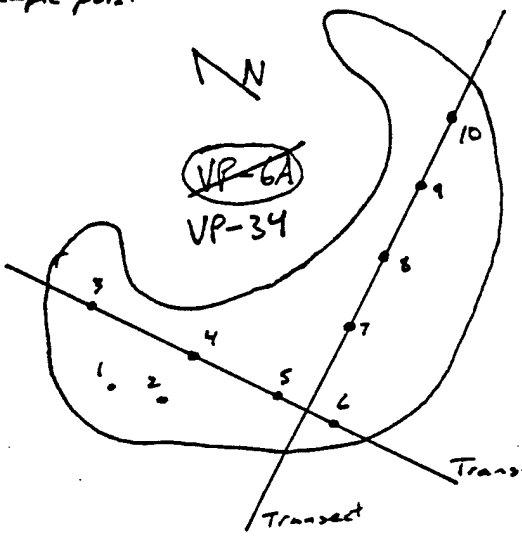


N

Depth ≈ + 30cm
Area = 0.05 acres
• = sample point

N

~~VP-6A~~
VP-34

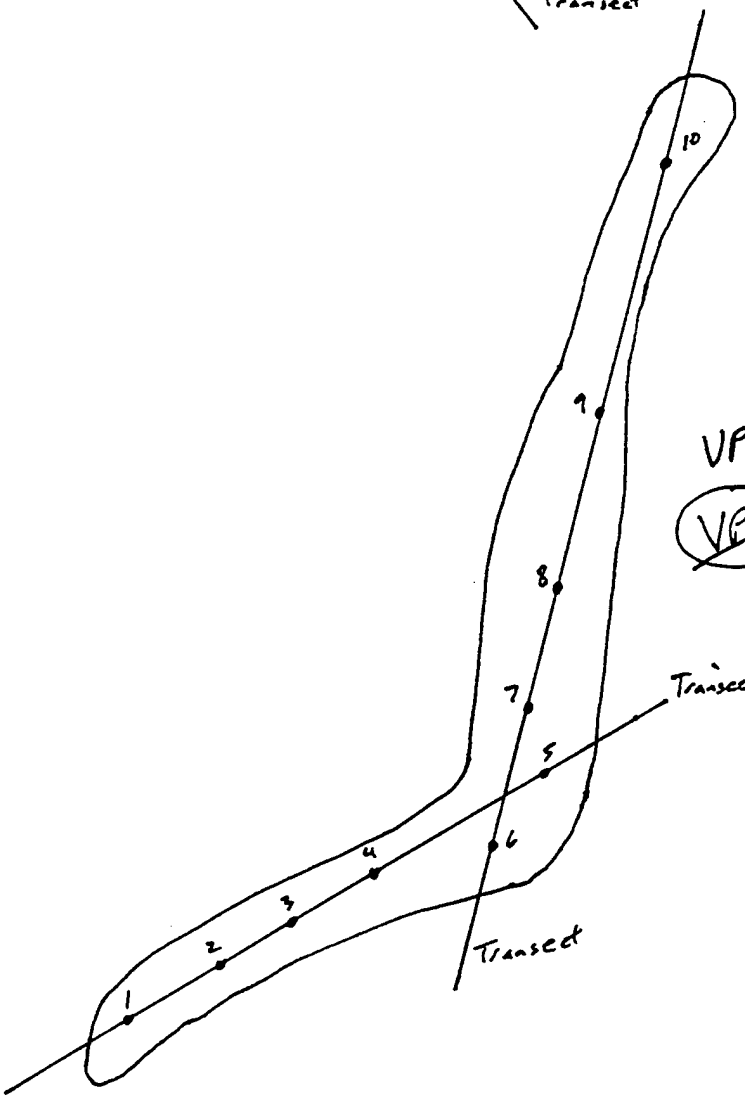


Depth ≈ 1
Area = 0
• = sampl

VP-35

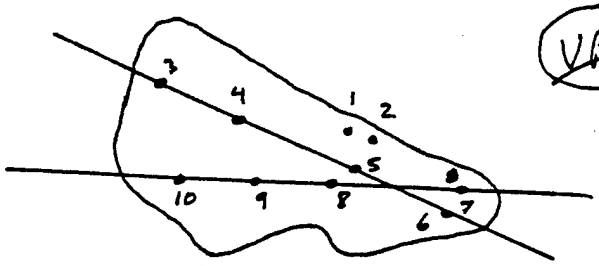
~~VP-6B~~

N



Depth ≈ 8cm
Area = 0.08 acres
• = sample point

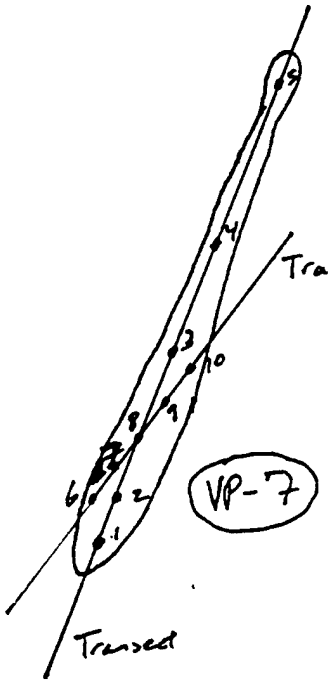
VP-36



~~VP-6C~~

N

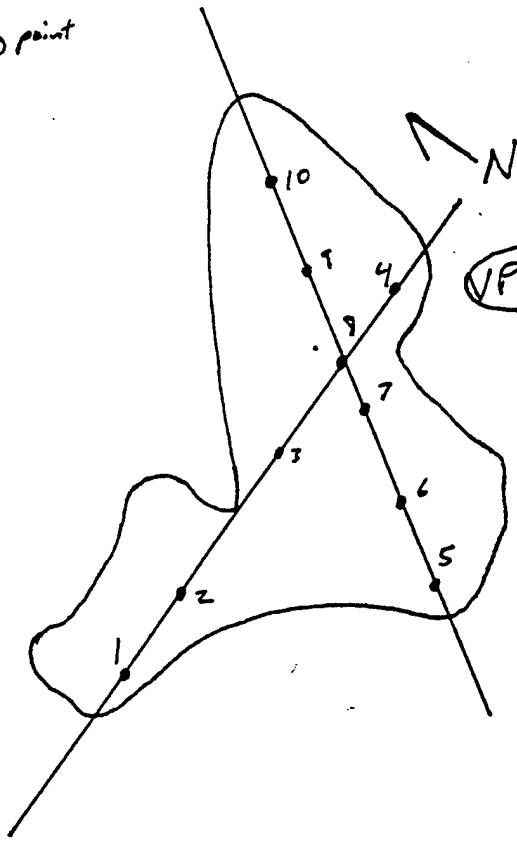
Depth ≈ 15 cm
Area = 1.18 acres
• = sampling points



N

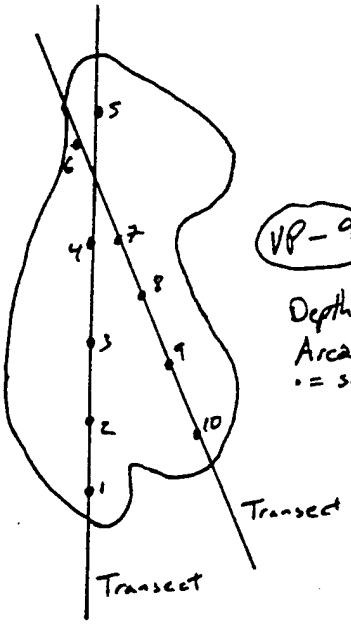
Depth ≈ [redacted]12 cm
Area = 0.02 acres
• = sampling point

VP-7

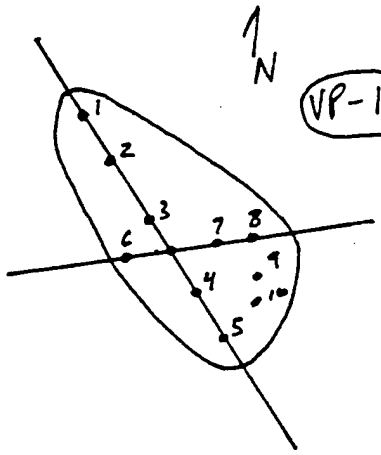


VP-8

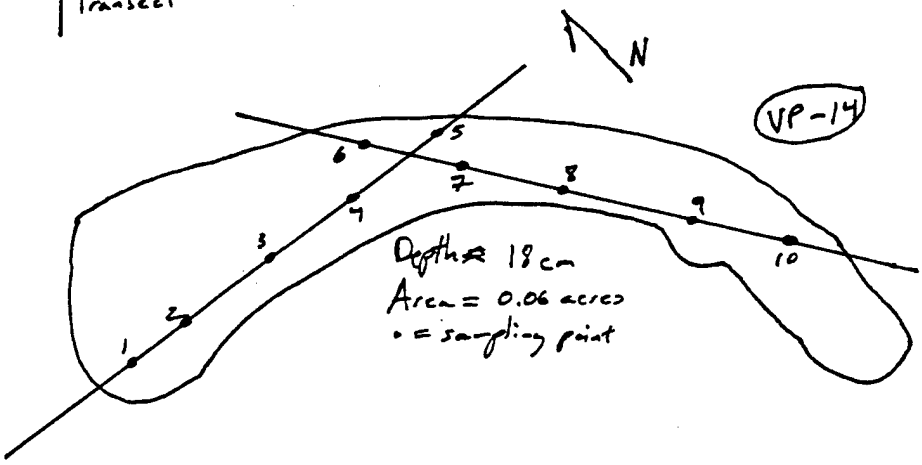
Depth ≈ 10 cm
Area = 0.17 acres
• = sampling point



Depth ≈ 10 cm
Area = 0.10 acres
• = sampling point

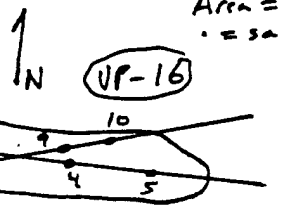


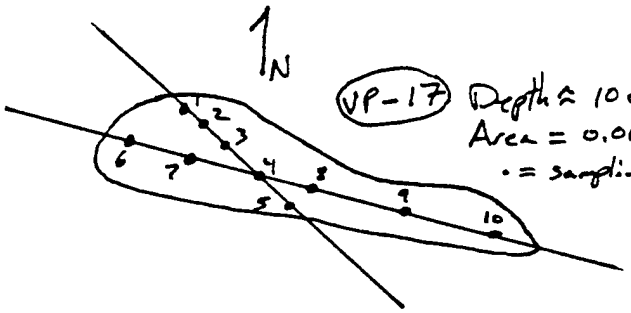
Depth ≈ 15 cm
Area = 0.03 acre
• = sampling point



Depth ≈ 18 cm
Area = 0.06 acres
• = sampling point

Depth ≈ 10 cm
Area = 0.02 a
• = sampling





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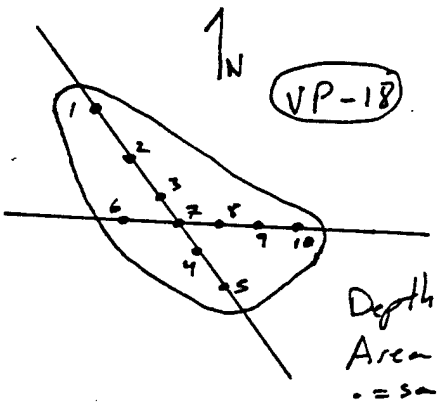
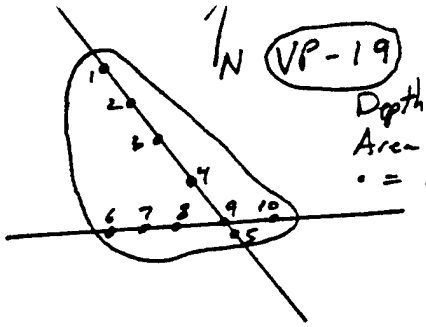
Area = 0.01 acres
• = sampling point



Depth ≈ 12 cm
Area = 0.01 acres
• = sampling point



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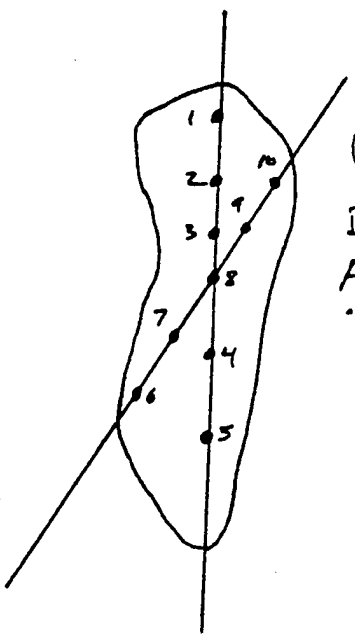
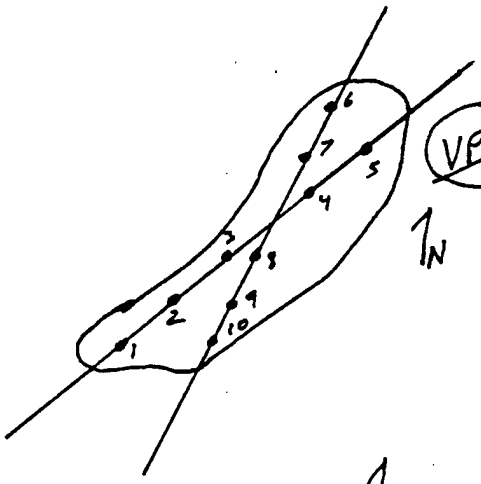
Area = 0.01 acres
• = sample point



Depth ≈ 10 cm
Area = 0.04 acres
• = sample point



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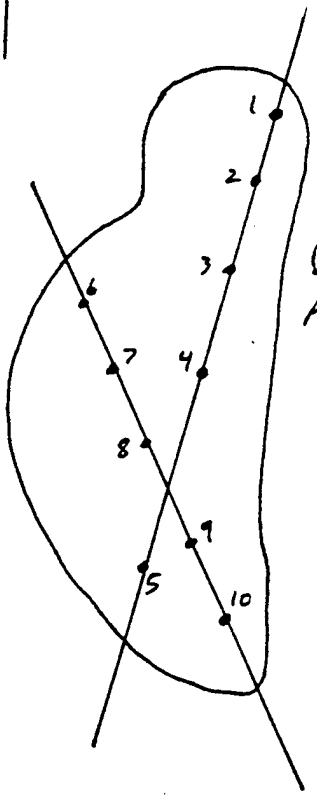
• = sample point



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Area = 0.09 acres
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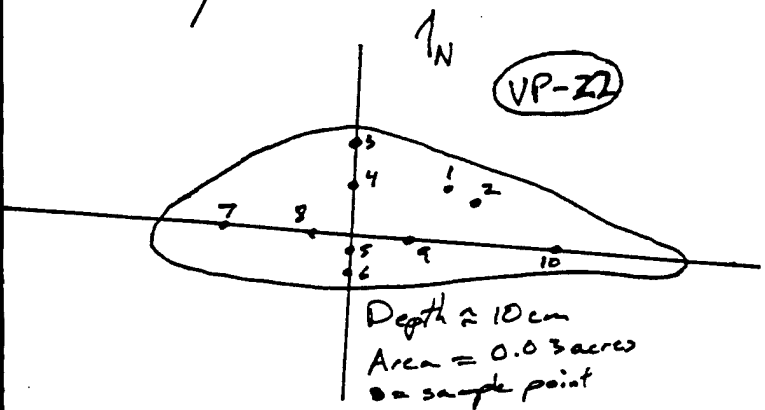
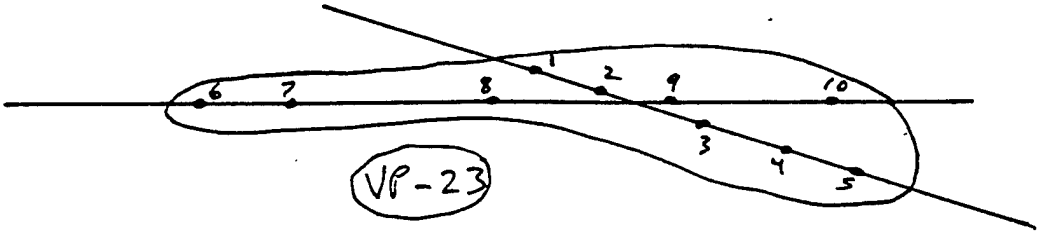
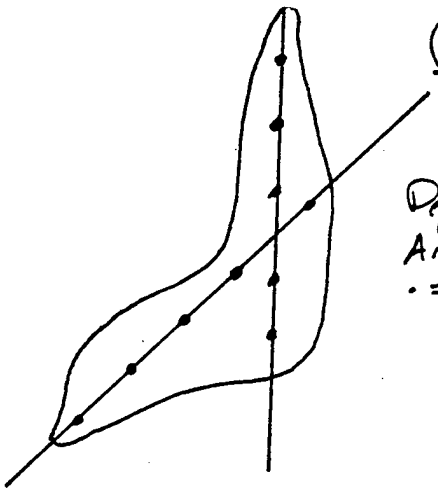


Depth ≈ 10 cm
Area = 0.03 acres
• = sample point



Depth ≈ 10 cm
Area = 0.03 acres
• = sample point

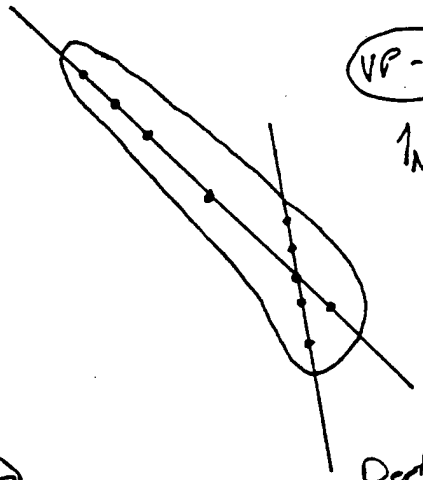
N →



~~VP-25B~~

1N

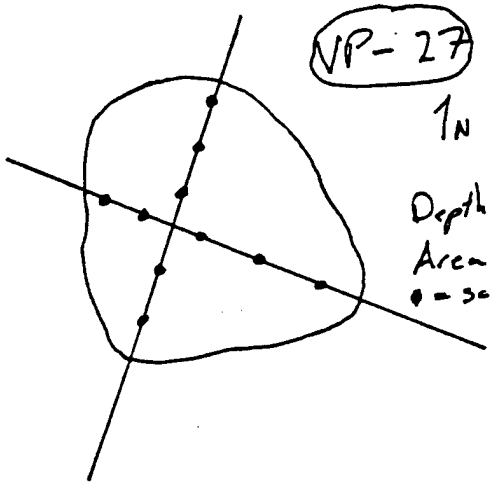
Depth ≈ 15cm
Area = 0.04 acres
• = sample point



VP-24

1N

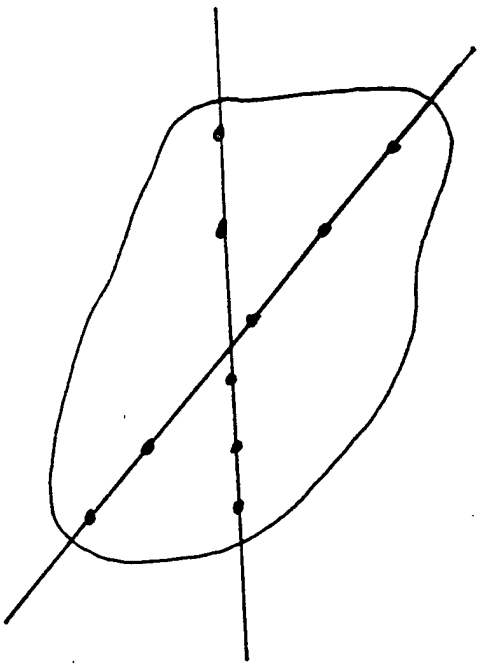
Depth ≈ 10cm
Area = 0.04 ac
• = sample poi



VP-27

1N

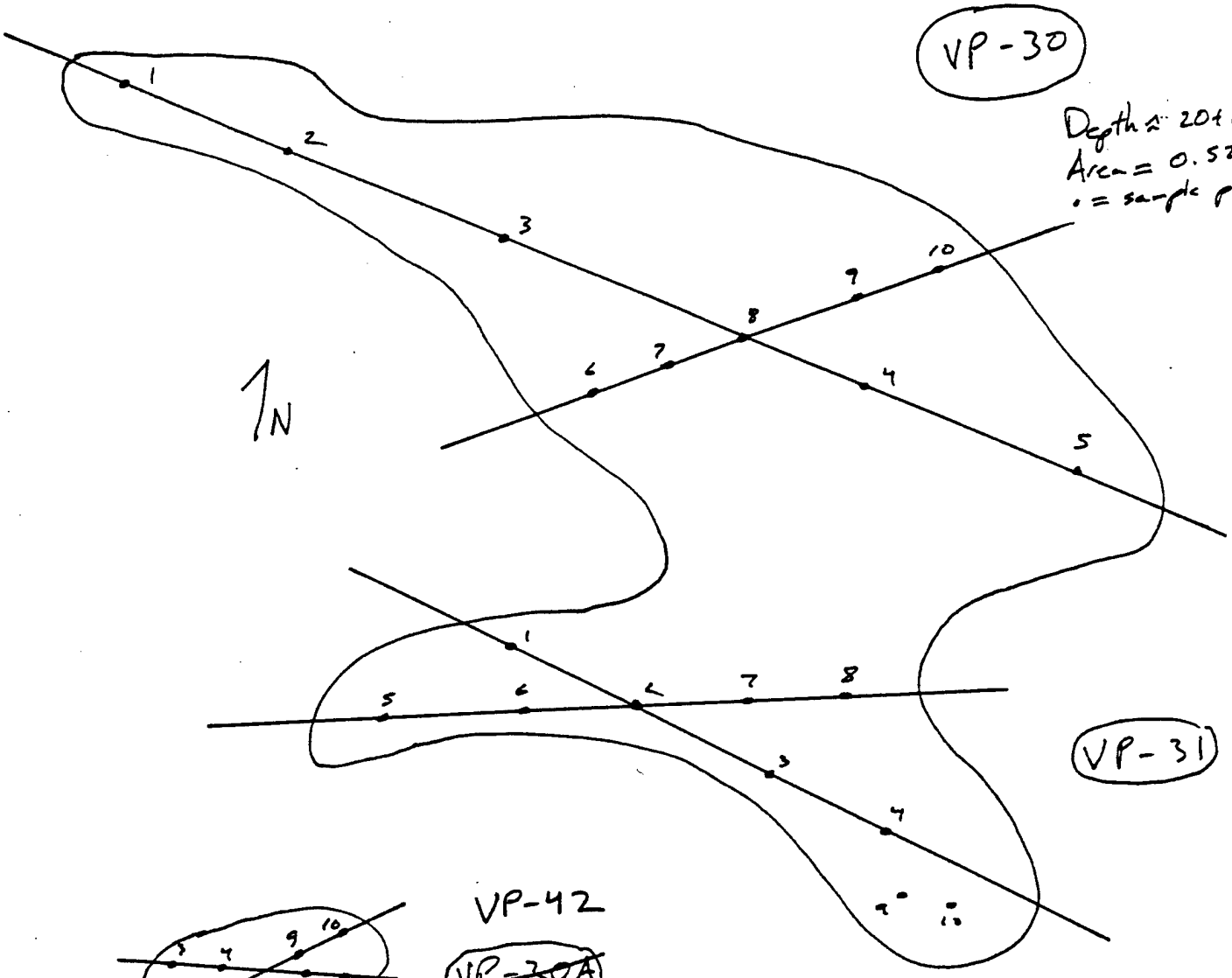
Depth ≈ 8cm
Area = 0.01 acres
• = sample point

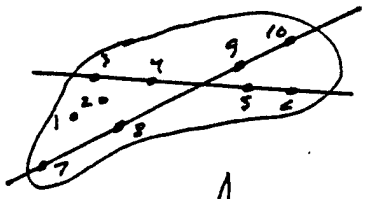


1N

VP-29

Depth ≈ 10cm
Area = 0.02 acres
• = sample point





VP-42

~~VP-30A~~

Depth ≈ 10cm

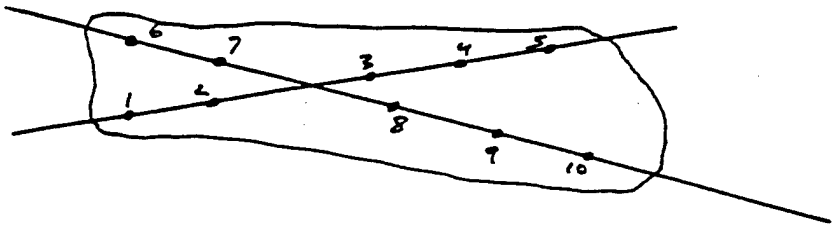
Area = 0.002 acres

• = sample point

N

PH-1

Depth ≈ 10 cm
Area ≈ 0.004 acres
• = sample point



Wetland Delineation on a Proposed Project Site for Travis Air Force Base, California

January 1999

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LIST OF FIGURES

1.0 INTRODUCTION

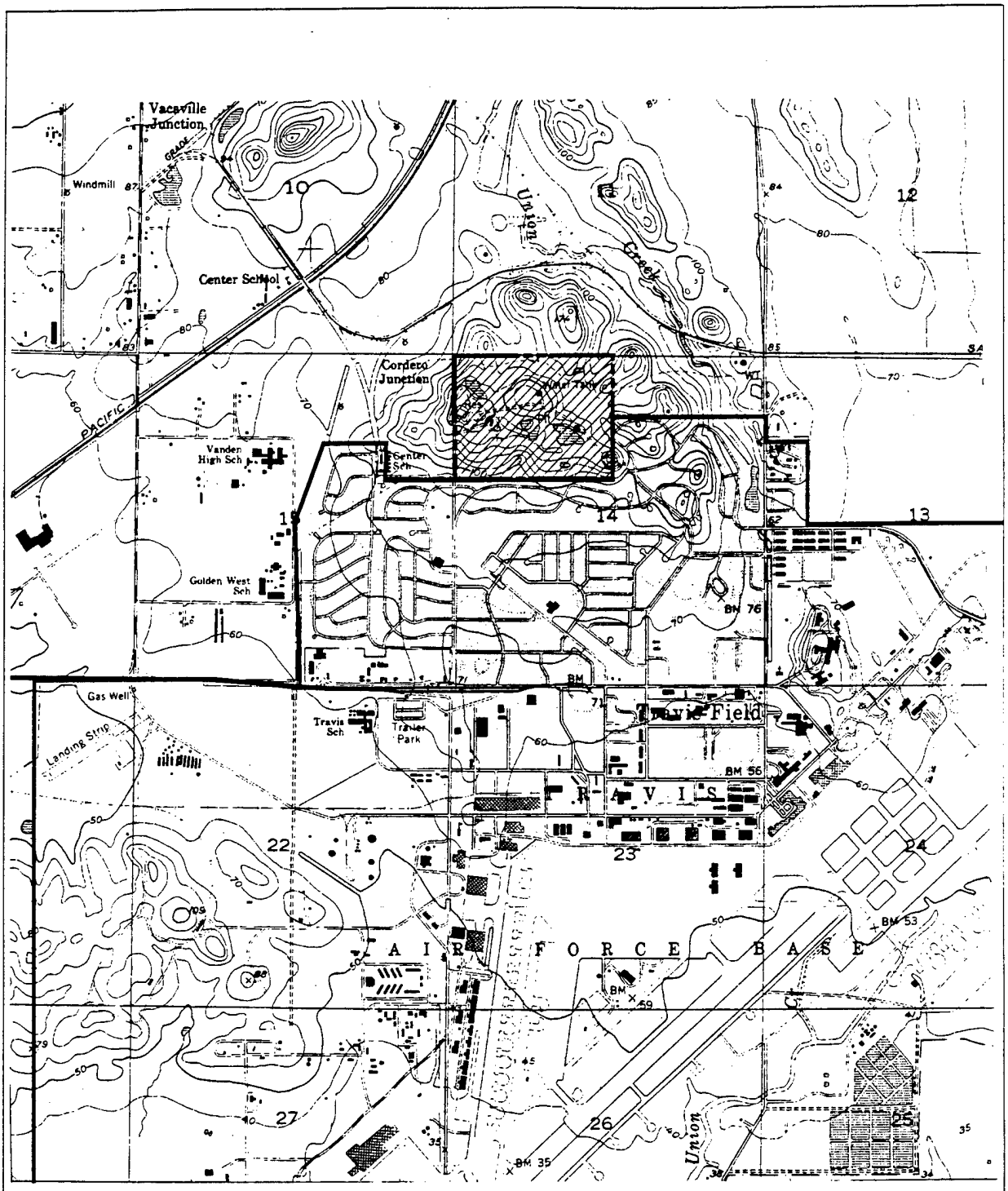
In September 1998, wetlands were delineated at a proposed housing development site for Travis Air Force Base (AFB) south of Fairfield, Solano County, California (Figure 1). The delineation was performed in support of development of a constraints analysis for the proposed construction of housing facilities at the site. The project area is a 101-acre parcel in the Cordero Hills on the north side of Travis AFB between Cordero Junction and North Gate Road (Figure 2). The total wetland acreage at the site is 7.97.

2.0 METHODS

A biologist performed a wetland delineation on September 8 and 16, 1998. Jurisdictional wetlands and other Waters of the United States were delineated according to the routine on-site determination procedure from the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory, 1987). Jurisdictional wetlands are defined for regulatory purposes as areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 Code of Federal Regulations [CFR] Part 328.3, 40 CFR Part 230.3). Sites qualifying for USACE regulatory jurisdiction as wetlands must meet criteria for three parameters: hydric soils, wetland hydrology, and hydrophytic vegetation.

Sample plots were selected within representative wetland communities and associated upland habitats. Representative sample plots were used instead of transects. The 101-acre parcel is predominantly uplands, with small, isolated wetlands scattered across the site. Because transect sampling would be inefficient and because there were only four wetland habitat types with distinct wetland/upland boundaries, representative sample plots were used to characterize that habitat type for the entire site.

The wetland indicator status of plant species present was taken from Reed (1988). Non-hydric soils were inferred from indicator plants and lack of hydrology indicators in the uplands. In accordance with the requirements in the 1987 Wetland Delineation Manual, data forms were completed for each wetland and upland habitat type encountered on the project site (Appendix A).



Burke Property

Travis AFB Boundary

SCALE IN FEET

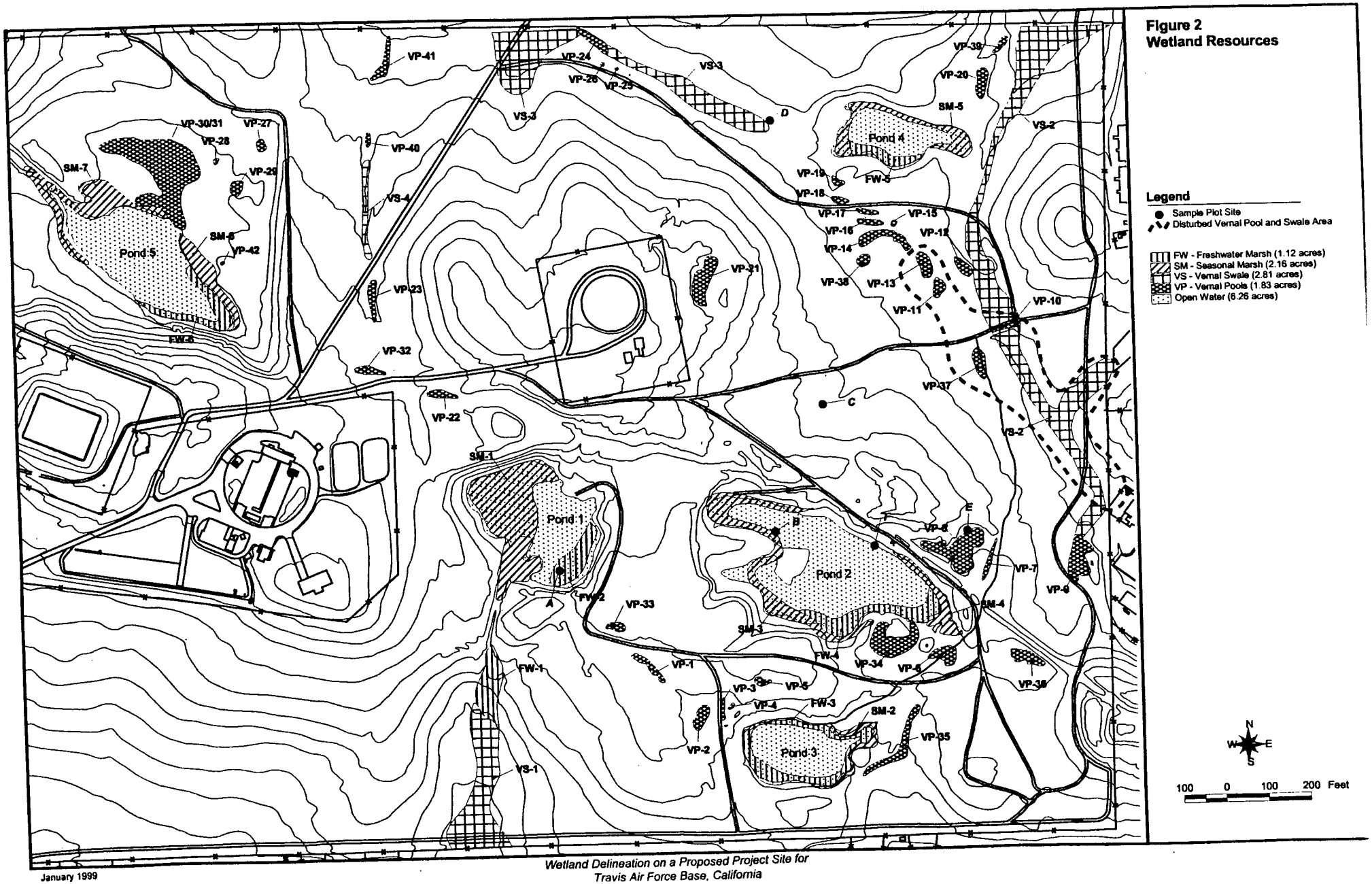
0 1100 2200

Source: USGS 1953 Elmira 7.5' Quadrangle (photorevised 1980)

Vicinity Map

Figure 1

Travis/003



Wetland Delineation on a Proposed Project Site for Travis Air Force Base, California

January 1999

The specific location of each jurisdictional wetland was recorded using global positioning units. The data points were imported into ARC/INFO software to generate a geographic information systems coverage of jurisdictional wetland resources at the proposed project site.

3.0 RESULTS

3.1 SETTING

The proposed project site is a former sandstone quarry that has been abandoned for 25 to 30 years. The site is dominated by upland, non-native weedy grasses and large patches of medusa head grass (*Taeniatherum caput-medusae*), yellow starthistle (*Centaurea solstitialis*), turkey mullein (*Eremocarpus setigerus*), and spiny cocklebur (*Xanthium spinosum*). Seasonal and perennial wetland habitats have developed within borrow areas and excavations resulting from previous quarrying activities. At the top of a central hill in the center of the project site are two large water tanks (Figure 2). These water tanks are flushed infrequently into some of the wetlands on the east side of the project site. The hill slopes are flanked with five stock ponds that occupy the former borrow pits of the quarrying activities and support groves of willows (*Salix* sp.) and Fremont's cottonwoods (*Populus fremontii*). The hill supports a stand of eucalyptus trees (*Eucalyptus* sp.) on the north side. One of these eucalyptus trees bears a large nest. West of the eucalyptus grove is a potable water treatment facility.

Two soil series are represented on the proposed project site (Bates 1977). The southwest quarter (approximately 25 percent) of the property is Dibble-Los Osos clay loam, 2 to 9 percent slopes, and is a Typic Haploxeralf. The large southern swale borders the eastern extent of this soil. The remainder (approximately 75 percent) of the site is Corning gravelly loam, 2 to 15 percent slopes, and is a Typic Palexeralf. All of the wetlands occur on the Corning gravelly loam. Both soil types are moderately well drained, and neither is on the hydric soils list. However, Corning gravelly loam has hydric soil inclusions and depressions (vernal pools) that are ponded more than 14 days per year. This site is currently used for grazing.

3.2 WATERS OF THE UNITED STATES

3.2.1 Wetlands

Four distinct types of wetland habitats, totaling 7.97 acres, were identified within the project site: freshwater marsh, seasonal marsh, vernal pools, and vernal swales (Figure 2; Appendix B). Seasonal marsh habitat is present at the margins of the five ponds. Freshwater marsh is present in the ponds and on the south side of the central hill. Both the isolated freshwater marsh and ponds appear to be supported by a perched water table within the hill. Considering the porosity of the sandstone substrate, capillary action could pull water to the surface.

3.2.1.1 Freshwater Marsh (FW).

Freshwater marsh habitat, defined as palustrine, emergent, persistent wetlands (Cowardin et al. 1979), was dominated by a prevalence of hydrophytic vegetation, including cattails (*Typha latifolia*), sword plant (*Echinodorus berteroi*), umbrella plant (*Cyperus eragrostis*), and duckweed (*Lemna minor*), with an overstory of willow and Fremont's cottonwood. Clover (*Trifolium* sp.) was also present but was not identifiable to species because of an absence of flowers.

During the field visit, all freshwater marsh habitat was inundated from 8 to 15 inches. Soil data were not collected because standing water was present, demonstrating an aquatic moisture regime. In addition to the presence of standing water, other primary and secondary hydrology indicators were present. Freshwater marsh habitat within the ponds all bore drift lines at the pond margins. Water stains were evident on cattail leaves, watermarks were present up to 3 feet above the ground on the trunks of willows and cottonwoods, and the willows bore adventitious roots below the watermarks.

Freshwater marsh on the project site qualifies as a wetland based on the presence of positive indicators of all three wetland parameters. Freshwater marsh is found in all five ponds and on the south side of Pond 1, where the water table is near the surface (see FW-1 on Figure 2). There are 1.12 acres of freshwater marsh within the project boundaries.

3.2.1.2 Seasonal Marsh (SM).

Seasonal marsh habitat occurs with all ponds on the project site. This habitat is defined as intermittently flooded, palustrine, emergent, persistent wetlands (Cowardin et al. 1979) and is dominated by a prevalence of hydrophytic vegetation, including spike rush (*Eleocharis macrostachya*), Bermuda grass (*Cynodon dactylon*), curly dock (*Rumex crispus*), salt grass (*Distichlis spicata*), and pennyroyal (*Mentha pulchella*). Clover, also occurring in the seasonal marsh, was present.

None of the seasonal marsh habitat was ponded during the field visit. However, watermarks were evident on stones and pieces of wood. Similarly, sediment deposits on the surface of stones, drift lines, and water-stained saltgrass and curly dock leaves provided evidence of extended ponding. Therefore, hydric soils were not determined on the basis of soil indicators but inferred from the fact that soils within seasonal marsh are ponded for long or very long duration, which meets the hydric soil definition (Environmental Laboratory 1987). The Wetland Delineation Manual provides that, under atypical situations, the delineator's " . . . basic knowledge of the ecology of the particular community types(s) and environmental conditions associated with the community type" can be used to make a determination (Environmental Laboratory 1987). There are 2.16 acres of seasonal marsh within the project boundaries.

3.2.1.3 Vernal Pool (VP).

Vernal pools were originally delineated by Earth Tech in May 1998 when the pools were still moist (Earth Tech 1998). This habitat is defined as temporarily flooded, palustrine, emergent, persistent wetlands (Cowardin et al. 1979) and is dominated by a prevalence of hydrophytic vegetation, including woollymarbles (*Psilocarphus* sp.), coyote thistle (*Eryngium vaseyi*), hyssop loosestrife (*Lythrum hyssopifolium*), cat's ear (*Hypochoeris* sp.), popcorn flower (*Plagiobothrys* sp.), and hair grass (*Deschampsia danthonioides*). Additional vernal pool species were observed in these pools by Earth Tech during their May 1998 survey, including Fremont's goldfields (*Lasthenia fremontii*), the federally listed as endangered Contra Costa goldfields (*Lasthenia conjugens*), and downingia (*Downingia* sp.).

Primary indicators of wetland hydrology observed were water marks on stones, swales leading into the pools, and drift lines of debris near margins of excurrent swales. In addition, oxidized root channels were observed in cracked soil at the bottoms of the pools. The 1998 Earth Tech report also noted the presence of wetland hydrology in the vernal pools.

Vernal pools are "atypical" situations in summer months because the soils oxidize when they dry; therefore, they do not display typical hydrologic soil indicators (U.S. Department of Agriculture 1996). Hydric soils were not determined on the basis of soil indicators but were inferred from the fact that soils within vernal pools are ponded for a long or very long duration. There are 1.88 acres of vernal pool habitat on the site.

3.2.1.4 Vernal Swale (VS).

Vernal swales are classified as temporary flooded, palustrine, emergent wetlands (Cowardin et al. 1979). The site supports 2.81 acres of vernal swale habitat on the northern and eastern portions of the proposed project area. The vernal swales are dominated by toad rush (*Juncus bufonius*), Italian ryegrass (*Lolium multiflorum*), and cat's ear. Additional plants observed in the vernal swales by Earth Tech (1998) during their late wet season survey included hyssop loosestrife, willow- herb (*Epilobium* spp.), red maids (*Calandrinia ciliata*), knotweeds (*Polygonum* spp.), and docks (*Rumex* spp.). The vegetation meets the hydrophytic vegetation criteria.

Similar to vernal pools, vernal swales do not have hydric soil indicators during the dry season; therefore, hydric soils were inferred under the same rationale used for vernal pools. Steeper portions of the vernal swales bore secondary hydrology indicators in the form of sediment deposits, were slightly incised, and drainage patterns were also evident in the vernal swale systems.

Disturbed Wetlands. Of the habitats discussed above, there is 0.84 acre of vernal pool and vernal swale on the east side of the hill that is subject to

intermittent inundation from the flushing of waterlines at the water tanks on top of the hill and are identified as "disturbed vernal pools and swales" (see Figure 2, VS-2, VP-13, VP-10, VP-11, and VP-37). These vernal pools and swales were observed holding water that was 0.5-meter deep on September 16, 1998. With normal vernal pool and swale hydrology, these habitats would be expected to be dry at this time of year.

3.2.2 Other Waters of the United States

The five ponds have a combined total of 6.26 acres of open water. These ponds dry down during the dry season. The areas exposed by the receding water are unvegetated except for small patches of clover and Bermuda grass near the margins. These ponds are not wetlands because they are unvegetated; however, they are Waters of the United States.

4.0 CONCLUSIONS

Approximately 7.97 acres were delineated as wetlands on the project site, subject to USACE jurisdiction under Section 404 of the Clean Water Act. Acreages per wetland type are summarized in Table 1. This wetland delineation is preliminary and subject to verification by the USACE.

Table 1. Acres of Wetlands and Other Waters of the United States by Habitat Type

Habitat Type	Size (Acres)
Freshwater marsh	1.12
Seasonal marsh	2.16
Vernal pool	1.88
Vernal swale	2.81
Open water	6.26
Total	14.23

5.0 REFERENCES

Bates, L., 1977. Soil survey of Solano County, California. U.S. Department of Agriculture and University of California Agricultural Experiment Station.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. Classification of wetlands and deepwater habitats of the United States. (FWS/OBS-79/31.) Fish and Wildlife Services, Office of Biological Services. U.S. Department of the Interior. Washington, DC.

Earth Tech, 1998. Vernal pool endangered plants survey and vernal pool delineation for northern parcel (Burke property), Travis Air Force Base, California. Colton, California.

Environmental Laboratory, 1987. Corps of Engineers wetlands delineation manual. (Technical Report Y-87-1.) U.S. Army Corps of Engineers Experiment Station. Vicksburg, Mississippi.

Reed, P.B., 1988. National list of plant species that occur in wetlands: California (Region 0). (Biological Report 88 [26.10].) U.S. Fish and Wildlife Service Research and Development. Washington, DC. Prepared for National Wetlands Inventory, U.S. Fish and Wildlife Service, Washington, DC.

U.S. Department of Agriculture, 1996. Field indicators of hydric soils in the United States. A guide for identifying and delineating hydric soils. Natural Resources Conservation Service. Wetland Science Institute and Soils Division, Fort Worth, Texas.

APPENDIX A

DATA FORMS

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Travis
Applicant/Owner: Travis Air Force Base
Investigator: D. C. Rogers

Date: Sept 8 1998
County: Solano
State: CA

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? (Yes) No
Is the area a potential Problem Area? Yes (No)
(If needed, explain on reverse.)

Community ID: Freshwater Marsh
Transect ID: ____
Plot ID: A

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Populus fremontii	ARB	FACW
2. Salix laevigata	ARB	FACW
3. Eleocharis macrostachya	Herb	OBL
4. Typha latifolia	Herb	OBL
5. Rumex crispus	Herb	FACW-
6. Xanthium spinosum	Herb	FAC+
7. Cyperus eriogonii	Herb	FACW
8. Trifolium sp.	Herb	NI
9. Lemna minor	Herb	OBL
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 88%

Remarks: Trifolium was not identifiable due to a lack of flowers.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
X No Recorded Data Available

Field Observations:
Depth of Surface Water: 8 - 15 (in.)
Depth to Free Water in Pit: NA (in.)
Depth to Saturated Soil: NA (in.)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
X Saturated in Upper 12 Inches
X Water Marks
X Drift Lines
X Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
X Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
X Other (Explain in Remarks)

Remarks: Adventitious roots were present on Salix trunks up to 3 feet above the surface. Water marks were apparent on all tree trunks.

SOILS

Map Unit Name (Series and Phase): Corning Gravelly Loam, 2-15% Slopes Drainage Class: Moderately well drained

Taxonomy (Subgroup): Typic Palexeralfs

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- X Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		
Hydric Soils Present?	(Yes)	No	Is this Sampling Point Within a Wetland?	(Yes) No

Remarks: Fresh water marsh in borrow pits from abandoned sandstone mining operation. Borrow pits are currently used as water sources for cattle. (Palustrine, emergent, persistant wetland).

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Travis
Applicant/Owner: Travis Air Force Base
Investigator: D.C. Rogers

Date: Sept. 8, 1998
County: Solano
State: CA.

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? (Yes) No
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID: Seasonal Marsh
Transect ID: ____
Plot ID: B

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Eleocharis macrostachya	Herb	OBL
2. Trifolium sp.	Herb	NI
3. Mentha pulchella	Herb	OBL
4. Cynodon dactylon	Herb	FAC
5. Rumex crispus	Herb	FACW-
6. Distichlis spicata	Herb	FACW
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 83%

Remarks: Trifolium sp. not identified due to lack of flowers.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)
Depth to Free Water in Pit: NA (in.)
Depth to Saturated Soil: NA (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
X Water Marks
X Drift Lines
X Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
X Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Corning Gravelly Loam, 2-15% Slopes Drainage Class: Moderately well drained

Taxonomy (Subgroup): Typic Palexeralfs

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- X Other (Explain in Remarks)

Remarks: Soils were not examined. Hydric soils were inferred based on professional experience with seasonal marsh habitats + ecology

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

(Circle)
Is this Sampling Point Within a Wetland? (Yes) No

Remarks: Seasonal Marsh. (Intermittently flooded, palustrine emergent, persistant wetland).

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Travis Applicant/Owner: Travis Air Force Base Investigator: D. C. Rogers	Date: Sept. 8, 1998 County: Solano State: CA
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? (Yes) No Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Upland Transect ID: ____ Plot ID: C

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Taeniatherum caput-medusae	Herb	UPL	9.		
2. Xanthium spinosum	Herb	FAC-	10.		
3. Centaurea solstitialis	Herb	UPL	11.		
4. Bromus	Herb	UPL	12.		
5. Erodium botrys	Herb	UPL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 0%

Remarks: Upland

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: NA (in.)

Depth to Saturated Soil: NA (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Not examined

SOILS

Map Unit Name (Series and Phase): Corning Gravelly Loam, 2-15% Slopes Drainage Class: Moderately well drained

Taxonomy (Subgroup): Typic Hapludalfs

Field Observations Confirm Mapped Type? (Yes) No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Not examined

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

Is this Sampling Point Within a Wetland? Yes (No) (Circle)

Remarks: Upland

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Travis
Applicant/Owner: Travis Air Force Base
Investigator: D.C. Rogers

Date: Sept. 8, 1998
County: Solano
State: CA.

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? (Yes) No
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID: Vernal swale
Transect ID:
Plot ID: D

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Juncus bufonius	Herb	FACW+
2. Hypochaeris sp.	Herb	—
3. Lolium multiflorum	Herb	FAC
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 67%

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
X No Recorded Data Available

Field Observations:
Depth of Surface Water: 0 (in.)
Depth to Free Water in Pit: NA (in.)
Depth to Saturated Soil: NA (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
X Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Late summer survey - wetland hydrology evident from sediment + debris deposits and slight incising at one margin.

SOILS

Map Unit Name (Series and Phase): Corning Gravelly Loam, 2-15% Slopes Drainage Class: Moderately well drained

Taxonomy (Subgroup): Typic Palexeralfs

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- X Other (Explain in Remarks)

Remarks: Soils were not examined because seasonal swales often do not exhibit hydric indicators during the dry season. Hydric soils were inferred based on professional experience with vernal swale ecology.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		
Hydric Soils Present?	(Yes)	No		
			Is this Sampling Point Within a Wetland?	(Yes) No

Remarks: Seasonal (vernal) swale. (Temporary flooded palustrine emergent wetland).

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Travis
Applicant/Owner: Travis Air Force Base
Investigator: D.C. Rogers

Date: Sept. 8 1998
County: Solano
State: CA

Do Normal Circumstances exist on the site? (Yes) No
Is the site significantly disturbed (Atypical Situation)? (Yes) No
Is the area a potential Problem Area? (Yes) No
(If needed, explain on reverse.)

Community ID: Vernal Pool
Transect ID: ____
Plot ID: E

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Eleocharis macrostachya	Herb	OBL
2. Eryngium vaseyi	Herb	FACW
3. Lithyrum hyssopifolium	Herb	FACU
4. Psilocarphus sp.	Herb	OBL
5. Plagiobothrys sp.	Herb	NI
6. Hypochaeris sp.	Herb	—
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 67%

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
X No Recorded Data Available

Field Observations:

Depth of Surface Water: 0 (in.)
Depth to Free Water in Pit: NA (in.)
Depth to Saturated Soil: NA (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
X Water Marks
X Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Oxidized root channels observed in cracked soil

SOILS

Map Unit Name (Series and Phase): Corning Gravelly Loam, 2-15% Slopes Drainage Class: Moderately well drained

Taxonomy (Subgroup): Typic Palexeralfs

Field Observations
Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- X Other (Explain in Remarks)

Remarks: Soils were not examined. Vernal pools doesn't exhibit hydric soil indicators during the dry season. Hydric soils were inferred based on professional experience with vernal pool ecology.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No (Circle)		(Circle)
Wetland Hydrology Present?	(Yes)	No		
Hydric Soils Present?	(Yes)	No	Is this Sampling Point Within a Wetland?	(Yes) No

Remarks: Vernal Pool. (Temporary flooded, palustrine, emergent persistant wetland).

Approved by HQUSACE 3/92

APPENDIX B

INDIVIDUAL ACREAGES FOR WETLANDS AND OTHER WATERS OF THE UNITED STATES

Appendix B. Individual Acreages for Wetlands and Other Waters of the United States

Habitat Type	Site	Acreage
Freshwater marsh (FW)	FW-1	0.18
	FW-2	0.16
	FW-3	0.27
	FW-4	0.26
	FW-5	0.09
	FW-6	0.16
	Total freshwater marsh	**1.12**
Seasonal marsh (SM)	SM-1	0.77
	SM-2	0.10
	SM-3	0.43
	SM-4	0.12
	SM-5	0.22
	SM-6	0.17
	SM-7	0.35
	Total seasonal marsh	**2.16**
Vernal swale (VS)	VS-1	0.56
	VS-2	1.45
	VS-3	0.73
	VS-4	0.07
	Total vernal swale	**2.81**
Vernal pool (VP)	VP-1	0.03
	VP-2	0.03
	VP-3	0.01
	VP-4	0.003
	VP-5	0.01
	VP-6	0.05
	VP-7	0.02
	VP-8	0.17
	VP-9	0.10
	VP-10	0.02
	VP-11	0.02
	VP-12	0.03
	VP-13	0.04
	VP-14	0.06
	VP-15	0.004
	VP-16	0.02
	VP-17	0.01

Appendix B. Individual Acreages for Wetlands and Other Waters of the United States

Habitat Type	Site	Acreage
	VP-18	0.01
	VP-19	0.01
	VP-20	0.04
	VP-21	0.09
	VP-22	0.03
	VP-23	0.03
	VP-24	0.04
	VP-25	0.002
	VP-26	0.002
	VP-27	0.01
	VP-28	0.003
	VP-29	0.02
	VP-30/31[(a)]	0.52
	VP-32	0.03
	VP-33	0.02
	VP-34	0.14
	VP-35	0.08
	VP-36	0.05
	VP-37	0.04
	VP-38	0.02
	VP-39	0.01
	VP-40	0.01
	VP-41	0.04
	VP-42	0.002
	Total vernal pool	**1.88**
Open water	Pond 1	1.30
	Pond 2	2.05
	Pond 3	0.80
	Pond 4	0.71
	Pond 5	1.40
	Total open water	**6.26**
	Total all habitat types	**14.23**

Note: (a) Site 30/31 was originally delineated as two separate sites (Earth Tech 1998), but no separation between the two was apparent at the time of this study. Therefore, these two sites herein are treated as a single site.

Assessment of Giant Garter Snake (*Thamnophis couchi gigas*) Habitat on a Proposed Project Site for Travis Air Force Base, California

January 1999

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LIST OF FIGURES

1.0 INTRODUCTION

In September 1998, a survey for habitat of the giant garter snake (*Thamnophis couchi gigas*) was conducted at a proposed housing development site for Travis Air Force Base (AFB) south of Fairfield, Solano County, California (Figure 1). The survey was performed in support of development of a constraints analysis for the proposed construction of housing facilities at the site. The area surveyed was a 101-acre parcel in the Cordero Hills on the north side of Travis AFB between Cordero Junction and North Gate Road.

2.0 METHODS

Field surveys were conducted on September 8 and 16, 1998. Biologists evaluated habitat conditions and assessed the potential for occurrence of the giant garter snake. Surveys for this taxon consisted of walking the site while recording habitat characteristics and the presence of wildlife species. Intensive searches for giant garter snakes were conducted along freshwater marsh habitat.

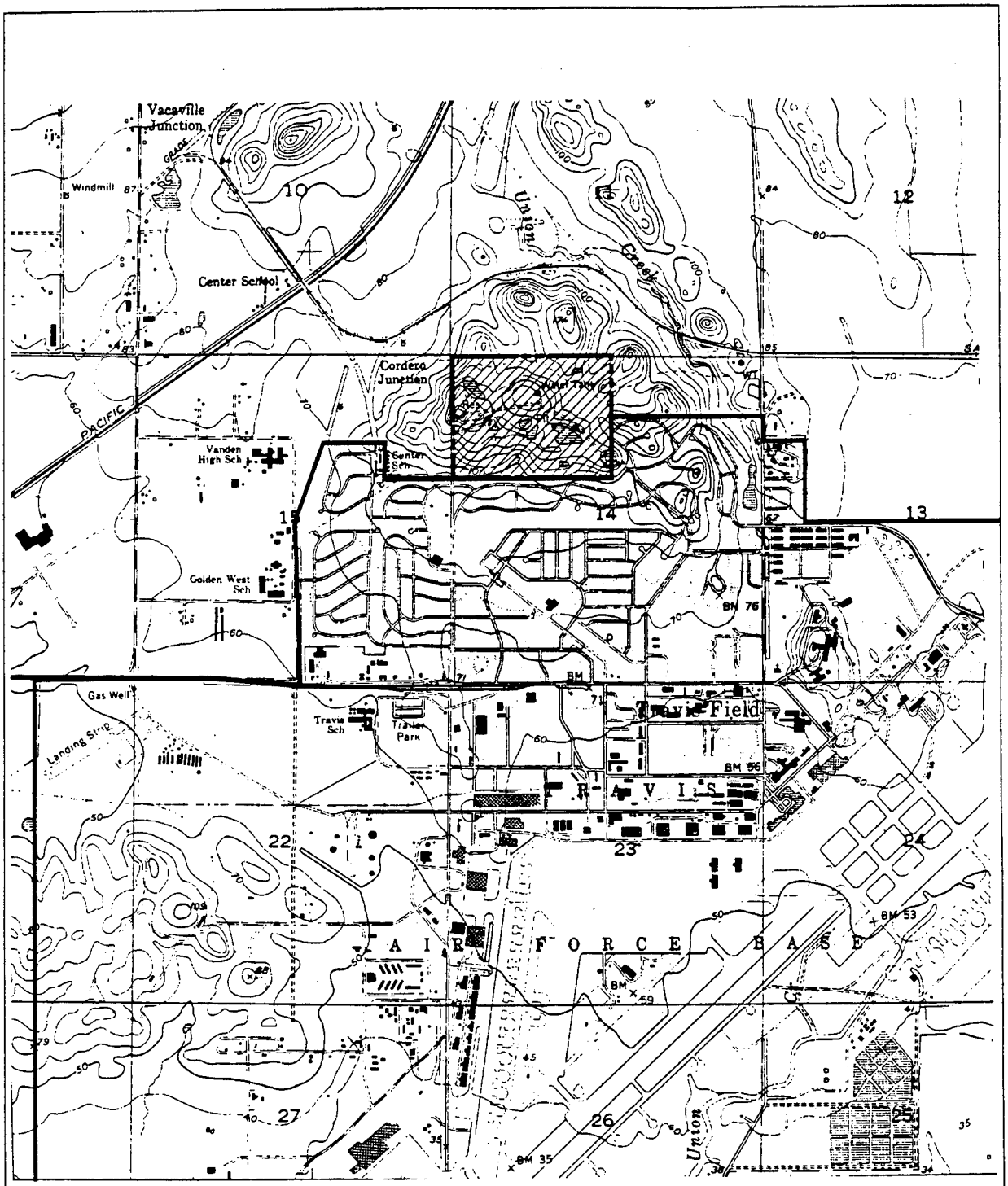
3.0 RESULTS

3.1 SETTING

The proposed project site is a former sandstone quarry that has been abandoned for 25 to 30 years. The site is dominated by upland, non-native weedy grasses and large patches of medusa head grass (*Taeniatherum caput-medusae*), yellow starthistle (*Centaurea solstitialis*), turkey mullein (*Eremocarpus setigerus*), and spiny cocklebur (*Xanthium spinosum*). Seasonal and perennial wetland habitats have developed within borrow areas and excavations resulting from previous quarrying activities. At the top of a central hill in the center of the project site are two large water tanks that are flushed infrequently into some of the wetlands on the east side of the project site. The hill slopes are flanked with five stock ponds that occupy the former borrow pits of the quarrying activities and support groves of willows (*Salix* sp.) and Fremont's cottonwoods (*Populus fremontii*). The hill supports a stand of eucalyptus trees (*Eucalyptus* sp.) on the north side. West of the eucalyptus grove is a potable water treatment facility. The site is currently used for grazing.

3.2 GIANT GARTER SNAKE HABITAT

No giant garter snakes were detected during the surveys. This snake is federally and state listed as a threatened species. Historically, it was found from Butte County to Kern County (Hansen and Brode 1980). This snake is endemic to contiguous lowland marsh and swamp habitat, including sloughs, ponds, marshes, streams, and irrigation canals on the Central Valley floor. Giant garter snakes feed on small fish, tadpoles, and frogs.



Burke Property

Travis AFB Boundary

SCALE IN FEET

0 1100 2200

Source: USGS 1953 Elmira 7.5' Quadrangle (photorevised 1980)

Travis/003

Vicinity Map

Figure 1

The U.S. Fish and Wildlife Service recognizes 13 populations of giant garter snakes. The closest known populations to the project site are along the eastern fringes of the Sacramento-San Joaquin Delta from Laguna Creek Grove to Stockton (20 miles from the project site), and along the western border of the Yolo Bypass (15 miles from the project site). The giant garter snake has been extirpated from the southern one-third of its former range and is known only from scattered localities in the Sacramento Valley. Habitat loss due to wetland reclamation and agricultural development has reduced the range of this snake (Hansen and Brode 1980). Its decline is attributed to habitat fragmentation and loss, introduction of predatory fish and bullfrogs, agricultural and urban development, and flood control projects (Treanor 1983). Existing habitat continues to be degraded by toxic chemicals associated with agricultural and urban runoff.

The freshwater marsh habitat at the study site is discontinuous with existing giant garter snake habitat and has existed only for about 20 years; therefore, it has never been contiguous with other giant garter snake habitats. It is outside of the species' historic distribution, and no individuals were observed at the project site. For these reasons, the study site is not considered to harbor any giant garter snake habitat.

4.0 CONCLUSIONS

No giant garter habitat is present on the project site.

5.0 REFERENCES

Hansen, G.E., and J.M. Brode, 1980. Status of the giant garter snake, *Thamnophis couchi gigas* (Fitch). (Inland Fisheries Endangered Species Program Special Publication 80-5.) California Department of Fish and Game. Sacramento, California.

Treanor, R.R., 1983. Contributions to the biology of the bullfrog, *Rana catesbeiana* Shaw, in California. (Administrative Report No. 83-1.) California Department of Fish and Game, Inland Fisheries Branch, Rancho Cordova, California.

Assessment of Potential Golden Eagle (*Aquila chrysaetos*) Nesting on a Proposed Project Site for Travis Air Force Base, California

January 1999

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LIST OF FIGURES

1.0 INTRODUCTION

In September 1998, a survey for nests of the golden eagle (*Aquila chrysaetos*) was conducted at a proposed housing development site for Travis Air Force Base (AFB) south of Fairfield, Solano County, California (Figure 1). The survey was performed in support of development of a constraints analysis for the proposed construction of housing facilities at the site. The area is a 101-acre parcel in the Cordero Hills on the north side of Travis AFB between Cordero Junction and North Gate Road.

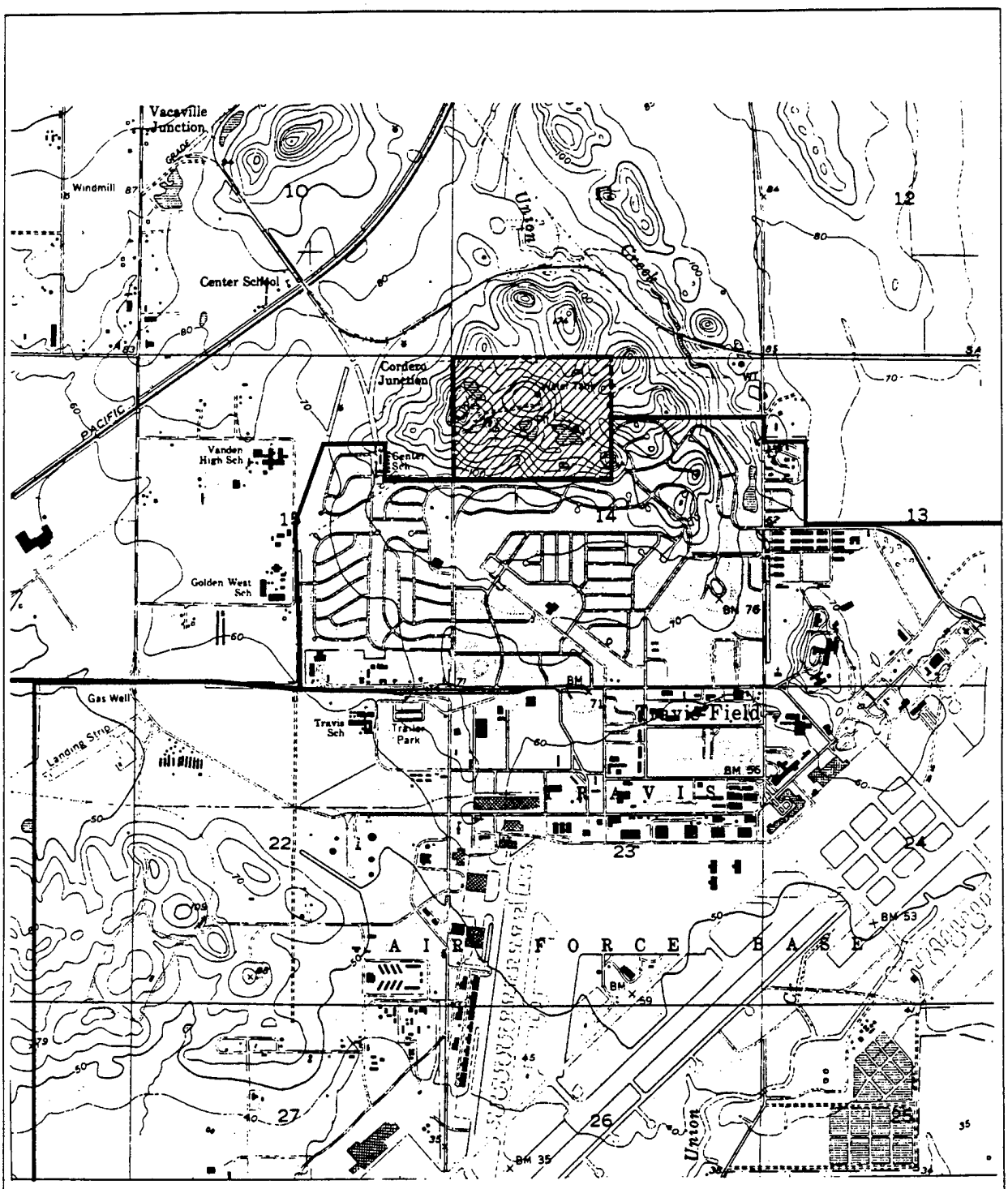
2.0 METHODS

Field surveys were conducted on September 8 and 16, 1998. Biologists evaluated habitat conditions and assessed the potential for golden eagle nests to occur at the site. Surveys included walking the site while recording habitat characteristics and the presence of wildlife species. Intensive searches for golden eagle nests were conducted around the water towers and trees on the site.

3.0 RESULTS

3.1 SETTING

The proposed project site is a former sandstone quarry that has been abandoned for 25 to 30 years. The site is dominated by upland, non-native weedy grasses and large patches of medusa head grass (*Taeniatherum caput-medusae*), yellow starthistle (*Centaurea solstitialis*), turkey mullein (*Eremocarpus setigerus*), and spiny cocklebur (*Xanthium spinosum*). Seasonal and perennial wetland habitats have developed within borrow areas and excavations resulting from previous quarrying activities. At the top of a central hill in the center of the project site are two large water tanks, which are flushed infrequently into some of the wetlands on the east side of the project site. The hill slopes are flanked with five stock ponds that occupy the former borrow pits of the quarrying activities and support groves of willows (*Salix* sp.) and Fremont's cottonwoods (*Populus fremontii*). The hill supports a stand of eucalyptus trees (*Eucalyptus* sp.) on the north side. One of these eucalyptus trees bears a large nest. West of the eucalyptus grove is a potable water treatment facility. The site is currently used for grazing.



Vicinity Map

Figure 1

3.2 NESTING HABITAT

No golden eagles, or evidence to indicate their presence, were observed on the project site during the field survey. The golden eagle is a state species of special concern and is protected under the federal Bald and Golden Eagle Protection Act. The breeding range of the golden eagle includes the entire western United States. In California, the breeding range includes the Coast Ranges, Sierra Nevada foothills, Great Basin, Transverse Ranges, and the mountains and deserts of southern California. In the interior central Coast Ranges, golden eagles inhabit grassland, shrubland, and oak savannah communities common to this region.

Thelander (1974) identified 64 active golden eagle territories in the central Coast Ranges, and estimated that a minimum of 500 pairs of golden eagles nested in California during the early 1970s. Results of a 1985 California Department of Fish and Game survey suggested that populations in areas less disturbed by human encroachment or other human activities, such as portions of the central Coast Ranges, had remained relatively stable since Thelander's (1974) surveys (Schlorff 1985).

Although the Coast Range breeding population appears to be stable (Thelander 1974, Hunt 1996), statewide populations have declined (Thelander 1974), especially near human population centers. The primary cause for the reduction in golden eagle numbers in California is the loss of foraging habitat due to conversion of native habitats to agriculture and expansion of urban centers.

In the interior central Coast Ranges, golden eagles forage primarily in grazed grasslands, open shrublands, and oak savannah communities supporting large populations of ground squirrels and lagomorphs (i.e., rabbits). Golden eagles use cliff ledges, rocky outcrops, and a variety of tree species as nest substrates (Johnsgard 1990). Although most nesting in the western United States occurs on cliff ledges, trees are used in areas where availability of suitable cliff sites is a limiting factor (Bruce et al. 1982).

In the interior central Coast Ranges, suitable cliff nesting habitat is uncommon, and most known golden eagle nests are found in trees (Hunt 1994). The nests of 14 of 17 golden eagle pairs observed in Alameda, Contra Costa, and Santa Clara counties in the central Coast Ranges were built in trees (Carney 1954). The dominant tree species available, and the species most commonly used by golden eagles in the central Coast Ranges, are the blue oak (*Quercus douglasii*), interior live oak (*Q. wislizenii*), and coast live oak (*Q. agrifolia*). Nests have also been reported in foothill pine (*Pinus sabiniana*) and eucalyptus (*Eucalyptus* sp.). In the central Coast Ranges, golden eagle tree nests are usually found midway up steep slopes (Hunt 1994) that provide a panoramic view of nearby foraging habitat from the nest and may provide important wind lift for flight (Dixon 1937).

The project site supports a stand of eucalyptus (*Eucalyptus* sp.) trees on the south side of the hill, overlooking one of the Travis AFB housing facilities. A single large nest is present in one of the eucalyptus trees. The nest is close to base housing facilities, not typical of preferred golden eagle nesting habitat. The nest, approximately 80 feet up in the tree and 5 feet in diameter, appears to be a raptor's nest. Feathers collected from the base of the tree belonged to a crow or a raven. The contents of the uninhabited nest were examined. Items included feathers that were identified by an ornithologist as being from a variety of small bird species and a corvid. Some feathers appeared to belong to a raptor, although the striped pattern was not indicative of golden eagle feathers. A vertebra belonging to a small mammal was also found.

It is not likely that this nest is currently used by golden eagles. It is more probable that this nest was at one time a raptor's nest, but was most recently used by ravens, which are commonly known to nest throughout the Montezuma and Portero Hills areas. Because the trees are not on a steep cliff, are close to human habitation, and the nearest reported nest site is in the Montezuma Hills overlooking the Sacramento River (Jones & Stokes Associates file information), this site appears to be an unlikely location for any future nesting activity.

4.0 CONCLUSIONS

No golden eagle nests were observed at the time of the field surveys. Considering the extensive human activity and that any potential nest site trees are not on steep slopes, it appears unlikely that golden eagles will nest on the project site in the foreseeable future.

5.0 REFERENCES

Bruce, A.M., R.J. Anderson, and G.T. Aulen, 1982. Observations of golden eagles nesting in western Washington. Raptor Research 16(4):132-134.

Carney, S.K, 1954. Food habits of nesting golden eagles in the Coast Ranges of California. Condor 56(1):3-12.

Dixon, J.B, 1937. The golden eagle in San Diego County, California. Condor 39(2):49-56.

Hunt, G., 1994. A pilot golden eagle population project in the Altamont Pass wind resource area, California. Predatory Bird Research Group. University of California, Santa Cruz. Prepared for National Renewable Energy Laboratory, Golden, Colorado.

Johnsgard, P.A., 1990. Hawks, eagles, and falcons of North America: biology and natural history. Smithsonian Institution Press, Washington, DC.

Schlorff, R.W., 1985. Golden eagle status review. (Nongame Wildlife Investigations W-65-R-2, Job No. II-17.) California Department of Fish and Game, Sacramento, California.

Thelander, C.G., 1974. Nesting territory utilization by golden eagles (*Aquila chrysaetos*) in California during 1974. Wildlife Management Branch Administrative Report No. 74-7. California Department of Fish and Game, Nongame Wildlife Investigations, Sacramento, California.

Plants Associated with Vernal Pools at Travis AFB, California (Earth Tech 1998)

Species	Vernal Pool Number																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Achrychnaea mollis	x			x				x			x	x																	x		
Alopecurus saccatus																											x			x	x
Anagallis arvensis	x											x			x								x								
Avena fatua																												x			
Blennosperma nanum var. nanum																														x	
Briza minor			x	x	x	x	x	x	x	x			x	x	x	x	x	x					x						x	x	
Bromus diandrus																													x		
Bromus hordeaceus												x				x	x						x						x		
Bromus tectorum																													x		
Callandrinia ciliatum	x																x												x	x	
Callitriche marginata	x																	x									x				
Castilleja attenuata	x		x							x	x							x				x									
Centaurea solstitialis																	x			x											
Convolvulus arvensis		x									x																				
Cotula coronopifolia	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Crassula aquatica	x		x						x	x	x			x		x	x			x	x					x					
Cyperus eragrostis		x						x	x	x	x	x		x		x				x			x	x	x	x		x			
Deschampsia danthonoides					x	x	x	x					x	x	x	x	x	x		x	x	x		x			x	x	x		x
Distichlis spicata	x	x	x	x	x				x						x																
Downingia concolor	x					x						x										x				x				x	
Downingia insignis																						x				x					
Downingia pulchella	x																														
Eleocharis macrostachya		x	x		x	x	x	x	x	x	x				x	x	x	x			x	x		x	x	x	x			x	x
Epilobium torreyi				x											x					x											
Erodium botrys									x																						
Erodium circutarium	x		x		x		x		x				x	x		x						x									
Eryngium vaseyi	x	x	x	x	x	x	x	x		x	x	x		x	x	x		x	x	x	x					x		x		x	x
Hemizonia fitchii																													x		
Hordeum brachyantherum																								x			x			x	
Hordeum marinum ssp gussoneanum				x		x		x	x	x		x	x	x	x	x	x	x		x	x			x	x				x		
Hordeum murinum ssp. glaucum			x										x			x					x				x	x		x			
Hypochaeris glabra																													x	x	

Species	Vernal Pool Number																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Juncus bufonius	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x								
Juncus mexicanus						x		x																							
Lasthenia conjugens	x																													x	
Lasthenia fremontii																															
Lasthenia glaberrima		x				x		x		x	x																				x
Layia chrysanthemoides																			x											x	x
Lolium multiflorum		x		x	x	x	x	x																							
Lotus corniculatus						x				x								x		x				x	x	x	x	x			
Lotus wrangelianus										x																		x	x	x	
Lupinus bicolor			x								x	x																x			
Lythrum hyssopifolium	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x		x	x	x	x	x	x	x			x		
Medicago polymorpha	x		x			x			x	x	x		x																		
Melilotus indica	x	x	x	x		x			x	x		x													x						
Plagiobothrys bracteatus				x											x												x				
Plagiobothrys leptocladus	x																			x									x	x	
Plagiobothrys stipitatus	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Plagiobothrys trachycarpus			x																												
Plantago coronopus	x																				x										
Plantago elongata																															
Plantago lanceolata																													x		
Pleuropogon californicus	x	x	x	x	x			x	x	x		x		x	x	x			x	x		x					x	x	x	x	x
Poa annua		x							x									x													
Pogogyne zizyphoroides			x																												
Polygonum arenastrum	x		x		x	x		x	x	x			x	x		x	x	x	x	x		x	x	x	x	x		x	x		
Polypogon maritimus						x																									
Polypogon monospeliensis	x				x	x			x		x		x	x							x	x	x	x	x	x		x		x	x
Psilocarphus brevissimus	x	x	x	x	x		x				x			x						x	x						x				
Psilocarphus oregonus	x														x			x		x							x				
Psilocarphus tenellus var. globeriferus		x		x		x								x						x							x				
Ranunculus aquitilis																														x	
Ranunculus muricatus																							x								
Rumex acetosella	x		x	x	x	x			x	x	x							x				x						x	x		

Species	Vernal Pool Number																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Rumex crispus		x										x		x	x	x		x	x			x				x	x	x		x	x
Salix lasiolepis								x																							
Silene gallica																								x							
Taeniatherum caput-medusae											x	x				x	x						x								
Trifolium campestre														x																	
Trifolium depauperatum			x								x	x		x				x	x								x		x	x
Trifolium fucatum	x									x	x			x																	
Trifolium hirtum			x						x								x		x											x	
Trifolium microdon																										x					
Trifolium variegatum				x			x																					x			
Trifolium wildenovii					x										x				x											x	
Triphysaria eriantha	x		x	x	x	x		x			x		x									x							x		
Triphysaria versicolor						x											x											x			
Triteleia hyacinthina					x		x							x		x	x			x											
Veronica peregrina															x													x		x	x
Vulpia myuros		x	x	-				x						x						x		x			x	-					

APPENDIX C
Archaeological Investigation for the Burke Property, Travis AFB, California

PRELIMINARY DRAFT

ARCHAEOLOGICAL INVESTIGATION FOR THE BURKE PROPERTY

OCTOBER 1998

TRAVIS AIR FORCE BASE, CALIFORNIA

Prepared by:

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Colton, California 92324

ABSTRACT

A reconnaissance was conducted on the 100-acre Burke Property at Travis Air Force Base on 22 September 1998 by Earth Tech personnel. One area was recommended for further investigation. Based on historic maps for the property, it was believed that a burned house site was situated on the southwestern portion of the property. This site was recorded by Earth Tech personnel on 5 October 1998. During the reconnaissance and site recordation, data was collected to support a recommendation of noneligibility for the site on the Burke Property. Much of the site's integrity has been destroyed due to extensive agricultural use, dumping, and quarrying activities. It is unlikely that any useful information regarding the site or the history of the property would result from further investigations. Therefore, given the extent of the disturbance on the Burke Property, no further archaeological work is recommended on the site as a whole.

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Appendices

A - State of California - The Resources Agency Department of Parks and Recreation Archaeological Primary Record, DPR523A
B - Photographs

LIST OF FIGURES

LIST OF ACRONYMS

AAB	Army Air Base
AAF	Army Air Field
ADC	Air Defense Command
AFB	Air Force Base
AFI	Air Force Instruction
AFSWP	Armed Forces Special Weapons Project
Ag.	Agriculture
AIRFA	American Indian Religious Freedom Act
APE	Area of Potential Effect
ATC	Air Transport Command
AW	Air Mobility Wing
B.C.	Before Christ
CA-CCO	California-Contra Costa County
CA-SOL	California-Solano County
CES	Civil Engineering Squadron
CFR	Code of Federal Regulations
Council	Advisory Council on Historic Preservation
DoD	Department of Defense
EM	Environmental Management
I-80	Interstate 80
Lt.	Lieutenant
MATS	Military Air Transport Service
NAGPRA	Native American Graves Protection and Repatriation Act
National Register	National Register of Historic Places
n.d.	no date
NHPA	National Historic Preservation Act
NPS	National Park Service
PVC	polyvinyl chloride
SAC	Strategic Air Command
SHPO	State Historic Preservation Office
60AW/EM	60th Air Mobility Wing, Environmental Management
UC	University of California
US	United States
USGS	United States Geological Survey

1.0 INTRODUCTION

1.1 LOCATION/STUDY AREA

This technical report has been prepared to outline the theoretical and methodological approach for the archaeological reconnaissance investigation for the 100-acre Burke Property, which is situated on the northern base boundary of Travis Air Force Base (AFB), Solano, County, and to describe the results of the site recordation for a homestead situated on the southwest portion of the Burke Property.

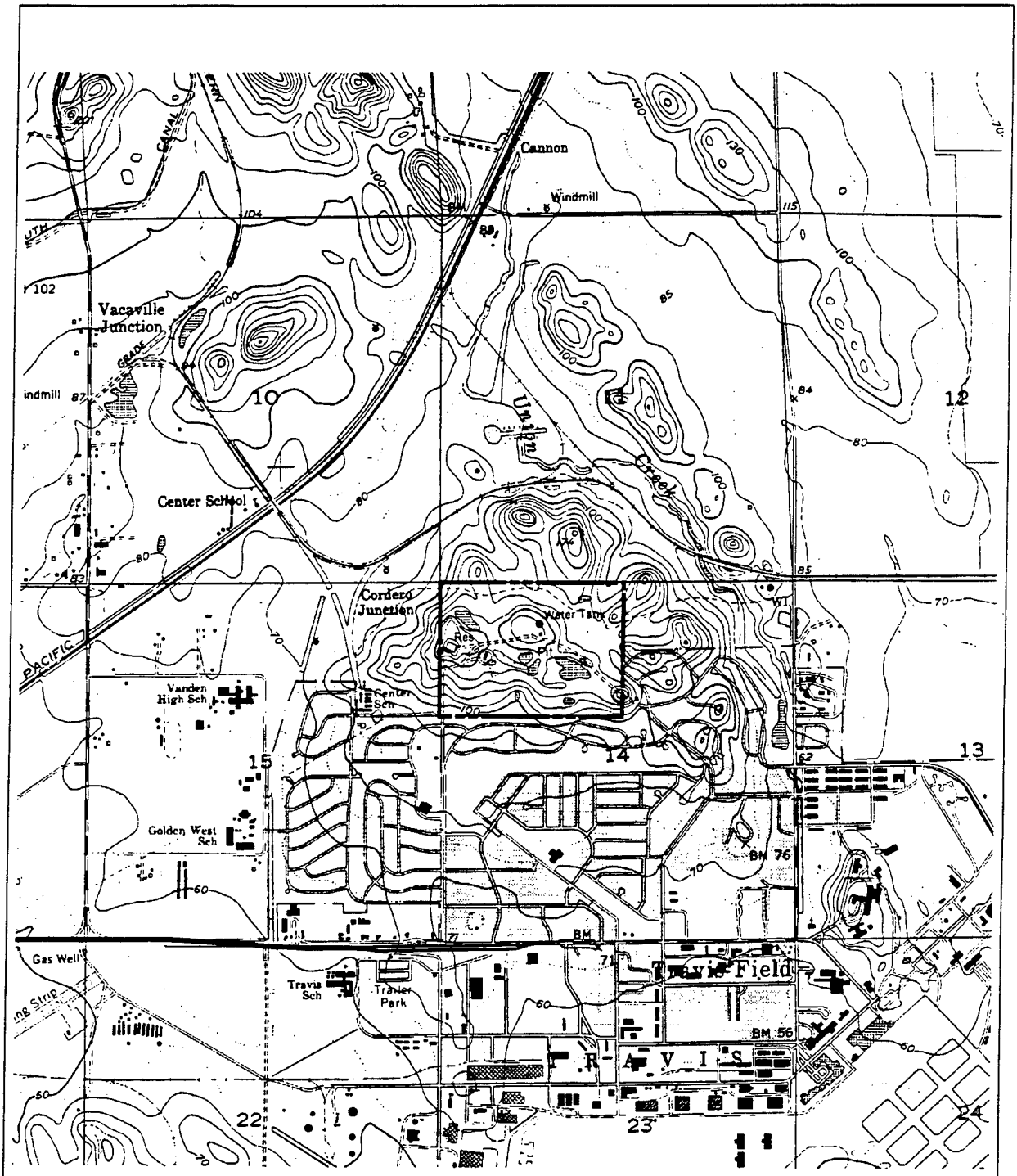
Travis AFB is situated within the city limits of Fairfield, California. It is in Solano County, in the Sacramento Valley. The base is readily accessible via Interstate 80 (I-80), which connects the cities of Sacramento and San Francisco. Currently, Travis AFB is planning use alternatives for a recently acquired parcel of land adjacent to the northern base boundary, known as the Burke Property. One plan calls for the construction of 384 single-family residential units, which would support the transfer of up to 830 full-time military personnel to the installation.

The Burke Property is situated in Section 14, Township 5 North, Range 1 West, U.S. Geological Survey (USGS) Elmira, California, 7.5' Quadrangle (Photorevised 1980). It is recorded in the Solano County Assessor's office as Parcel Number 4, Book 174 (Figure 1-1). It contains approximately 101.06 acres and is bordered by military housing on both the south and east. The property may be accessed via a gated entrance to the northwest of the Travis AFB/City of Vallejo Water Treatment Plant property. In the center of the property are two large water holding tanks and a small building, all enclosed within a fence.

The Burke Property was previously used as a borrow site and sandstone quarry. It currently has depressions, reaching a depth of 30 feet, that coincide with two borrow pit or mining locations, one in the southeastern portion and one in the northwestern portion. It is possible that four of the five ponds on the property were also the result of borrow pit or mining excavation. Several of these ponds are surrounded by large eucalyptus trees. Additionally, the site was utilized as a landfill by Kaweah Construction Company in 1993 (Air Mobility Command 1994). A water main has also been constructed through the middle of the site; it is operated by the City of Vallejo and Travis AFB. According to historic documents provided by the 60th Air Mobility Wing, Environmental Management (60AW/EM), a homestead site is believed to have been situated in an area surrounded by eucalyptus trees. The property is currently being used for livestock grazing.

1.2 LEGISLATIVE REQUIREMENTS

Numerous laws and regulations require federal agencies to consider the effects of a proposed project on cultural resources. These laws and regulations stipulate a process for compliance, define the responsibilities of the federal agency



Property Boundary

SCALE IN FEET
0 1000 2000

Source: USGS 1953 Elmira 7.5' Quadrangle (photorevised 1980)

Travis/003

Travis Air Force Base and the Burke Property

Figure 1-1

1

proposing the action, and prescribe the relationships among other involved agencies (e.g., State Historic Preservation Officer [SHPO], the Advisory Council on Historic Preservation [Council]).

Ideally, compliance with requirements of cultural resources laws and regulations consists of five steps: (1) identification of cultural resources that could be affected by the proposed action or its alternatives; (2) assessment of the impacts or effects of these actions; (3) determination of significance of potential historic properties within a region of influence, or Area of Potential Effect (APE); (4) Council comment; and (5) development and implementation of measures to eliminate or reduce adverse effects. The primarily law governing cultural resources is the National Historic Preservation Act (NHPA), which addresses the protection of historic properties.

Significant cultural resources, either prehistoric or historic in age, are referred to as historic properties. Under 36 Code of Federal Regulations (CFR) Part 800, historic properties are defined as

> ...any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places. This term includes, for the purposes of these regulations, artifacts, records, and remains that are related to and located within such properties. The term 'eligible for inclusion in the National Register' includes both properties formally determined as such by the Secretary of the Interior and all other properties that meet National Register listing criteria.

Only historic properties, as defined under cultural resources legislation, are subject to protection or consideration by a federal agency.

According to National Register of Historic Places (National Register) criteria (36 Code of Federal Regulations Part 60.4), the quality of significance is present in districts, sites, buildings, and objects:

(a) that are associated with events that have made a significant contribution to the broad patterns of history; or

(b) that are associated with the lives of persons significant in the past; or

(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) that have yielded, or may be likely to yield, information important in prehistory or history.

To be listed in or considered eligible for listing in the National Register, a cultural resource must meet at least one of the above criteria, and must also possess integrity of location, design, setting, material, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics that existed during the property's historic or prehistoric occupation or use. If a resource retains the physical characteristics it possessed in the past, it has the capacity to convey information about a culture or a people, historical patterns, or architectural or engineering design and technology.

Transfer or conveyance of federal lands that may contain historic properties is considered an undertaking under the NHPA. The Air Force must, therefore, comply with Section 106 of the NHPA and Council regulations implementing Section 106 (36 Code of Federal Regulations Part 800). As a federal agency, the Air Force must also comply with Sections 110 and 111 of the NHPA. Under these requirements, the Air Force:

- Assumes responsibilities for the preservation of historic properties under its control.

- Exercises caution to ensure that historic properties are not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly.

- Takes into account the effects of its undertakings on historic properties and affords the Council a reasonable opportunity to comment on such undertakings. In addition, the proposed action must comply with Air Force Instruction (AFI) 32-7065, which implements Air Force Policy Directive 32-70, Environmental Quality; and Department of Defense (DoD) Directive 4710.1, Archaeological and Historic Resources Management.

These efforts are aimed at protecting all sensitive cultural resources in the United States and its territories and possessions.

1.3 NATIVE AMERICAN CONCERNS

Legislation pertaining to Native American concerns on federal lands consists of the American Indian Religious Freedom Act (AIRFA) and the Native American Graves Protection and Repatriation Act (NAGPRA). The Air Force has developed specific guidelines and regulations to address Native American concerns and the management of Traditional Resources (refer to Air Force Instruction 32-7065). Traditional and sacred sites may include, but are not necessarily limited to:

- Burial grounds and graves
- Traditional resources (e.g., floral, faunal) gathering sites
- Spiritual and legendary sites

- Astronomical observatories
- Access to traditional and sacred resource sites.

Air Force policy stipulates that attempts to identify sites and areas of concern to Native Americans should be accomplished during the earliest stages of project planning. These efforts serve to avoid unnecessary impacts to sensitive sites and associated traditional practices.

Examples of sites of religious or cultural importance to Native Americans include mountain peaks, springs, prehistoric archaeological sites and artifacts, native plant gathering areas, and sources for materials used in the sites that may have archaeological manifestations. There is, however, a possibility that a culturally important area will not contain any physical manifestations or archaeological features or artifacts. In these instances, it is important to distinguish cultural importance from archaeological significance. Archaeological sites lacking significance under federal law (36 Code of Federal Regulations Part 60.4) may nevertheless be culturally important; many sensitive Native American sites will lack archaeological materials altogether (Air Force Instruction 32-7065).

2.0 ENVIRONMENTAL SETTING

2.1 TOPOGRAPHY

Travis AFB is situated within the Suisun Delta of the Sacramento Valley. The terrain of the Burke Property is characteristic of the Suisun Delta, which comprises rolling hills and swales with wetland areas. The Burke Property also contains severely eroded gravelly loam soils, with loam soils in the northeast and a clay loam soil in the southwest (University of California Ag. Experiment Station n.d.).

Much of the northern base property also contains several wetlands areas known as vernal pools. Vernal pools are associated with drainages, or vernal swales, that allow water runoff to flow into the pool basins and collect on the relatively impermeable surfaces. Additionally, the property has been subjected to borrow activities, which may account for four of these vernal pools. A fifth pool is situated between two small hills and lies along the gravelly loam and loam interface (Earth Tech 1998).

2.2 SOILS AND GEOLOGY

Ancient alluvium dominates the geological setting of Travis AFB. To the northern part of the base, sedimentary rock is present, while outcrops of the Tehama Formation are present in the southwestern part. The Tehama Formation is composed of a conglomerate of sand, silt, gravels, and calcium carbonate, which assists in forming rolling hills in the region. The remainder of the terrain is relatively flat, ranging from 20 to 160 feet above mean sea level. The soils are predominantly of the Antioch and San Ysidro series; they possess a thick, claylike subsoil and are formed in alluvium derived from sedimentary sources. Soils of this type are typically utilized for dry-farming sugar beets, small grains, and irrigated pastures. Uncultivated areas are dominated by grasses and forbs (Soil Conservation Service 1977 in Argonne National Laboratory 1996). Claypan soils, such as Capay and Solano series, give way to vernal pools in the area.

2.3 BIOTIC RESOURCES

2.3.1 Vegetation

Over 200 plant species have been identified on the Burke Property (Earth Tech 1998). At least seven vegetation types or habitats and two additional non-vegetated habitats are supported by the Burke Property. Vegetated habitats were present surrounding the vernal pools and swales, freshwater marsh and pond areas, riparian areas (drainages and streams), non-native grasslands, and landscaped areas. Non-vegetated habitats comprise unvegetated pools, or fairy shrimp habitats, and disturbed/developed areas that were enclosed within fences.

Native vegetation in the area typically includes fescue, foxtail, and brome grass, while native trees include valley oaks, live oaks, willows, and some cottonwoods. Due to historic settlement of the area, windbreaks comprising Montery Cypress, non-native eucalyptus (*Eucalyptus* sp.), and other trees have been planted. The majority of the landscape, however, is dominated by grassland, especially introduced species that have resulted from past agricultural activities such as livestock grazing and discing; construction activities (e.g., bulldozing, mining, grading, and excavation); and landscaping. Grasslands on the Burke Property include barleys (*Hordeum* spp.), bromes (*Bromus* spp.), star thistle (*Centaurea solstitalis*), butter and eggs (*Tryphisaria eriantha* ssp. *eriantha*), blue-eyed grass (*Sisyrinchium bellum*), and others. Other species, such as salt grass (*Distichlis spicata*), Baltic rush (*Juncus balticus*), meadow fescue (*Festica pratensis*), and cattails (*Typha* sp.) may be found along the wetland areas on the property.

2.3.2 Vernal Pools and Vernal Swales

Approximately 31 vernal pools exist in the 100-acre parcel. The pools comprise small, shallow ponds or depressions that hold water in grassland or woodland areas during the winter and spring months; during the summer and fall, most of these areas are dry. Vernal pools support habitat for sensitive species, including both invertebrates (fairy shrimp) and plants (Contra Costa goldfields [*Lasthenia conjugen*], barleys [*Hordeum* spp.], and rushes [*Juncus bufonius*]). The wetlands are linked by swales and seasonal inundated drainages. Most of the artificial vernal pools, swales, and depressions on the Burke Property have been created through construction, dumping, and mining activities. Freshwater marshes also occur on the Burke Property, primarily around the edges of ponds or within swales. These marshes are characterized by cattails (*Typha* sp.).

2.3.3 Landscaped Areas

Historic human use of the site probably accounts for the presence and success of various cultivars localized around historic use sites. Landscape species in the project area include blue gum (*Eucalyptus globulus*), plum (*Prunus domesticus*), apricot (*Prunus armenianus*), velvet ash (*Fraxinus velutina*), and narrow-leafed firethorn (*Pyrachantha angustifolia*) (Earth Tech 1998).

2.3.4 Wildlife

The Burke Property has been historically used for livestock grazing. Grasslands provide habitats for pheasants (*Phasianus colchicus*), doves (*Zenaidura macroura*), California quail (*Callipepla californica*), songbirds, cottontail rabbits (*Sylvilagus aiduboni*), and the common garter snake (*Thamnophis sirtalis*) (Earth Tech 1998). Canada geese (*Branta canadensis*) also frequent the vernal pools on the property.

3.0 CULTURAL SETTING

3.1 PREHISTORIC OVERVIEW

Situated within the delta subregion of the Central Valley Archaeological Region, the area of Travis AFB and the Burke Property provided prehistoric inhabitants a wealth of resources. Most of these cultures lived on hunting, gathering, and fishing. By the arrival of the Spaniards, many of these cultures had established the foundations of the early agricultural practices for the southwest.

3.1.1 Late Pleistocene and Early Holocene (10,000-6,000 Before Christ [B.C.])

Sites dating to this period are often near the sea coast, or old stream channels near estuaries, or on the fossil shores of ancient lakes and marshes (Moratto 1984:76). These sites typically yield evidence of a sophisticated lithic technology; specialized tools and associated faunal remains indicate that the early inhabitants exploited a wide range of both animal and plant life.

It is possible that the early inhabitants exploited, or traveled through, the area now occupied by Travis AFB. During this period, sea levels would have been significantly lower, and the Sacramento River would have flowed through the Suisun Bay area of the valley (Argonne National Laboratory 1996). As a result, any sites along the banks of the river would be covered in sediment or under water. Traces of early occupation may, however, be identified along tributary valleys and ravines that provide access to the river.

3.1.2 Pre-Early Horizon (6000-2500 B.C.) and Early Horizon (2500-1500 B.C.)

Although earlier sites have been recorded in the San Francisco Bay Region, the prehistory of the Suisun Delta usually begins with the Windmiller Phase of the Central California Early Horizon (2500-1500 B.C.) (Argonne National Laboratory 1996). This period is characterized by an increasingly intense hunting and gathering culture. Also during this period, the population increased in size and tended to be less nomadic, relying more on plant resources. Populations to the west of the Sierra Nevada, possibly including those in the Travis AFB area, are believed to be Hokan speakers (Moratto 1984:546).

Typical artifacts associated with Early Horizon Sites include obsidian and chert projectile points, bone awls and needles, mortar fragments, and baked-clay balls, which are believed to be "cooking stones." Fishing spears, hooks, and possible net weights have also been identified, indicating a reliance on fishing in the area.

Faunal remains include salmon, sturgeon, smaller fishes, deer, elk, pronghorn, rabbits, and waterfowl. Decorative and ritual artifacts include polished stones of

marble, alabaster, and diorite. The Windmiller tradition is representative of the arrival of the Utian language group from outside of California spreading into the Delta and East Bay Area to the south of Carquinez Strait (Moratto 1984:207, 550-553; Argonne National Laboratory 1996).

3.1.3 Middle Horizon (1500 B.C.-Anno Domini [A.D.] 500)

During the Middle Horizon Period, inhabitants of the Suisun Delta area and the San Francisco Bay Region shared cultural traits, indicating that both regions were inhabited by Western Miwok-speaking groups (Argonne National Laboratory 1996; Moratto 1984:279). Further, based on linguistic evidence, this culture reflected earlier Hokan and Utian cultures.

Also during this period, there was an increase in the population, and villages were established near freshwater streams rather than marshlands. Artifacts of this period include cobble mortars and pestles, and atlatl and darts that feature distinctive diagonal flaking of large concave base points (Argonne National Laboratory 1996; Moratto 1984:210). Although there is little evidence of a trade network for raw materials, there appears to have been trading of finished products. The polished stone industry becomes less important, but a bone industry emerges that includes decorative shell appliqué (Frederickson in Moratto 1984:278).

3.1.4 Late Horizon (A.D. 500-1900)

During this period, there was an increase of population density and social complexity, resulting from the village pattern established during the Middle Horizon period. By A.D. 700, at the time of the arrival of the ancestral Patwin into the Solano area, there is a distinctive set of cultural traits emerging among the cultures. The period also reflects intensive hunting, fishing, and gathering. Artifacts include the bow and arrow, the harpoon, Gunther barbed points, bone awls for basketry, shaped mortars and pestles, and pottery in the Central Valley.

By A.D. 1400, evidence of increased populations and social complexity is observed through a proliferation of settlements, elaborate ceremonialism, and an intensification of trade through the use of shell disk moneys. By the time of Spanish contact, the cultures had developed a proto-agricultural environment, focusing on techniques to manage both animal and plant resources.

3.2 HISTORIC OVERVIEW

The area that is now California drastically changed with the arrival of the Spaniards. Using the foundations for agriculture developed by the cultural groups, the Spaniards began establishing a system of missions. The Spaniards also transmitted deadly diseases that decimated the native populations.

3.2.1 Contact Period

About A.D. 1750, Spaniards arrived in Alta California. At this time, Penutian-speaking groups inhabited Travis AFB's current location; the Suisun and Talenas tribelets of the Southern Patwin (or Wintuan) also occupied this region.

In 1833 and 1837, malaria and smallpox epidemics nearly decimated the indigenous Central Valley population. By the 1850s, little was left of the Southern Patwin due to the effects of the Gold Rush. In 1923-1924, A.L. Kroeber conducted ethnographic investigations of the area, which revealed that those who had survived had already abandoned the area. What has been determined about the Southern Patwin is based on ethnographic information provided by the Northern Patwin (e.g., Kroeber 1925) and the Plains Miwok (Bennyhoff 1977).

Southern Patwin lived in large villages along water courses above levels of seasonal flooding (Powers 1877:219). Grassy plains served as temporary hunting grounds for both large and small game in the winter, including deer, elk, pronghorn, and rabbits; the plains also provided seeds, acorns, and blackberries (Flynn and Roop 1984:26). A variety of resources were exploited, including salmon and steelhead trout on the Sacramento River, and waterfowl (Johnson 1978:355). Historically known Patwin Village locations in the Travis AFB area have been recorded in Vacaville, Napa, and near Suisun City (Argonne National Laboratory 1996; Kroeber 1925: plate 34; Powers 1877:218).

3.2.2 Settlement of the Travis Air Force Base Area

Agriculture. During the Spanish Mission Period (A.D. 1750-1830), the foundation was laid for the foundations of agricultural development and land tenure. Missionaries, who controlled much of coastal California, built missions on land that could be cultivated and irrigated and would be well suited for raising cattle (Argonne National Laboratory 1996; Gates 1967:75-76; Liebman 1983:7).

The 1830s marked the end of Spanish rule and the beginning of Mexican control. This period also marked an end to the missionary monopoly of lands throughout California, and the beginning of the "rancho." Mission lands were secularized, creating an era of private ownership, and spawning ranchos, or large agricultural holdings. Rancheros, or ranchers, continued the missions' agricultural practices, but focused more readily upon cattle ranching, as well as hide and tallow trade (Argonne National Laboratory 1996; Liebman 1983:7).

Settlements were made by the Mexican government, primarily for Mexican citizens, and extended away from the former mission lands and coastal regions. Outlying grants in the Central Valley included areas along the Sacramento and San Joaquin river valleys (Jelinek 1979:18-19; Liebman 1983:7). Several grants were made to rancheros in Solano County; however, they did not include the land Travis AFB now occupies (Argonne National Laboratory 1996).

In the 1840s, Mexican rule came to an end and California was granted U.S. statehood. A flood of immigrants entered the state in 1949 with the gold rush, spurring on a growth of cities as well as providing a market for beef and steady profits for the rancheros (Argonne National Laboratory 1996; Paul 1973:18; Jelinek 1979:24; Liebman 1983:8). By the 1850s, however, the rancheros faced competition from cattle ranching from the Midwest and Texas; additionally, the state introduced a property tax, causing many rancheros to fall into debt, forcing the sale of both land holdings and herds (Jelinek 1979:23-24). Although cattle ranching continued to be an agricultural economic focus, the cultivation of cereal grains gained prominence, especially in the Central Valley (Argonne National Laboratory 1996).

Many of the miners who came to California during the gold rush gave up mining and began to turn to agriculture. Dry farming of barley and wheat was centered in the Sacramento and northern San Joaquin river valleys, which were well suited for grain agriculture production. Barley provided a food supply for pack animals in the mining regions and was used in the production of beer, while wheat provided flour for the baking of breads. By the 1850s, California had begun exporting surplus grains to Australia and Great Britain (Jelinek 1979:34, 40; Liebman 1983:16). During the 1860s, orchard crop production, including apples, plums, peaches, pears, and apricots, expanded throughout the state.

River routes provided the earliest means for transporting harvested grains and fruits for export. The construction of railroads led to increased cultivation of land for wheat farming. In 1869, the transcontinental railroad was completed, providing a significant link to the domestic market. Between 1874 and 1902, California saw a peak in the production of wheat (Jelinek 1979:34, 40-41; Paul 1873:22). The production of wheat soon exhausted the soil, however, leading to smaller yields, and by 1903, the consumption of wheat exceeded exports; by 1904, wheat had to be imported into the state (Argonne National Laboratory 1996; Jelinek 1979:43).

After the collapse of the wheat market, some landowners made a transition to fruit and specialty crops, while others began irrigating their crops and harvested other grains and alfalfa. Orchards were expensive, and some landowners sold subdivisions of their large land holdings (Argonne National Laboratory 1996; Liebman 1983:55).

In the Sacramento Valley, the trend towards subdivision came in the early 20th century, somewhat later than in other parts of the state. Prior to the 1900s, large landowners in the valley blocked the establishment of irrigation, as dry farming of grains could still bring a profit (Liebman 1983:54). Large landowners in this area rented land to tenant farmers in order to keep their holdings intact (Liebman 1983:79).

Land surrounding the Travis AFB area was referred to as "poor man's acres" (Central Solano County Cultural Heritage Commission 1975:41). This land,

unlike that of the Maine Prairie township or the Vacaville fruit district, was not regarded as prime farmland. As a result, much of the land was utilized for sheep and cattle ranching, with irrigation for crops such as sorghum, corn, alfalfa, tomatoes, sugar beets, and some fruit trees (Argonne National Laboratory 1996; Loving 1986:3; Soil Conservation Service 1977).

Industry. Between 1875 and the early 1900s, the local economy was based on agriculture and local extractive industries, primarily tufa and basalt quarries. To the east of Travis AFB, at Cement Hill, the Pacific Portland Cement Company employed between 500 and 1,000 individuals at its tufa and limestone quarry (Central Solano County Cultural Heritage Commission 1975:33-34; Gregory 1912:74). A town was erected at the quarry, catering to the needs of its employees, and included housing and dormitories, a hotel, store, hospital, and a school (Central Solano County Cultural Heritage Commission 1975:34). By the 1920s, the tufa deposit had been depleted, however, and the plant and employment suffered a decline.

At Thomasson's Hill, near present-day Cordelia, a basalt/andesite quarry was established in 1875. The dark-gray to black andesite was crushed and used for concrete and macadam (Central Solano County Cultural Heritage Commission 1975:33; Weaver 1949:173). Quarries in the area also produced basaltic paving stones, street pavers, and building stone (Thompson and West 1878:9; Weaver 1949:173; Higgins 1983:238-239; Argonne National Laboratory 1996).

In the early 1900s, when the demand for street pavers declined, the industry began to wane. A few quarries remained open, like the E.B. and A.L. Stone Company, which operated near Cordelia in 1912; these companies produced crushed and building stone for the Southern Pacific Railroad and similar companies. Local stone was used for the construction of bridges, retaining walls, culverts, and farm outbuildings (Central Solano County Cultural Heritage Commission 1975:34; Gregory 1912:74; Weaver 1949:173-174).

Settlement. Jose Franciso Armijo established the first Hispanic settlement in the area now known as Solano County. In 1839, Armijo applied for a land grant in Suisun and Tolenas valleys. In 1840, he received the grant and was followed by his son, Antonio, who established a rancho on his father's land grant. In 1842, the Vaca and Pena families applied for and received a land grant; this land centered on the Lagoon and Vaca valleys and extended into the northern part of present-day Solano County (Argonne National Laboratory 1996; Central Solano County Cultural Heritage Commission 1975:20-21).

John Wolfskill was the first recorded Anglo-American settler of Solano County. In 1842, he settled on the Putah Creek land grant, which had been obtained by his brother, a naturalized Mexican citizen. Unlike the Mexican cattle ranchers in the area, Wolfskill cultivated grains, row crops, vegetables, a vineyard, and an orchard (Argonne National Laboratory 1996; Central Solano County Cultural Heritage Commission 1975:21; Gregory 1912:57).

In 1847 or 1848, Daniel Barry and his family became the first recorded Anglo-Americans to settle in the Travis AFB area, along Cache Creek. They later established a permanent residence two miles north of Rockville (Argonne National Laboratory 1996; Central Solano County Cultural Heritage Commission 1975:21).

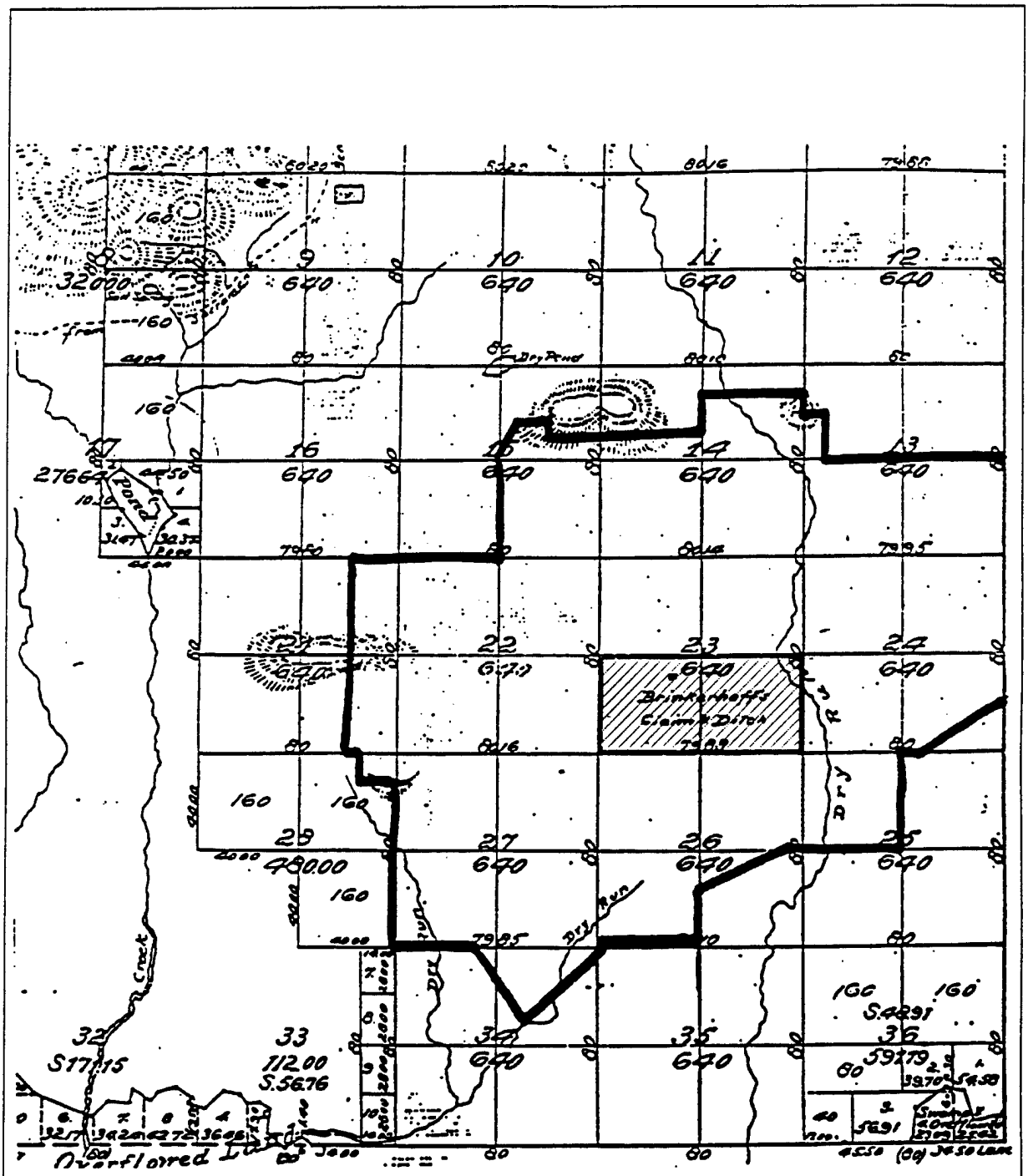
In 1848, with the discovery of gold, Solano County ranchers used the Benicia to Sacramento Road to drive cattle and transport food supplies to Sacramento to feed miners. This road ran approximately 2 miles west of Travis AFB (Argonne National Laboratory 1996; Central Solano County Cultural Heritage Commission 1975:21; Gregory 1912:58; U.S. Government Land Office 1861).

The 1851 U.S. Government Land Office map (revised 1861) of the Travis AFB area depicts the Benicia to Sacramento Road, as well as several houses along its route. This map also depicts Brinkerhoff's Claim and Ditch, the first settlement on the present-day Travis AFB property (Figure 3-1). It is believed that the ditch referenced on the map is actually a type of mound constructed by the early settlers to enclose their property, rather than an irrigation channel. Such an enclosure may indicate that Brinkerhoff was an agriculturist and needed the ditch to protect his crops from cattle grazing in the area; additionally, early accounts of Solano County refer to "wild oxen" and "wild cattle," which roamed the surrounding landscape (Argonne National Laboratory 1996; Munro-Fraser 1879:71). By 1878, both the Brinkerhoff name and the structure associated with the property are absent from Solano County map sources.

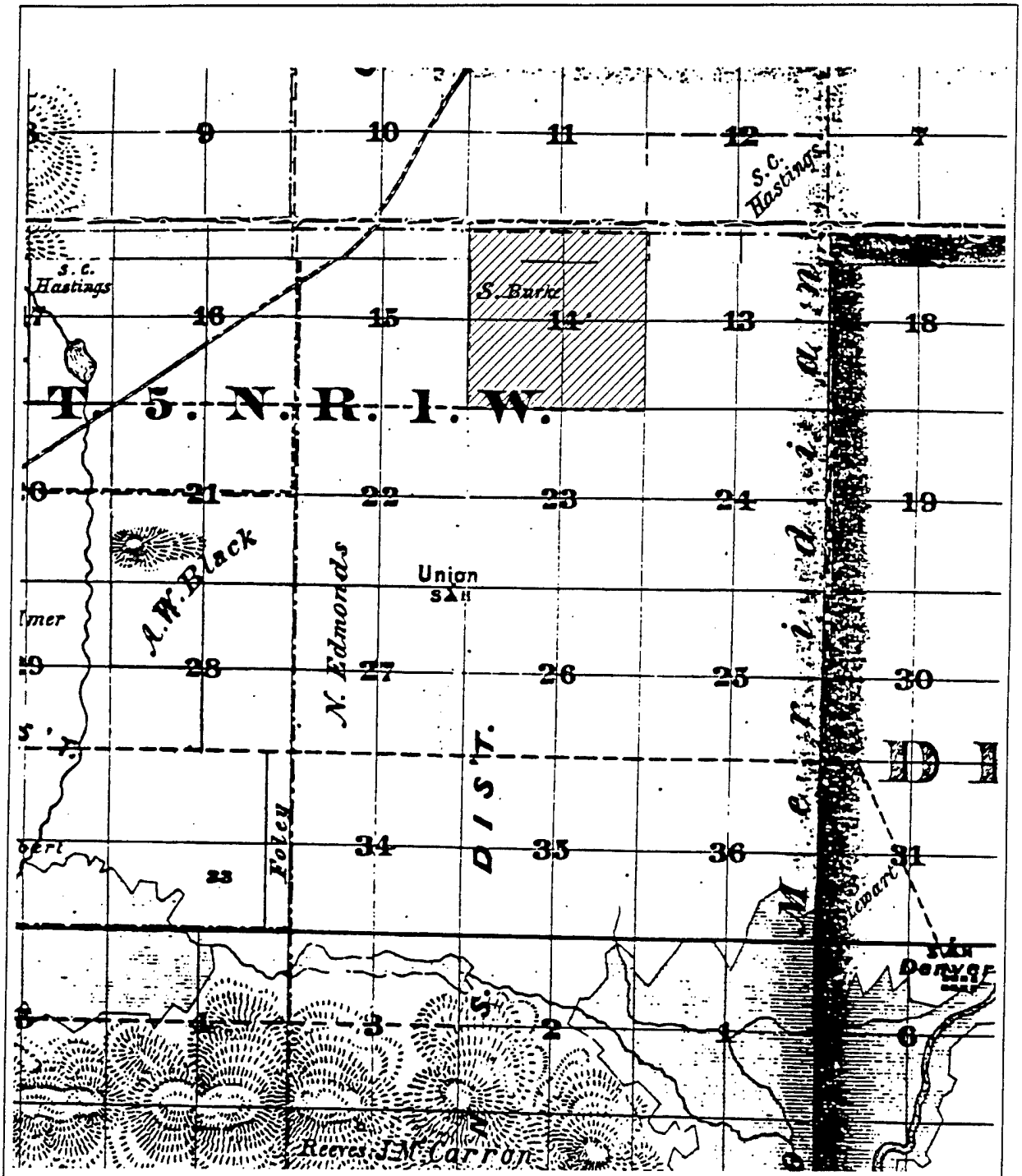
The Henning map of Solano County (1872) indicates relatively few landowners in the area of present-day Travis AFB. One of these is S. [Stephen] Burke (Figure 3-2). One structure depicted on the map has been identified as the Union or Scandia School.

The Thompson and West map of Solano County, dated 1878, indicates the landowners of the area now known as Travis AFB (Figure 3-3). The majority of these properties served as farmsteads, operating as part of the wheat farming bonanza of the Sacramento Valley. Union, or Scandia, School is also represented on this map.

Between 1878 and 1908, Solano Irrigated Farms, Inc., is reported to have owned an increasing number of discontiguous land tracts in the Travis AFB area (Solano County n.d.) (Figure 3-4). This land holding pattern probably reflects a trend toward consolidation of specialty crop agriculture, where large land holdings were created through the purchasing of small, unsuccessful orchards and vineyards (Argonne National Laboratory 1996). By 1908, several homestead locations are depicted in the Travis AFB area (U.S. Geological Survey 1908), indicating that previously large land holdings had been subdivided, including that of the Burke Property (Figure 3-5).


Brinkerhoff's Claim Ditch
Dry Run
Overflowed Land
Brinkerhoff's Claim and Ditch
Travis Air Force Base Property
Brinkerhoff's Claim and Ditch
Travis AFB Boundary
NOT TO SCALE
Source: U.S. Government Land Office 1861, cited in Argonne National Laboratory 1996.
Figure 3-1
Travis/004

1



Burke Property

NOT TO SCALE

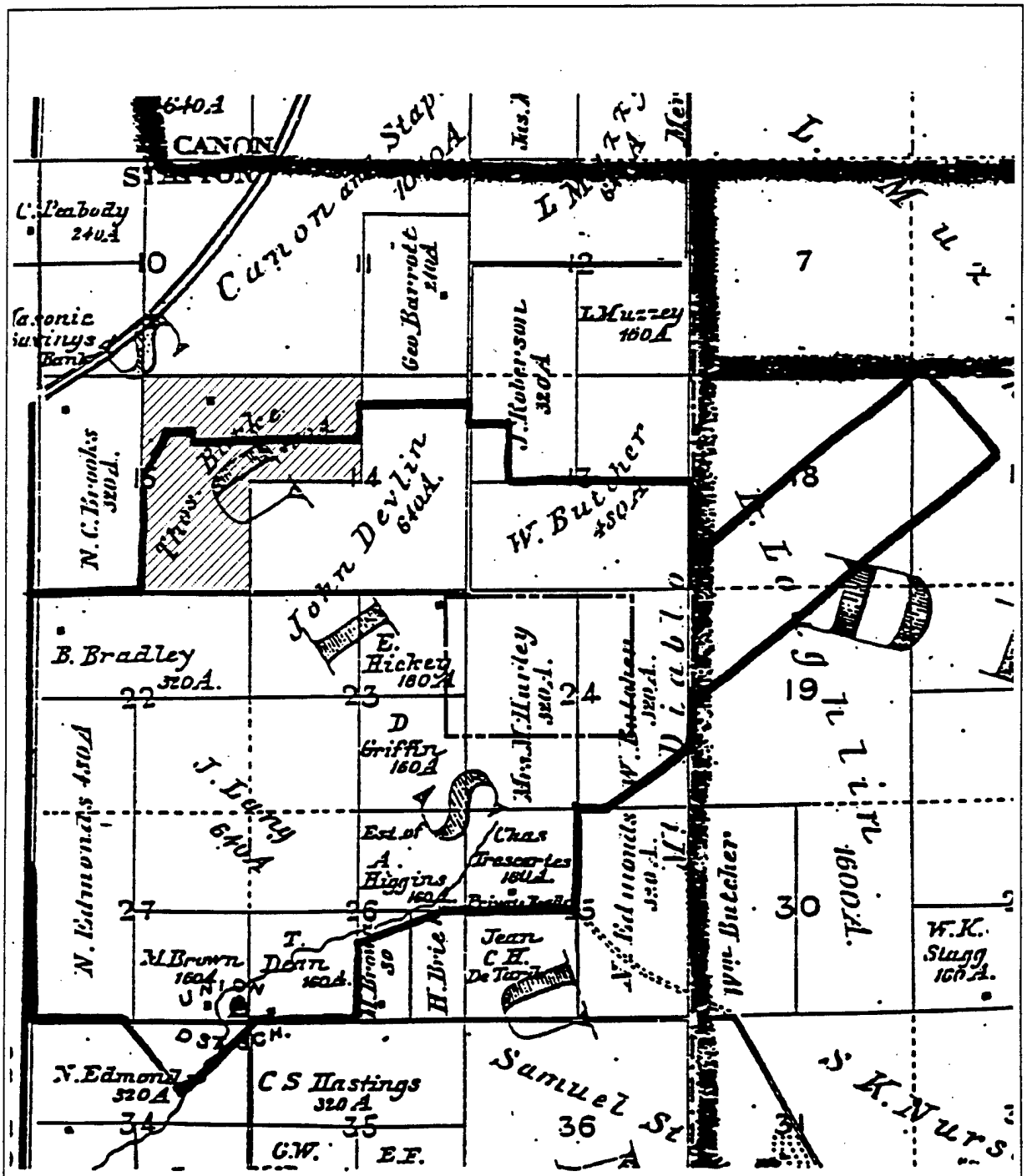
Source: Henning, 1872. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

S. Burke Property ca. 1872

Figure 3-2

Travis/005

1



Burke Property

NOT TO SCALE

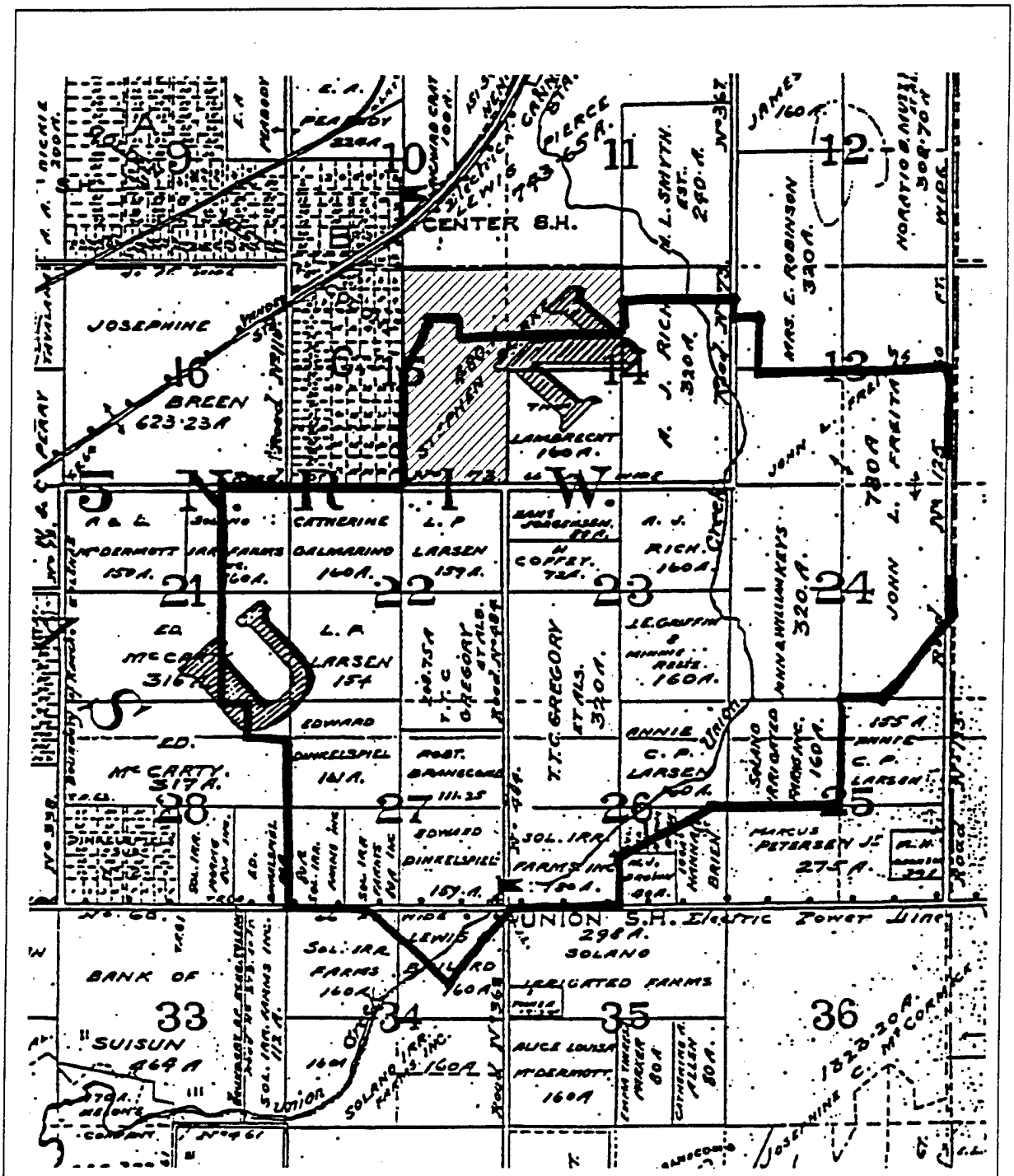
Source: Thompson and West 1978 as cited in Argonne National Laboratory 1996.

Solano County ca. 1878 and Thomas Burke Property

Figure 3-3

Travis/006

1



Solano Irrigated Farms, Inc.

Stephen Burke Property

NOT TO SCALE

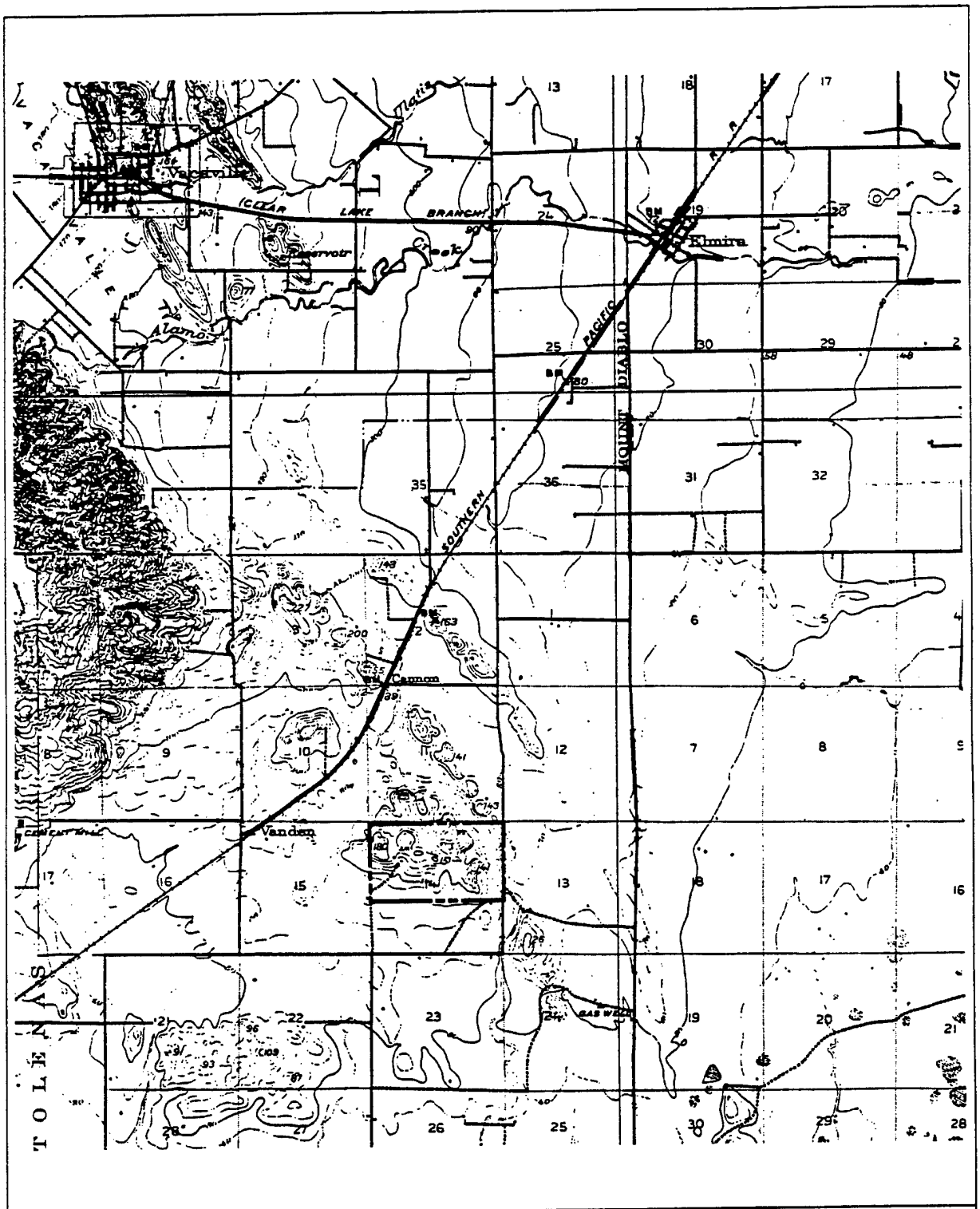
Source: Solano County, n.d., as cited in Argonne National Laboratory 1996.

Solano Irrigated Farms, Inc. and the Stephen Burke Property ca. 1878-1908

Figure 3-4

Travis/007

1



Property Boundary

Burke Property ca. 1908

NOT TO SCALE

Source: USGS 1908, Vacaville Quadrangle. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

Figure 3-5

Travis/006

The 1941 USGS Vacaville Quadrangle depicts the Sacramento Northern Railroad running northwest to southeast through the present-day location of Travis AFB, just south of the Burke Property (Figure 3-6). This map depicts several structures (at least three on the Burke Property) in Travis AFB at this time.

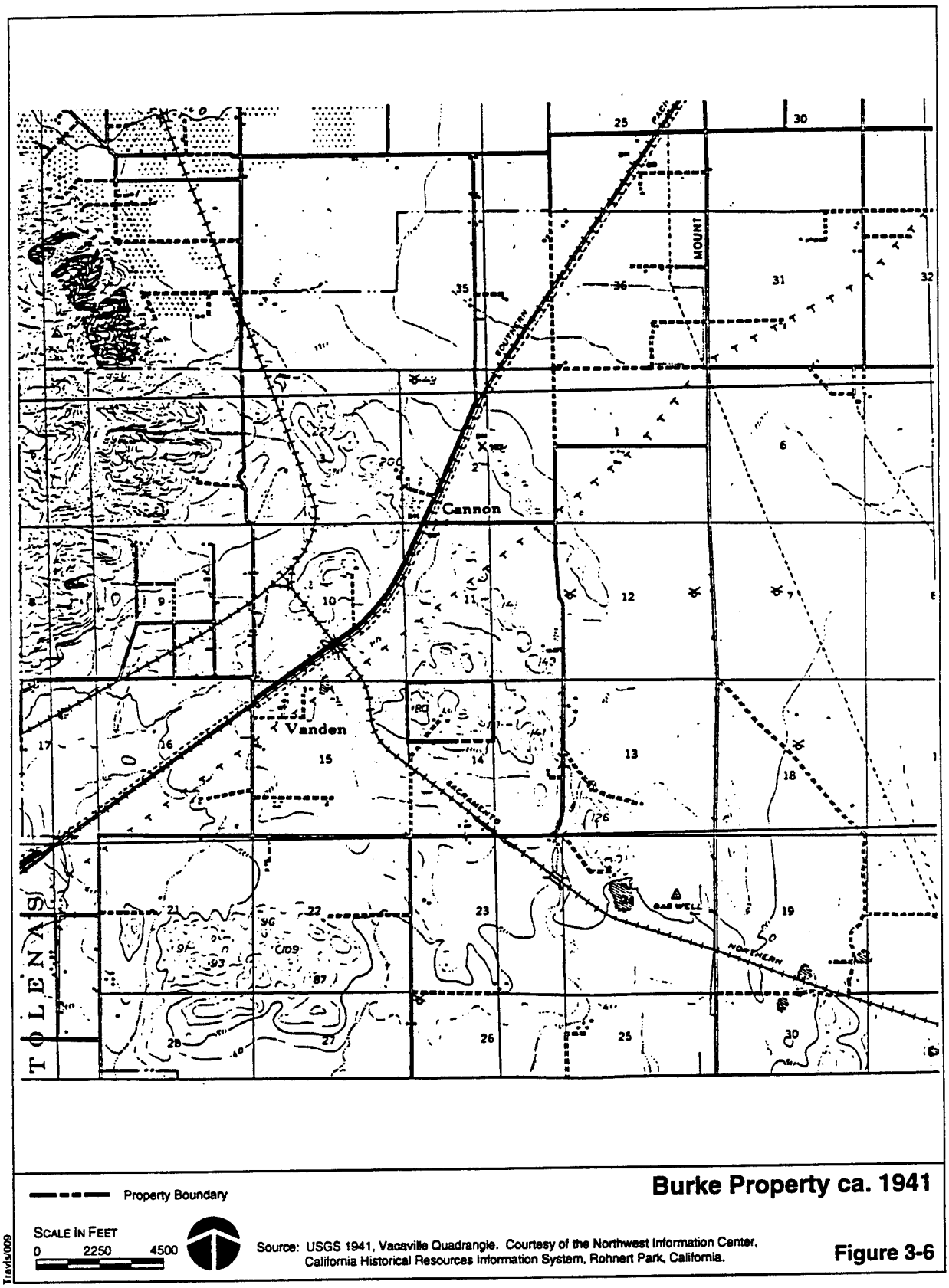
In 1942, the army established an airfield in the area. By 1953, most of these structures had been razed, dismantled, or had been used on a temporary basis by the army personnel; the Sacramento Northern line was abandoned and relocated just north of the present-day base property (Argonne National Laboratory 1996; Travis Air Force Base 1953). Also by 1953, a water tank had been constructed on the Burke Property (Travis Air Force Base 1953) (Figure 3-7). The remnants of these homesteads on Travis AFB consist of imported Australian eucalyptus trees, planted as windbreaks, as a self-regenerating wood source, and for protection from malaria and miasma (Argonne National Laboratory 1996; Pisani 1984:68-69).

3.2.3 History of Travis Air Force Base

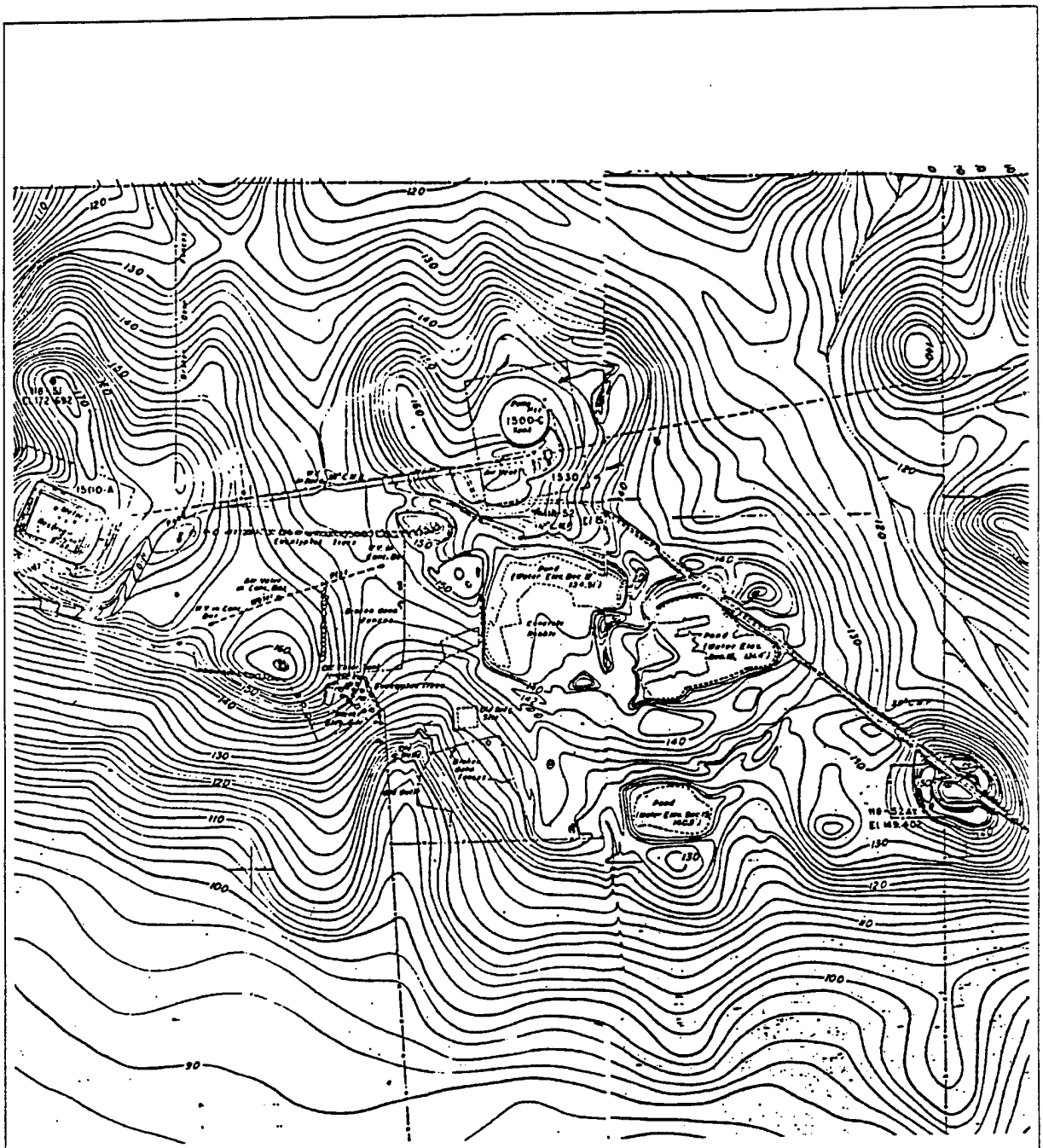
In 1942, the U.S. Government selected property in the area of present-day Travis AFB as the site of an air transportation location, primarily due to its prevailing winds. After being assigned to the Air Transport Command (ATC), however, plans for the bomber base were canceled. In 1943, the facility was activated as the Fairfield-Suisun Army Air Base (AAB). Originally occupying 945 acres, the base expanded to 2,257 acres as its role in World War II operations increased. As a major aerial port and supply transfer point for both replacement troops and cargo for the Pacific Theater, the base also prepared aircrews and newly constructed bombers for deployment. By 1945, Fairfield-Suisun AAB had become the largest air freight terminal for ATC on the West Coast.

The War Department declared the base a permanent installation in May 1945. As a result, an additional $19.6 million was allocated for construction and expansion programs, expanding the base by an additional 1,145 acres (Argonne National Laboratory 1996; Snow 1983:5; NPS 1989:12). In 1946, Fairfield-Suisun AAB became the headquarters for the ATC, which had moved to the base from nearby Hamilton Army Air Field (AAF) in Marin County, California. Also in 1946, Fairfield-Suisun AAB became the western hub for all of ATC's domestic aeromedical evacuation flight network, reflecting the importance not only of the base, but also of its hospital (Argonne National Laboratory 1996; Snow 1983:8).

During the Berlin Airlift in 1948, ATC transport units conducted operations in Germany. At this time, the Strategic Air Command (SAC) used the base for bomber operations. In 1949, SAC became a host unit of the base. In 1950, Fairfield-Suisun AAB was renamed Travis Air Force Base in honor of Brigadier General Robert Falligant Travis, an SAC commander.


Cannon
Vanden
MOUNT
SOUTHERN
PACIFIC
SACRAMENTO
NORTHERN
TOLENAS
Property Boundary
SCALE IN FEET
0 2250 4500
Source: USGS 1941, Vacaville Quadrangle. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.
Burke Property ca. 1941
Figure 3-6
Travis/009

1



Property Boundary

Burke Property, ca. 1953

NOT TO SCALE

Source: Travis AFB, 1953. Courtesy of Sanford Bennett, 60AW/CES, Travis AFB, California

Figure 3-7

Travis/011

1

During the Korean War, and throughout the 1950s, Travis AFB participated in Military Air Transport Service (MATS) activities and operated as a center of air logistics support in Southeast Asia. MATS regained host responsibilities in 1958.

3.2.4 History of the Burke Property

Based on historic maps of the area, the property has been owned by the Burke family since 1872 (Henning 1872). The earliest known owner of the property is S[tephen] Burke. By 1878, approximately 400 acres of the property in Sections 14 and 15 was owned by Thos. [Thomas] Burke (Thompson and West 1878). Between 1878 and 1908, the surrounding area increased in population. Many of the large land holdings in Solano County were subdivided and sold to Solano Irrigated Farms, Inc. At this time, 480 acres in Sections 14 and 15 were owned by Stephen Burke (Solano County n.d.). By 1908, one structure had been erected on the Burke Property; it is unknown who constructed this structure (U.S. Geological Survey 1908). At least three structures had been erected on the property by 1941 (U.S. Geological Survey 1941). Between 1941 and 1953, the Burke Property was mined for sandstone. In some areas, sandstone was quarried to a depth of 30 feet.

In February 1943, Stephen Burke granted a 1.4-acre easement to the government to construct a water pipeline through the middle of the property. The pipeline, which runs through the southwest portion of the property, is currently maintained and operated by the City of Vallejo and Travis AFB. On 24 May 1943, the Air Force purchased Tract 15, comprising 2.5 acres, from Katherine Burke, who is possibly Stephen Burke's wife or daughter. In March 1952, Katherine Burke granted an easement for the construction of a second pipeline on the southwest portion of the property. Tract 96, comprising 2.41 acres, was acquired from Ms. Burke under a Declaration of Taking on 21 May 1952 (Air Mobility Command 1994 Environmental Baseline Survey).

Based on maps of the property dating to 1953, at least two structures, several wells, and broken fence lines had been constructed on the southern half of the Burke Property (Travis Air Force Base 1953). A reservoir on the westernmost edge of the property and a water tank in the center of the property had been constructed. A dirt road leads from the reservoir to the tank, and a pipeline extends from the tank to the southeast corner of the property. Also, three ponds had been dug on the southern half of the property. It is believed that one of these ponds was created through sandstone quarrying just south of the water tank.

In February 1957, the government acquired 66.4 acres of land from Katherine Burke through a Declaration of Taking. Military family housing was constructed on this portion of the property, which lies to the south of the current property. In December 1960, Katherine Burke granted a 2-year easement to the government on 4.3 acres to construct a temporary road on the north section of the property. This road was used to access housing being constructed to the east of the current property (Air Mobility Command 1994 Environmental Baseline Survey).

After the 1960s, Katherine Burke deeded the remainder of the property to her children, Patrick Burke, Mary Wunderlich, and Kathleen Powell. The Burke Property surrounds 8.35 acres (Parcel Number 2) owned by the City of Vallejo and used as the site of a water treatment plant. The Air Force also owns water tanks enclosed within a fence in the center of the property. In September 1992 and March 1993, the Burke family gave the Kaweah Construction Company permission to dump 1,120 cubic yards of earth material and 23 loads of concrete and construction debris on the property (Air Mobility Command 1994 Environmental Baseline Survey). Much of this material derived from the upgrade of the Travis AFB/City of Vallejo Water Treatment Plant. Other waste deposited on the property includes fragments of steel and metal, terra cotta piping, and tires. Most of the debris and rubble were covered with soil up to 20 feet thick (Air Mobility Command 1994 Environmental Baseline Survey). Currently, the property is part of a 10-year contract under an agricultural preserve program known as the Williamson Act.

3.3 CULTURAL RESOURCES IN THE VICINITY OF THE PROJECT AREA

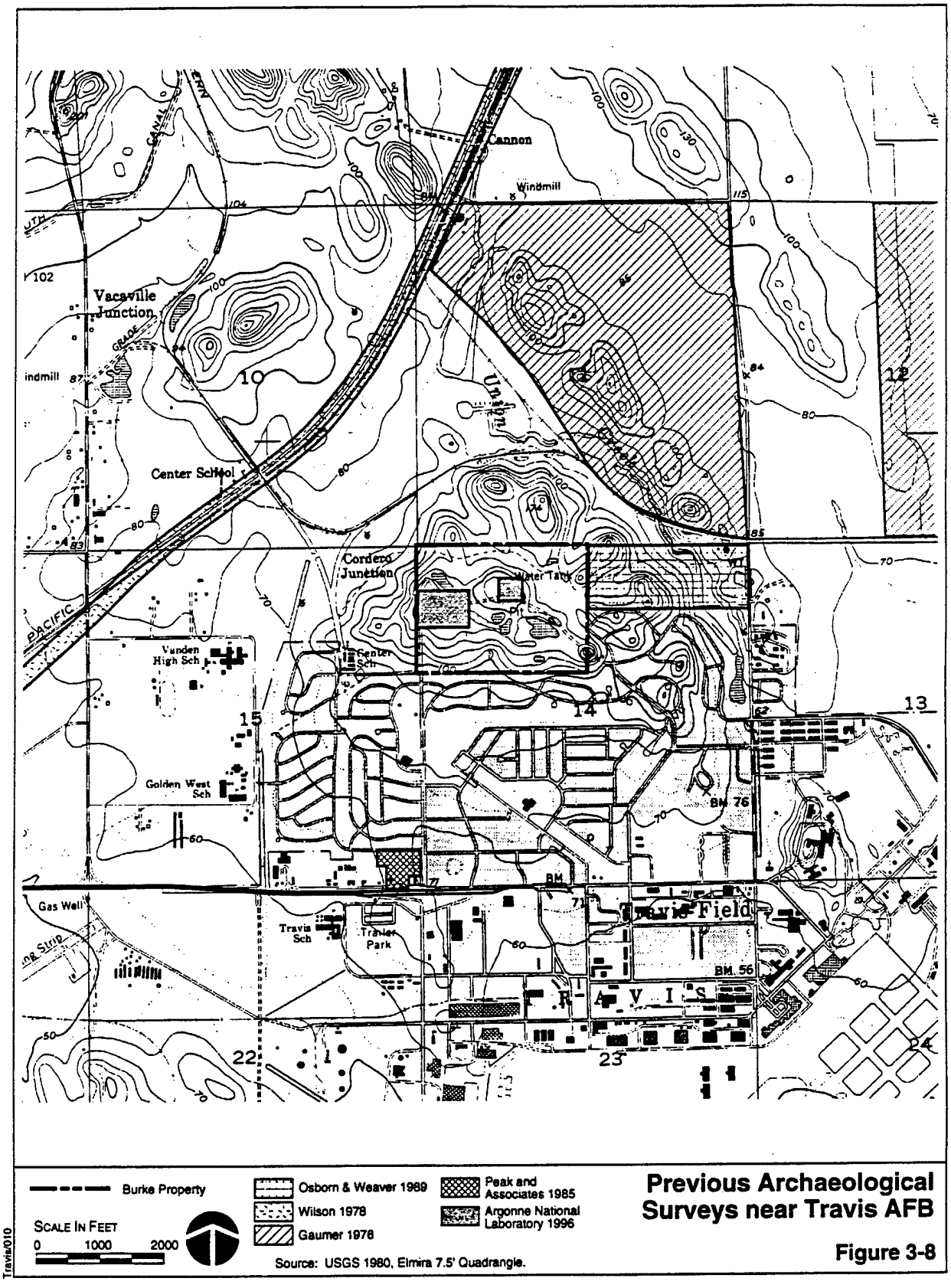
In order to identify previously recorded archaeological sites in the Travis AFB area, a record search was conducted through the California Historical Resources Information System, Northwest Information Center, at Sonoma State University, California (Figure 3-8). Additionally, existing archaeological reports and files, historic maps and records, and other sources for the area were consulted for background information regarding the Burke Property.

Several archaeological surveys have been conducted in the Travis AFB (Solano County) area since the 1960s. Each of these surveys is summarized below:

- One survey was conducted in the 1960s for the construction of the Tehama-Colusa Canal. The study, which covered several counties, identified 19 sites, none within Solano County (Treganza et al. 1965).

- In 1975, a survey was conducted to the west of the base for the proposed widening of Walters Road (Greenway 1975). No archaeological sites were identified during this survey.

- Two surveys were conducted in 1976 by Peak and Associates; a third survey was conducted by this firm in 1985. All three surveys focused on a road expansion project including portions of a 4.64-acre parcel outside the main gate at Travis AFB for the California National Guard Fairfield Armory, portions of a drainage ditch, and Air Base Parkway to the north of the new medical facility. No archaeological sites were identified during these surveys (Peak and Associates 1976a, b, 1985).



Previous Archaeological Surveys near Travis AFB

Figure 3-8

Travis010

1

- In 1978, a survey was conducted for a transmission line along the Southern Pacific Railroad to the north boundary of Travis AFB. This survey also included an area outside the southern boundary of Water Well II (a discontiguous property belonging to the base). No archaeological sites were identified during this survey (Wilson 1978).

- A survey of 430 acres to the south of Travis AFB and near the Potrero Hills Storage Annex along a canal/drainage route for the Solano County Water Project Feasibility Study was conducted in 1979 (True 1979). No archaeological sites were identified during this survey.

- In 1989, Osborn and Weaver conducted a 50-acre survey of land adjacent to the base and discontiguous property (Water Well I; Burke Property) for the construction of family housing. This 50-acre parcel is adjacent to the eastern boundary of the Burke Property. No archaeological sites were identified during this survey.

- In March 1996, Argonne National Laboratory conducted an archaeological and historic resources survey and inventory for Travis AFB. No prehistoric remains were identified on Travis AFB or its discontiguous properties. Six historic locations were identified, but none were recommended eligible for inclusion in the National Register. Additionally, none of the pre-1947 military structures was determined eligible for inclusion in the National Register.

- An inventory of 50 Cold War-era buildings and structures was conducted in August 1996 by the Air Mobility Command. Approximately 32 buildings were recommended as potentially eligible for inclusion in the National Register. The properties comprise two historic districts, including 25 buildings in the assembly, laboratory, and communications/intelligence section of the Armed Forces Special Weapons Project's (AFSWP) Q Area (1951-1960), six buildings in the Air Defense Command (ADC) readiness area (1952-1955), and one independently eligible building (Building 810) (Air Mobility Command 1996).

3.3.1 Prehistoric Sites

Although no exact location was given, Gaumer (1976) identified a prehistoric site to the north of Travis AFB in the hills along Union Creek. This site consisted of a bedrock mortar and small midden with several basalt flakes. Gaumer (1976) also recorded a historic hunting blind and water well, along with a historic trash scatter of bottles and shotgun shells.

Two prehistoric lithic scatters (CA-SOL-313 and CA-SOL-314) were recorded in 1984 (Flynn and Roop 1984). Both sites were on Travis AFB, in the area now occupied by the new medical building. One of the sites, CA-SOL-314, had been severely disturbed, and no further testing was recommended; the other site, CA-SOL-313, underwent testing and was fully recorded prior to the construction of the hospital (Flynn and Roop 1984).

No prehistoric sites have been identified for the discontiguous properties in Solano County. One prehistoric site (CA-CCO-252) was recorded in Contra Costa County on Travis AFB's OZOL property. Consisting of a shell midden 30 feet in diameter and less than 3 feet deep, the site was recorded in 1907 by N.C. Nelson.

Argonne National Laboratory (1996) determined that, based on surface reconnaissance and the observed level of disturbance, it is unlikely that any prehistoric materials would be encountered on Travis AFB. Additionally, no prehistoric sites are likely at Water Well I (on the Burke Property) or at Water Well II (golf course), due to heavy disturbance at both locations. Additional prehistoric sites are unlikely on the steep slopes or the disturbed areas of the OZOL location. It is, however, possible that subsurface material may be present at Potrero Hills and the location of the storage annex (Argonne National Laboratory 1996).

3.3.2 Historic Sites

As of 1992, at least 12 historic properties have been listed in the National Register, including areas in Benicia, Fairfield, Vacaville, Vallejo, and Suisun City. Two of these properties are the Pena Adobe in Vacaville and the Hastings Adobe in Collinsville. Fifteen of 23 properties listed in the Historic Properties Index at Sonoma State University have been determined eligible for inclusion in the National Register; only two of those have been listed. None of these properties is on Travis AFB or its discontiguous properties.

Argonne National Laboratory (1996) identified six locations as possibly containing historic sites. At least five of these contained artifactual materials; however, due to extreme disturbance, none were recommended as eligible for inclusion in the National Register. Furthermore, no pre-1947 (World War II) properties at Travis AFB were determined eligible for inclusion in the National Register (Argonne National Laboratory 1996).

In August 1996, the Air Mobility Command conducted an inventory of the Cold War-era buildings and structures situated on Travis AFB. Thirty-two buildings were determined potentially eligible for the National Register as two historic districts and one individually eligible building (Air Mobility Command 1996).

4.0 METHODS

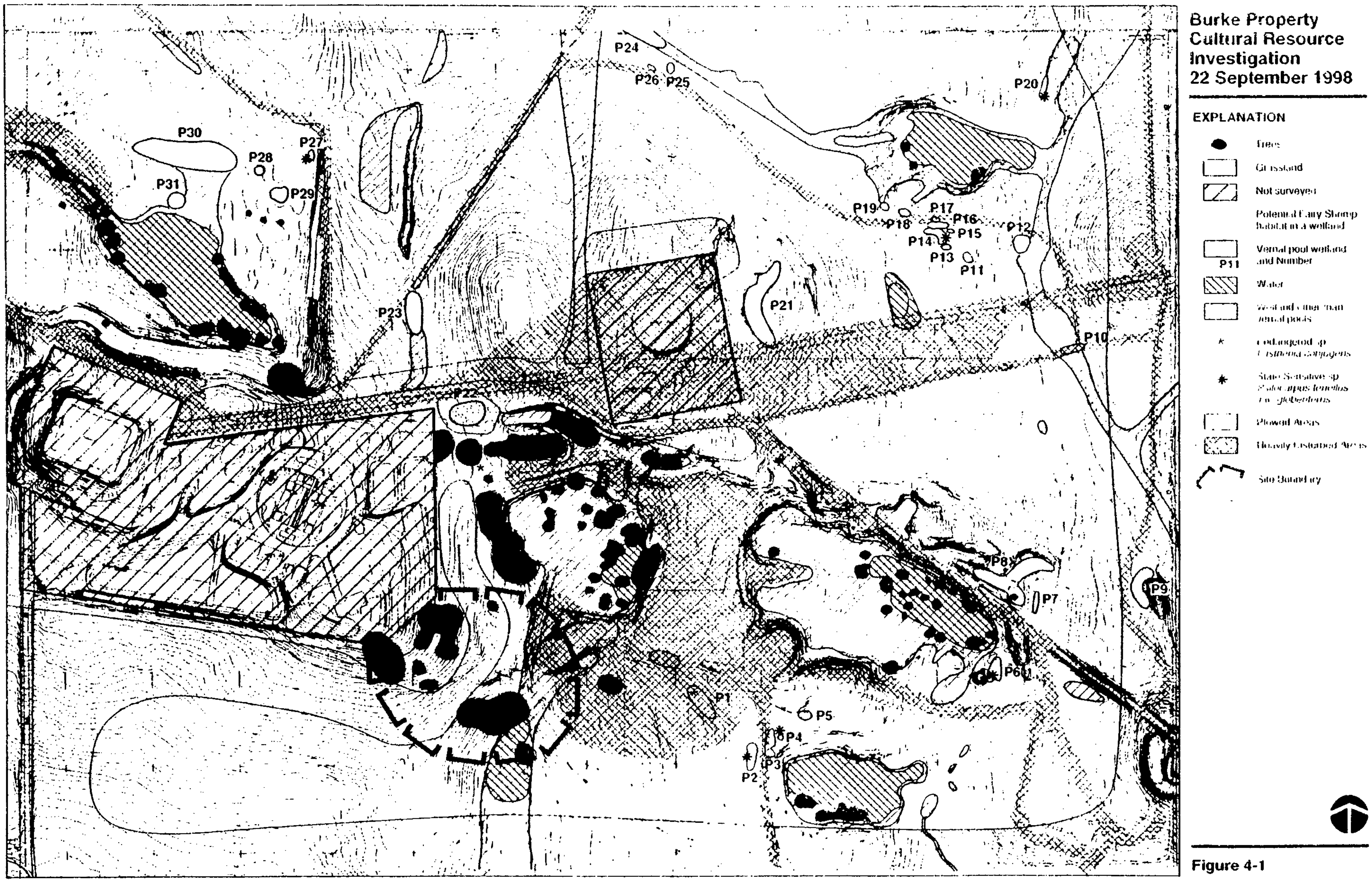
4.1 RECONNAISSANCE INVESTIGATION

Earth Tech personnel visited Travis AFB, California, on 22 September 1998, to gather historical land use information regarding the newest northern land parcel (Burke Property) and to conduct a reconnaissance for cultural resources on that 100-acre parcel. A reconnaissance was conducted by Earth Tech Senior Staff Cultural Resources Specialist, Heather Puckett, and Lt. David Gwisdalla (60AW/EM) (for Robert Holmes [60AW/EM]). Lt. Gwisdalla and Mr. Holmes provided copies of documents pertaining to the historic land use of the Burke Property. Earth Tech also met with Sanford Bennett, Architect (60AW/CES), who provided copies of historic maps of the property that dated to 1953. These maps indicated the location of a burned feature and additional structures that had been situated on the property prior to acquisition by the Air Force.

Earth Tech walked over the entire 100-acre parcel in order to identify disturbances or areas with the potential to contain cultural deposits. Exposed ground surfaces, including the steep slopes of the vernal swales and pools, were visually observed for artifacts. Ground terrain was also examined for any aboveground features, such as berms or depressions, that may be evidence of a prehistoric or historic site. Photographs were taken of the reconnaissance area, while topography and areas displaying disturbance were indicated on the project area map (Figure 4-1). The field investigation also included the survey of areas known to have contained structures prior to the construction of Travis AFB. Structures known to have been located on the Burke Property included a burned house location and an old building location. Upon observation of the property, a possible burned structure (bricks and two wooden structural beams), as well as tools, a windmill or possible water wheel, and ceramics were identified at the southeastern corner of the fence enclosing the City of Vallejo/Travis AFB Water Treatment Plant property. It was determined that this site warranted further investigation and a more detailed recordation.

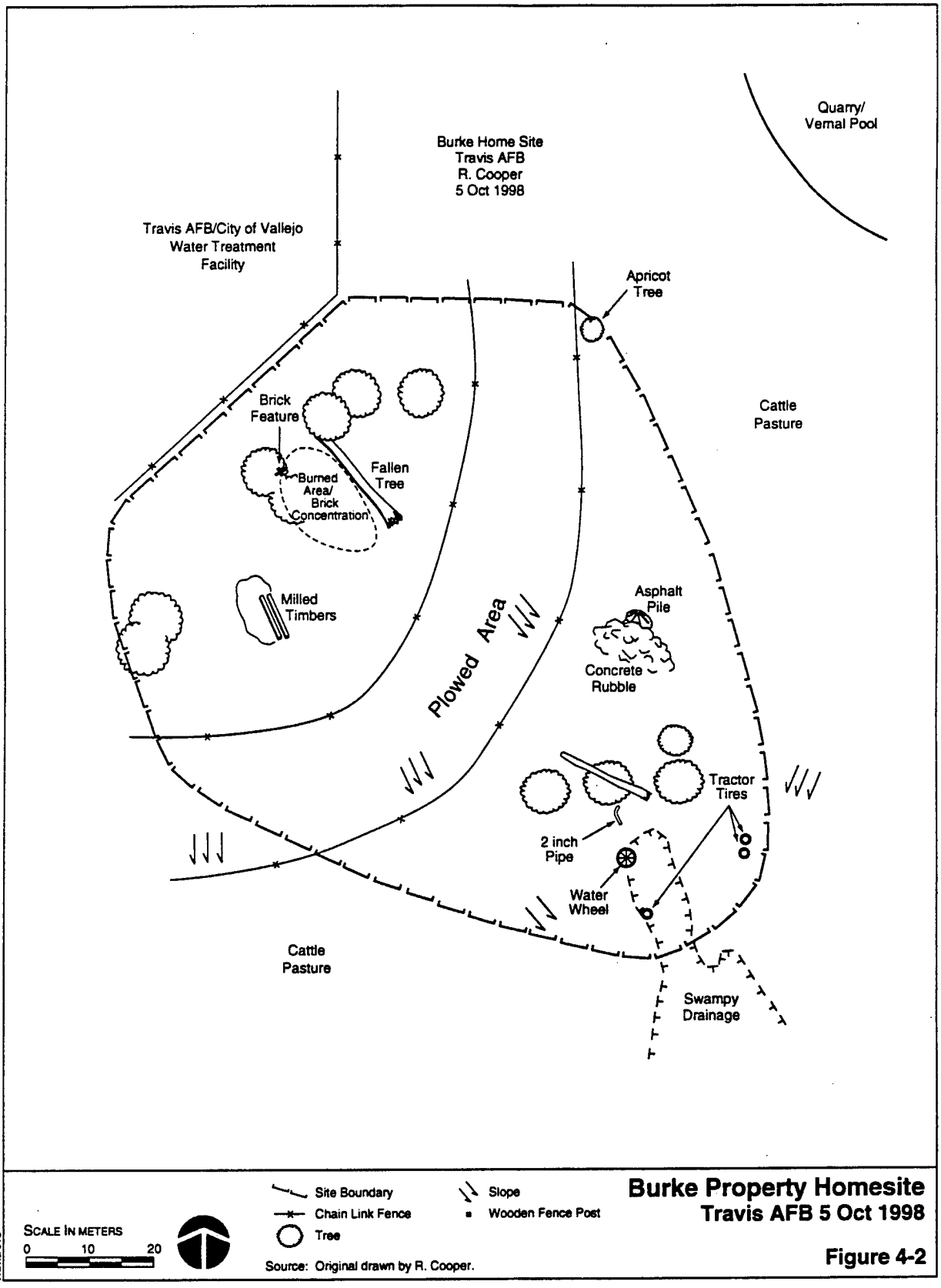
4.2 SITE RECORDATION

On 5 October, Earth Tech personnel Heather Puckett and Randy Cooper returned to the Burke Property to record the possible burned homestead location (Figure 4-2). The recordation involved the relocation of artifacts and features noted during the earlier reconnaissance, and careful examination of exposed areas (especially the plowed area) and "hot spots" (areas near features) to identify other remains. An effort was also made to determine the areal extent of associated remains in order to establish site boundaries. Remains included not only artifacts and features, but introduced trees. In the northern part of the site, determining the extent of remains was not possible because of the fence and property line of the City of Vallejo/Travis AFB Water Treatment Plant. The fence was therefore considered the northern site boundary, despite the presence of



Burke Property
Cultural Resource
Investigation
22 September 1998

Figure 4-1



Burke Property Homesite
Travis AFB 5 Oct 1998

Figure 4-2

eucalyptus trees on the other side. A map of the site was made using a compass and survey tape. Features and important artifacts were described, measured, and in some cases, photographed. Site overview photographs were also taken. All necessary information, including environmental and locational information, was gathered to complete site recordation on the State of California -The Resources Agency Department of Parks and Recreation Archaeological Primary Record DPR523A (see Appendix A). No artifacts were collected.

5.0 RESULTS

5.1 RECONNAISSANCE INVESTIGATION RESULTS

During Earth Tech's reconnaissance of the Burke Property on 22 September, the following observations were recorded:

Surveying along the east fence of the Travis AFB/City of Vallejo Water Treatment Plant, Earth Tech observed what appeared to be a manhole or cistern marked by a concrete monument inscribed with "MH"/"40." Walking southward, Earth Tech personnel observed concrete debris, metal pieces, a tin can, and golf balls. The concrete debris and metal pieces appear to have been dumped, probably by the Kaweah Construction Company, which is known to have dumped construction debris at the site in the early 1990s.

At the center of the project area, on the southwestern corner of the fence enclosing the large water tanks, is a sandstone outcrop, indicating a possible location of the quarry pit. To the east of this sandstone area, approximately 5 meters from the fence line, is a well, also indicated by a concrete monument (not inscribed). There is no indication of the age of this well, but it may be associated with the tank facility. The well comprises a metal casing that has been capped. A white polyvinyl chloride (PVC) pipe protrudes from the ground approximately 1 foot to the north, between the well casing and the monument.

Approximately 10 meters from the center of the southern edge of the fence surrounding the tanks is a water valve. It has a large, round metal cover and is marked by a blue sign that has apparently fallen. The area between the valve and the fence line has also been plowed. Except for a few (>5) chunks of concrete mixed with the dirt, no cultural material was visible. At the southeastern corner of the fence surrounding the tanks is a large growth of what appear to be bamboo stalks. The earth outside the fence is heavily eroded due to water flow in the area.

Walking south between two large pools, Earth Tech personnel observed concrete, wood, and metal debris scattered throughout the terrain. At the westernmost edge of the large pool on the east edge of the southern portion of the property, Earth Tech observed a scatter of wooden fence posts, a black plastic pail, a brick, a flattened and rusted metal pail, a large square concrete box or vault, and a cylindrical concrete object. The concrete box appears to have a PVC pipe and a small metal pipe emerging from the top. Both have been broken away. The concrete has been chipped on both the left and right sides. A metal pipe sticks out from the side and bends slightly to the rear. A hole is situated approximately 5 inches above this pipe. Inside the box are two pipes, copper tubing, and what looks like a coupling for a pipe. It is probably a housing for a small pump. The cylindrical concrete object is approximately 12 feet to the south; it has no distinguishing characteristics.

At what would be the center of the pool (when filled completely with water) is a wood panel piece comprising veneer nailed to a wood timber. This is situated approximately 3 feet east of a large rock/boulder. Near the edge of the current water level sits a small green boat. A child's helmet (upside down in a fallen tree trunk/log) and two water bottles (recently deposited) are scattered to the east and west of the boat.

Walking back to the top of the ridge above the pool, Earth Tech observed several small hills (vernal swales) and a holding vault containing a faucet/pipe that appears to drain into the pool below. The top of the ridge is relatively flat and appears to be the water main constructed in the 1940s. At the base of this ridge, to the southeast of the property, is a large depression, possibly from mining or use as a borrow pit. A culvert emerges from the center of the ridge. The area surrounding the fence line, and much of the area to the southeast of the property, has been plowed. The only cultural material observed in the southeastern portion of the property was a piece of wire cable that had been plowed up, and recently deposited trash (i.e., gum wrappers and a small piece of chain-link fence).

Walking north, Earth Tech personnel observed a rusty piece of unidentified metal, a recently deposited white cigarette lighter, an orange traffic cone (which had been tossed over the fence), and pieces of white styrofoam. Midway between the water holding tanks and the fence line is a wetlands area and what appear to be monitoring units on the north edge of the wetlands area. To the east of this wetlands area, along the ridge near the fence line, are three water valves. Two water valves are set in large concrete vaults, each with a metal cover. The northernmost valve is uncovered and consists of a concrete vault with a pipe and pump emerging from the interior of the vault.

To the east of the valves, the earth has been plowed. Situated in this plowed area is a piece of metal sheeting and a piece of bent window screen, both of which appear to have been tossed over the adjacent fence line. No other cultural material was observed in the northeast corner of the property. The area to the north is bordered by a partially fallen wooden fence line. The property to the north of the fence line is not part of the Burke Property and was not walked over. In the distance are several rolling hills, another partial wooden fence, and a road. Cattle graze in the pastures nearest to the road.

The north portion of the Burke Property is hilly and covered primarily by grassland and other vegetation. A small vernal pool is situated in the northeast portion of the property. This pool is, like the others, surrounded by eucalyptus trees and other vegetation. A tire, a small depression, and a metal pipe were observed on the surface to the northwest of the pool. Continuing to the center of the north portion of the property, Earth Tech personnel observed a two-track dirt road leading from the southwest (between the Travis AFB/City of Vallejo Water Treatment Plant and the water holding tanks) and extending through the fallen wooden fence and off the Burke Property to the north. Situated to the west of the

two-track road is a ravine/depression previously identified by Earth Tech biologists as a wetlands area (Earth Tech 1998).

To the west of the two-track road and ravine, just north of the road accessing the property, is another large pool surrounded by eucalyptus trees. It is believed that this pool was created through quarrying or borrowing activities. On the northern edge of this pool are shrubs and small rodent burrows. Earth Tech observed a small gray box (in an area marked for biological concerns). The box had a white label inscribed "[HO]LD BEACON/SO THAT/[AN]TENNA/POINTS/STRAIGHT UP." Also along this edge of the pool were an old shoe sole and a small, plastic, blue ball. A trench on the western edge of this pool leads away into the open pasture; the ground is heavily eroded in this area. Off the Burke Property, in an adjacent pasture, is a large windmill and tank, as well as several old wooden fence posts.

At the southeast corner of the Travis AFB/City of Vallejo Water Treatment Plant, Earth Tech personnel noted several burned bricks and fragments, structural beams, a glass bottle, and several eucalyptus trees. The area to the south and southeast of this site (down slope) has been plowed, revealing several white-ware ceramic sherds, broken glass, metal, brick fragments, and an old plowshare. Approximately 40 meters down the hill from the house site is a wetlands area. In and around this area are eucalyptus trees (standing and fallen), a couple of old rusted tools (pliers and a pipe wrench), more ceramic sherds, old tractor tires, a section of fence, and a metal object that resembles an old windmill or waterwheel.

5.2 RESULTS OF THE SITE RECORDATION

The concentration of historic debris at the southeast corner of the water treatment plant, and the cultural remains near the wetlands area just to the southeast, were recorded in more detail on 5 October. In the northern (upper) part of the site, Earth Tech personnel recorded a tight cluster of at least six bricks and fragments. The bricks lie flat and are aligned as if they were part of a wall, floor, or perhaps a hearth. Some are red and some are orange, and their sizes vary. They are mostly buried in the ground. The surface they form is somewhat uneven, and there is no visible mortar between them. This feature is at the edge of a larger concentration of bricks, charcoal, wood fragments, and burned or melted glass. These are apparently the remains of a structure that burned in this location. Several large eucalyptus trees stand over this area, and one has fallen across the edge of the brick concentration. A few meters to the southwest, two long, wooden beams lie side by side under a small willow tree. These are approximately 16 ½' and 19 ½' long. A small (4" long) extract or medicine bottle near the tree is the only complete bottle observed on the site. This bottle has an Owens-Illinois maker's mark on the base, but the numbers are unreadable due to weathering.

A wide swath has been plowed across the slope between the upper and lower areas, revealing hundreds of pieces of scattered debris. The scatter is made up mostly of small sherds of ceramics or bottle glass. The ceramics are almost all plain white-ware, but one piece has a bird painted on it. Several heavier white sherds, also plain, might be porcelain. The glass sherds are clear, white (milk), green, brown, and amethyst. One green bottle base bears the letters "...ERD..." Red and orange bricks and fragments are strewn down slope from the concentration into the plowed area and below. An old plowshare turned up by the more recent plowing marks the western edge of the site. Other iron objects and fragments (unidentified) are scattered sparsely throughout the plowed area and down the slope towards the drainage.

At the head of the swampy drainage in the southeastern corner of the site, a section of fence remains partially standing. It consists of a 13'-long section of "pig wire" attached to square wooden posts at each end. It marks the upper edge of the drainage. A few meters north, a 2" pipe sticks out of the ground toward the drainage. The exposed part of it is approximately 9½' long. It is part of some kind of water conveyance system, perhaps connected to a well that is no longer visible on the surface. Some kind of bladed wheel is buried in the muck of the drainage and is believed to be a remnant of either a water wheel or a windmill. Also partially buried in the drainage is a weathered tractor tire with "54" embossed in a box on the side wall. This may represent a date (the tire's diameter is approximately 44"). Two other tractor tires rest at the base of the slope just to the northeast. Several large eucalyptus trees stand over the head of the drainage, and another has recently fallen. Rusted pliers and a pipe wrench were noted near the base of this tree during the initial reconnaissance of the property in September but disappeared in the two weeks before the site was mapped. Fragments of bottle glass and white-ware ceramics are scattered around the upper end of the drainage.

Up the slope to the northeast of the drainage is an elongated pile of rubble (mostly concrete chunks) and a pile of asphalt that are apparently the result of recent dumping. North of this rubble, a lone apricot tree marks the northeastern boundary of the site. It may have been planted when the site was occupied.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

The property examined in this investigation was owned by the Burke family as early as 1872. Records suggest that it was mainly used for livestock grazing. Presumably, at some point, some members of the Burke family occupied and/or farmed it. Maps dating from 1908 to 1941 depict at least three structures on the property during the first half of the twentieth century. A 1953 map, however, shows only a single, burned house (Travis Air Force Base 1953). Massive pits were excavated in the 1950s as sandstone was quarried on the property. In the early 1990s, construction debris, including concrete, asphalt, and metal, was dumped on the property, which was still owned by the Burke family at that time.

The entire property was walked, and cultural remains (some quite recent) were observed. One area contained the remains of an older historic period occupation and warranted recordation as an archaeological site. The resource of greatest concern on the property is the apparent burned house site and its associated remains. A concentration of bricks, charcoal, and burned or melted glass at the edge of a eucalyptus grove seems to correspond to the location of the "burned house" shown on the 1953 map (Travis AFB 1953). There is no information available regarding the occupants of this structure nor is it known when it was actually occupied or burned. No visible trace remains of the other two structures depicted on maps from 1908 and 1941.

Much of the interpretive value of the site has been lost and/or corrupted over the years. Despite the presence of hundreds of glass fragments, only a single intact bottle was found. An even greater number of ceramics were present, but there was not even a half-complete vessel among them. Melted glass observed during the site recordation suggests that the fire was intense and probably very destructive. There is little chance of finding any items in this rubble that can increase our understanding of the occupants. Eucalyptus trees suggest that a substantial portion of the site lies across a fenced property boundary (inside the water treatment plant enclosure) and may be mostly destroyed. Construction, plowing, grazing, quarrying, dumping, fire, and, possibly, looting have further compromised the integrity of the site.

Most of the information about this site may be found on historical maps and in historical documents. These sources probably cannot be expanded, elucidated, or supplemented through further archaeological investigation of the site.

This site does not meet any of the criteria for inclusion in the National Register. It does not have a direct association with any significant persons or important events in local, state, or national history. It does not represent the work of a master, nor does it possess any high artistic value. Activities such as quarrying, dumping, and extensive agricultural use over the past several years have

destroyed the site's integrity. Prior to this loss in integrity, the site may have had the potential to yield information important to our understanding of the history of the region. Chances of recovering any useful information regarding the history of the region are slight. As a result, this site is not recommended for inclusion in the National Register.

6.2 RECOMMENDATIONS

During the investigation and site recordation, data was collected to support a recommendation of noneligibility for the site on the Burke Property. Much of the site's integrity has been destroyed due to extensive agricultural use, dumping and quarrying activities. It is unlikely that any useful information regarding the site or the history of the property would result from further investigations. Therefore, given the extent of the disturbance on the Burke Property, no further archaeological work is recommended on the site or the property as a whole.

7.0 BIBLIOGRAPHY

Air Mobility Command

1994 *Final Environmental Baseline Survey for the Family Housing Child Development Center, Travis AFB, California*, January. Courtesy of the 60 AW/EM, Travis AFB, California.

1994 *Final Environmental Impact Statement for the Realignment of Travis AFB, California*, June. Courtesy of the 60 AW/EM, Travis AFB, California.

1996 *Travis AFB, California, Inventory of Cold War Properties*, August. Prepared by Geo-Marine, Inc., Texas. Courtesy of the 60 AW/EM, Travis AFB, California.

Anderson, D.J., Chief, Soil Design Section

1995 Memorandum for Military Projects Branch. To Jack Davies regarding the Travis AFB Proposed Military Family Housing Project (with a map attachment), February. Courtesy of the 60 AW/EM, Travis AFB, California.

Argonne National Laboratory

1996 *An Archaeological and Historic Resources Survey and Inventory of Travis Air Force Base, Solano and Contra Costa Counties, California*, March 1996. Courtesy of the 60 AW/EM, Travis AFB, California.

Bennyhoff, J.A.

1977 *Ethnography of the Plains Miwok.* Center for Archaeological Research at Davis, Publication No. 5, University of California-Davis, Davis, California.

Central Solano County Cultural Heritage Commission

1975 *Our Lasting Heritage: A Historical and Archaeological Preservation Plan for Central Solano County*, June.

Earth Tech

1998 May 1998 Vernal Pool Endangered Plants Survey and Vernal Pool Delineations, Northern Parcel, Travis Air Force Base, California, June.

Flynn, Katherine and William Roop

1984 *Cultural Resources Inventory of the Proposed Travis Air Force Base Medical Facility, Fairfield, Solano County, California.* Prepared by the Archaeological Resource Service for Travis Air Force Base, Base Civil Engineering, Environmental and Contract Planning Section, Novato, California, August.

Gates, P.W.

1967 *California Ranchos and Farms, 1846-1862.* The State Historical Society of Wisconsin, Madison, Wisconsin.

Gaumer, Dean H.
1976 *An Archaeological Evaluation of the Proposed Wastewater Storage Ponds of the Vacaville Easterly Treatment Plant Enlargement Project.* Prepared for VTN Engineers, Architects, and Planners, October.

Greenway, G.
1975 Unpublished information regarding proposed highway widening. On file at the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

Gregory, T.
1912 *The History of Solano and Napa Counties, California.* Historic Record Corporation, Los Angeles, California.

Henning, J.S.
1872 Map of Solano County, California. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

Higgins, C.T.
1983 "Geology of Annadel State Park," *California Geology* 36(11):235-241.

Jelinek, L.J.
1979 *Harvest Empire: A History of California Agriculture.* Boyd & Fraser Publishing Company, San Francisco, California.

Johnson, P.J.
1978 "Patwin," in *California*, edited by R.F. Heizer, *Handbook of North American Indians*, Volume 8, Smithsonian Institution, Washington DC.

Kroeber, A.L.
1925 *Handbook of California Indians.* Bureau of American Ethnology, Bulletin 78, Washington DC.

Liebman, E.
1983 *California Farmland: A History of Large Agricultural Landholdings.* Rowman & Allanheld, Totowa, New Jersey.

Moratto, M.J.
1984 *California Archaeology.* Academic Press, Orlando, Florida.

Munro-Fraser, J.P.
1879 *History of Solano County.* Wood, Alley and County, East Oakland, California.

National Park Service
1989 *Cultural Resource Management Recommendations, Travis Air Force Base, Solano County, California.* Prepared by the Interagency Archeological Services Branch, Division of National Register Programs, Western Region, National Park Service. Prepared for Travis Air Force Base and the U.S. Air Force Military Airlift Command, April 1987. Revised February 1989.

Osborn, Sannie Kenton, and Richard A. Weaver
1989 *Travis Air Force Base, Solano County, California, Proposed Section 801 Family Housing, Cultural Resources Survey and Evaluation.* Prepared for the U.S. Army Corps of Engineers. Manuscript on file at Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

Paul, R.W.
1973 "The Beginnings of Agriculture in California: Innovation vs. Continuity," *California Historical Quarterly* 52(1):16-27.

Peak and Associates
1976a *Cultural Resources Assessment of the Road Expansion Project and Installation of a 24" Water Transmission Main along Cement Hill Road from Dover Avenue East to New Travis AFB Hospital.* Manuscript on file at Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

1976b *Cultural Resources Assessment of Three Sections of Drainage Ditch in the City of Fairfield.* Manuscript on file at Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

1985 *Cultural Resources Assessment of the Proposed California National Guard's Fairfield Armory, Solano County, California.* Manuscript on file at Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

Pisani, D.J.
1984 *From Family Farm to Agribusiness: The Irrigation Crusade in California and the West, 1850-1931.* University of California Press, Berkeley, California.

Powers, S.
1877 *Tribes of California, Contributions to North American Ethnology.* U.S. Geological Service, Washington, DC. Reprinted 1986 by the University of California Press, Berkeley, California.

Snow, C.B.
1983 *Travis AFB 40 Years on Active Duty*, Travis AFB Historical Society, Travis AFB, California.

Soil Conservation Service
1977 *Soil Survey of Solano County, California.* U.S. Department of Agriculture Soil Conservation Service in cooperation with the University of California Agricultural Experimentation Station, May.

Soil Foundation Systems, Inc.
1990 *Fairfield Residential 101 Acres.* Provided to Travis Air Force Base, June. Courtesy of the 60 AW/EM, Travis AFB, California.

Solano County
n.d. "Portion Official Map of Solano County California." On file with Solano County Office of Transportation, Fairfield, California.

Thompson and West
1878 *Historical Atlas Map of Solano County, California.* Thompson and West Publishing Company, San Francisco, California.

Travis Air Force Base
1953 Historic maps of the Burke Property. Provided by Sanford Bennett, 60 AW/CES, Travis AFB, California.

Treganza, Adan. E., Robert L. Edwards, and Thomas F. King
1965 *Archaeological Survey and Excavations along the Tehama-Colusa Canal, Central California.* Manuscript on file at Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

True, D.L.
1979 *Archaeological Surveys in Solano County, CA: Solano County Water Project Feasibility Study.* Prepared for the Bureau of Reclamation. Manuscript on file at Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

U.S. Geological Survey
1908 Vacaville Quadrangle. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

1941 Vacaville Quadrangle. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

1980 Elmira, California, Quadrangle, 1953. Photorevised 1980. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

U.S. Government Land Office
1861 "Survey Plat of Township 5 North, Range 1 West of the Mount Diablo Meridian - Amended," Surveyor General's Office, San Francisco, California.

University of California Agricultural Experiment Station
n.d. Excerpts from a soils survey.

Weaver, C.E.
1949 *Geology of the Coast Ranges Immediately North of the San Francisco Bay Region, California.* Memoir 35, Geological Society of America, New York, New York.

Wilson, Kenneth L.
1978 *Cultural Resources Survey of the Peabody 230 KV Transmission Line and 230/21 KV Substation*, July. Manuscript on file at the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

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APPENDIX A

STATE OF CALIFORNIA - THE RESOURCES AGENCY
DEPARTMENT OF PARKS AND RECREATION
ARCHAEOLOGICAL PRIMARY RECORD, DPR523A
BURKE PROPERTY, TRAVIS AIR FORCE BASE

PREPARED BY
EARTH TECH
OCTOBER 1998

PRIMARY RECORD

NRHP Status Code: 7
Other Listings: None
Review Code: Reviewer: Date:

P1. Other Identifier: Burke Home Site; Solano County Parcel 4 (Book 174)
P2. Location: Not for publication
a. County: Solano
b. USGS Quadrangle: Elmira, California 7.5' Date: Photorevised 1980
T 5 N; R 1 W; N ½ of the NE ¼ of the SW ¼ of the NW ¼ of Sec 14; MDM
d. UTM: Zone 10, 592140 mE/ 4237500 mN
e. Other Locational Data: The site is located on the northern part of Travis Air Force Base, on the south side of the City of Vallejo/Travis AFB Water Treatment plant.
P3a. Description: The site consists of a scatter of ceramic sherds, bottle glass sherds, metal fragments, tractor tires, collapsed fencing, a possible well, a wind mill or water wheel, and a concentration of bricks in a burned area which might be the remains of a burned house. A grove of Eucalyptus trees and a single apricot tree are probably the legacy of the home site occupation also.
P3b. Resource Attributes: HP2, HP30, HP33, HP34, AH4, AH5, AH6
P4. Resources Present:
☐ Building ☐ Structure ☐ Object ☐ Other (Isolates, etc.):
■ Site ☐ District ☐ Element of District
P6. Date Constructed/Age and Sources:
☐ Prehistoric ■ Historic ☐ Both
The age determination was based on the nature of the artifacts.
References:
P7. Owner and Address: U.S. Air Force - AFFTC, Edwards AFB, CA 95324
P8. Recorded by: H. Puckett and R. Cooper, Earth Tech
P9. Date Recorded: 5 October 1998
P10. Survey Type: ☐ Intensive ☐ Reconnaissance ■ Other
Describe: Site recordation
Purpose:
P11. Report Citation:
Attachments:

☐ None
■ Sketch Map
☐ Building, Structure, and Object Record
☐ District Record
☐ Milling Station Record
☐ Artifact Record
☐ Other (List):
■ Location Map
☐ Continuation Sheet
■ Archaeological Record
☐ Linear Feature Record
☐ Rock Art Record
☐ Photograph Record

ARCHAEOLOGICAL SITE RECORD

A1. **Dimensions: a. Length** 114 meters (NW/SE) × **b. Width** 96 meters (NE/SW)
Method of Measurement: ☐ Paced ■ Taped ☐ Visual estimate
☐ Other:
Method of Determination: ■ Artifacts ■ Features
☐ Soil ■ Vegetation ☐ Topography ☐ Cut bank
☐ Animal burrow ☐ Excavation ■ Property boundary
☐ Other (Explain):
Reliability of Determination: ☐ High ■ Low
Explain: The boundary was delineated based on the distribution of occupation debris, features, and introduced trees. Other cultural remains might be obscured by vegetation, and some areas that might otherwise have been included were not accessible at the time of the survey -- i.e. they belonged to a different property owner and were fenced off. Also, the general area has been disturbed by construction, quarrying, and farming which almost certainly destroyed or obscured other remains.
Limitations: ■ Restricted access ■ Paved/built over
☐ Site limits incompletely defined ■ Disturbances ■ Vegetation
☐ Other (Explain):

A2. **Depth:** ☐ None ■ Unknown ___ Method of Determination:

A3. **Human Remains:** ☐ Present ☐ Absent ☐ Possible
■ Unknown (Explain): Not tested

A4. **Features:** A cluster of bricks at the north end of the site measures 18" by 9.5". The six bricks lie flat and are aligned with each other as if they were part of a wall, floor, or perhaps a hearth. Their sizes vary. Some are red and some are orange. The surface they form is somewhat uneven however, and there is no visible mortar between the bricks. This feature lies at the edge of a larger concentration of bricks, charcoal, and burned or melted glass fragments. These are apparently the remains of structure that burned in this location. The remains of other features can be found at the head of the drainage at the southeast edge of the site. A 2" pipe protruding from the ground in this area is part of a water conveyance system, possibly connected to a well. Just below the pipe is a 13' long section of a collapsed fence which marks the north edge of the swampy drainage. The fence consists of "pig wire" attached to a wooden post at each end. Some kind of bladed wheel is buried in the muck of the drainage and is a remnant of either a water wheel or windmill.

A5. **Cultural Constituents:** Hundreds of pieces of historic period debris are scattered over the site. It is especially obvious in the plowed area just below the brick concentration. The scatter is made up mostly of small sherds of ceramics or bottle glass. The ceramics are almost all plain whiteware, but one piece had a bird painted onto it. A couple of heavier white sherds (also plain) might be porcelain. The glass sherds are clear, white (milk), green, brown, and amethyst. A single complete bottle was found. It is made of clear glass, measures approximately 4", and is probably an extract or medicine bottle. It has an Owens-Illinois maker's mark on the base, but it is weathered and the numbers are unreadable. Part of a green glass bottle base bears the letters "...ERD.." Two 4" x 6" timbers lie side by side under a willow tree to the southwest of the brick concentration. One is approxi-

mately 16 ½' long and the other is approximately 19 ½'. A little further to the west an old plow share has been turned up by recent plowing. A few other iron objects and fragments (unidentified) are strewn down the slope to the south. Bricks and fragments (both red and orange) are scattered downslope from the concentration also. In the southeast portion of the site, three weathered tractor tires lie in or near the drainage. One has "54" embossed inside a box on the side wall. This might represent the year of manufacture (its diameter is approximately 44"). A rusted set of pliers and a rusted pipe wrench were noted during a visit to the site in September of 1998 near the drainage, but disappeared in the two week period before the site was mapped. Eucalyptus trees are concentrated around the brick concentration to the north and the drainage to the southeast. They are also abundant inside the water treatment plant enclosure, suggesting the site originally extended much further north. A lone apricot tree marks the eastern boundary of the site. A pile of asphalt, concrete chunks, and construction rubble south of the apricot tree is apparently from recent dumping.

A6. **Were Specimens Collected?** ■ No ☐ Yes

A7. **Site Condition:** ☐ Good ☐ Fair ■ Poor
Describe disturbances: Construction, plowing, quarrying, fire, bioturbation (especially from large trees and cattle grazing), and looting

A8. **Nearest Water:** There is a drainage at the southeast edge of the site, and a nearby water pipe protruding from the ground suggesting there might have been a well.

A9. **Elevation:** Approximately 130 to 150 feet

A10. **Environmental Setting:** The site sits on a hill slope overlooking a small drainage. The vegetation cover is predominantly grasses and thistle, but much of the site is shaded by large Eucalyptus trees. The plowed area across the middle of the site reveals a reddish brown sandy loam. Sandstone bedrock is revealed in large quarry pits to the east of the site. Several vernal pools now exist in and around these quarry pits.

A11. **Historical Information:** This parcel was owned by the Burke family from at least as early as 1872. At least three structures were present on the property between 1908 and 1941, but whether these were actually built by the Burke family has not been confirmed. A burned structure appears on a 1953 map (Earth Tech 1998).

A12. **Age:** ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848
☐ 1848-1880 ■ 1880-1914 ■ 1914-1945 ☐ Post 1945
☐ Undetermined
Describe position in regional prehistoric chronology or factual historic dates if known:

A13. **Interpretations:** This site is a remnant of a home site/farm that was owned by the Burke family from the late 19th century to the 1990s. At least three structures stood on the property from 1908 to 1941, but it is not clear who built and/or occupied these. The site described in this record constitutes a small portion of the original site. Parts of the property were sold over the years, and much of the original site is fenced off or built over. Most of the site seems to have been destroyed by construction, quarrying, farming and perhaps looting. Despite the presence of hundreds of sherds of ceramics and bottle glass, a single complete bottle and no complete vessels were observed. The concentration of bricks noted during this survey is believed to be a remnant of a burned house that appears on a 1953 map.

A14. Remarks:

A15. References:

Earth Tech

1998 *Archaeological Investigation for the Burke Property.* Travis Air Force Base, California, October.

A16. Photographs:

Original Media/Negatives kept at:

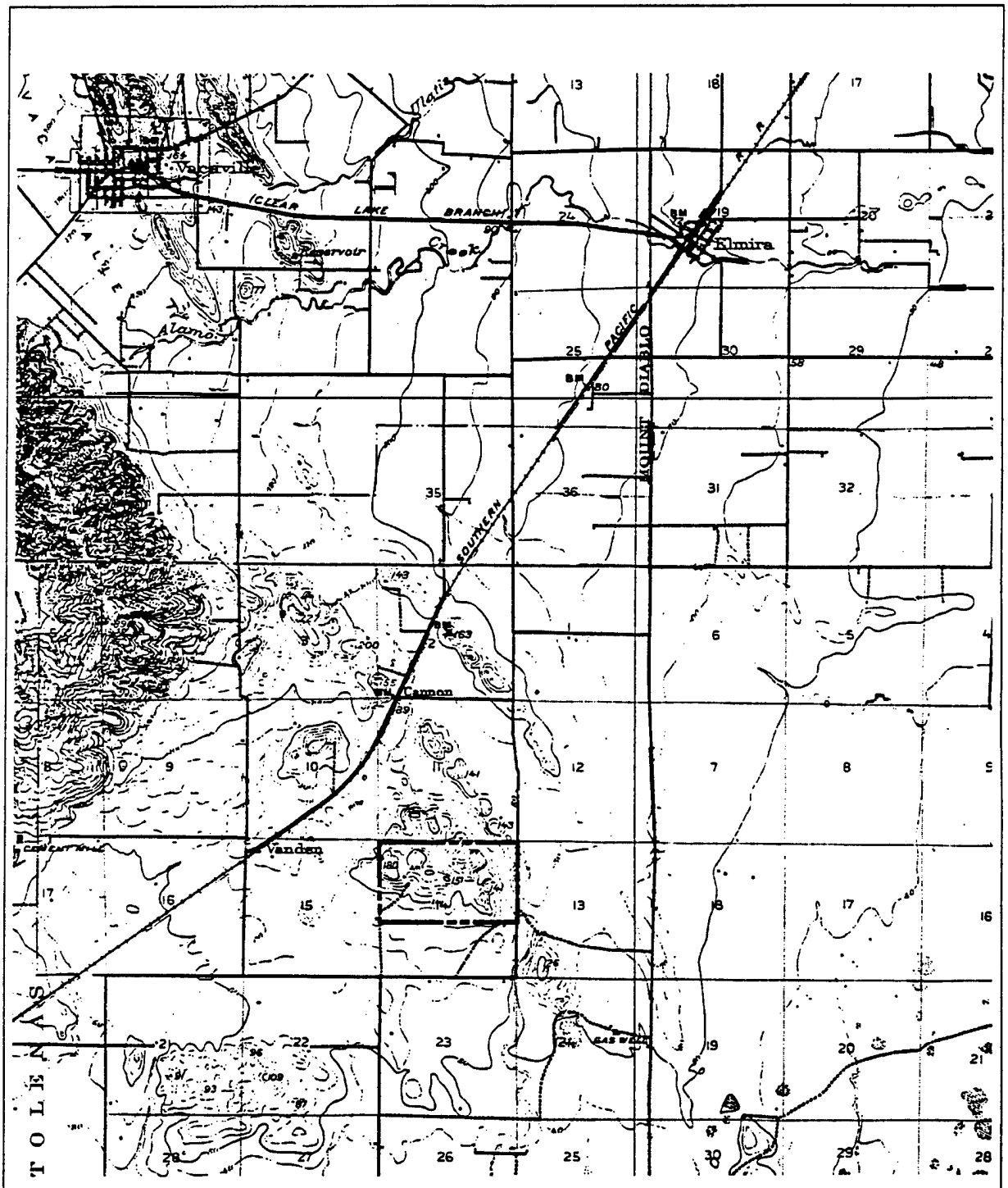
A17. Form Prepared by: R. Cooper

Date: 12 October 1998

Affiliation and Address: Earth Tech, 1461 East Cooley Drive, Suite 100, Colton, California 92324.

SKETCH MAP

Drawn by: Date:



Property Boundary

Burke Property ca. 1908

NOT TO SCALE

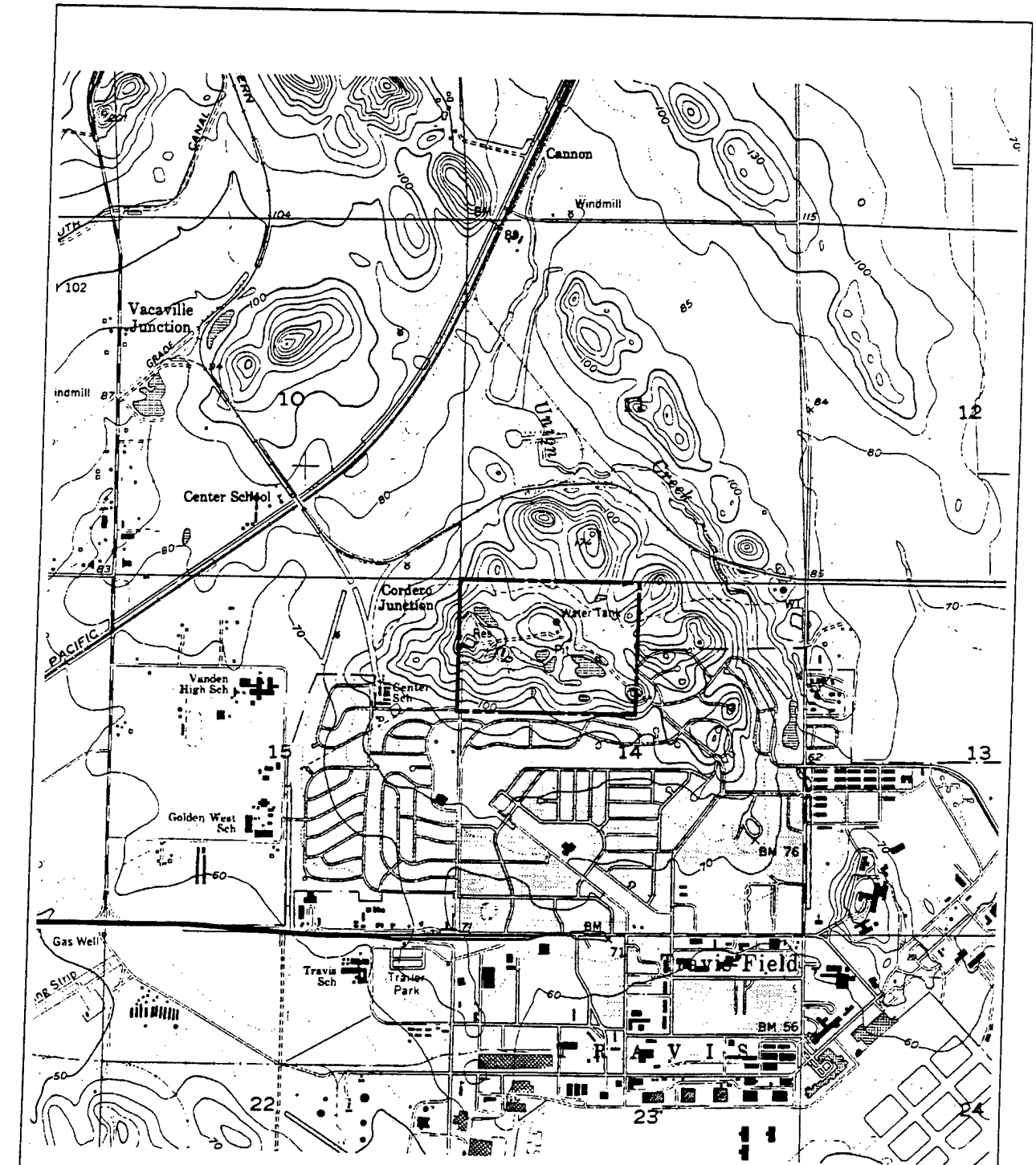
Source: USGS 1908, Vacaville Quadrangle. Courtesy of the Northwest Information Center, California Historical Resources Information System, Rohnert Park, California.

Figure 3-5

Travis/006

LOCATION MAP

Map Name: Elmira, California 7.5' **Date:** 1980



Property Boundary

SCALE IN FEET
0 1000 2000

Source: USGS 1953 Elmira 7.5' Quadrangle (photorevised 1980)

Travis Air Force Base and the Burke Property

Figure 1-1

Travis/003

APPENDIX B

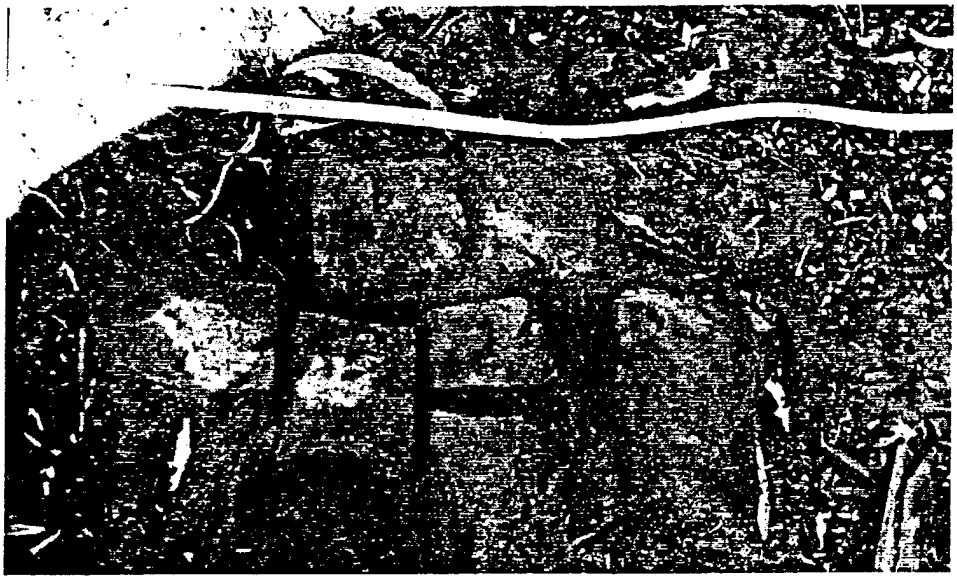
PHOTOGRAPHS
BURKE PROPERTY, TRAVIS AIR FORCE BASE

PREPARED BY
EARTH TECH
SEPTEMBER-OCTOBER 1998

Photograph 1. Site overview,
view looking northwest

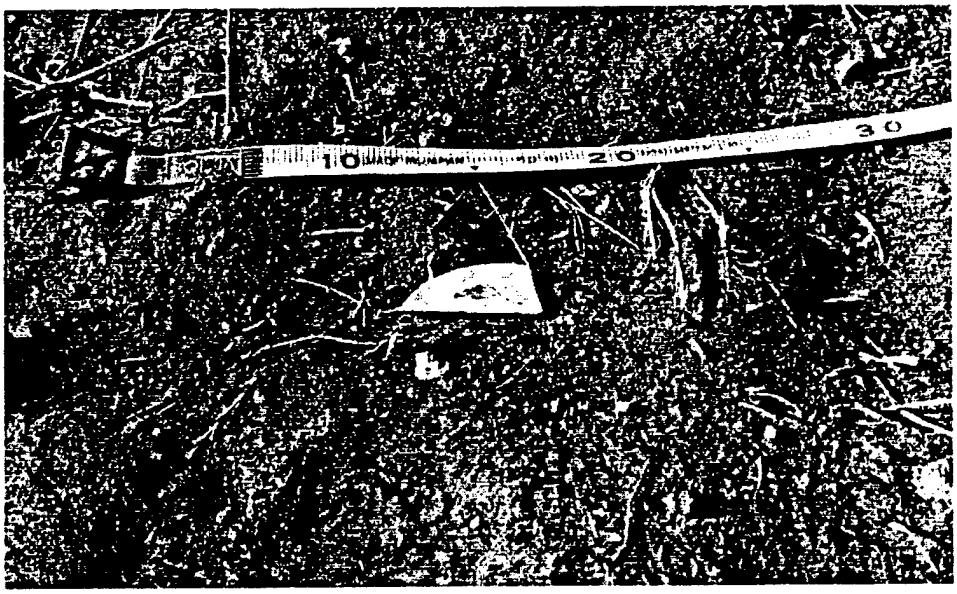
Photograph 2. Close-up of burned site location,
view looking west to northwest

Photograph 3. Structural beams near burned site location, view looking south to southeast



Photograph 4. Close-up of brick feature at burned site location

Photograph 5. Complete bottle found near structural beams at burned site location



Photograph 6. Ceramic sherd bearing bird imprint near burned site location

Photograph 7. Possible windmill or water wheel
southeast of the burned site location

Photograph 8. Site disturbed by asphalt pile and other debris,
view looking south to southeast